Health Information Management

HEALTH INFORMATION MANAGEMENT

Unlocking the Power of Data in Healthcare

EDITED BY SHEREE LLOYD; JOEL SCANLAN; AND SALLYANNE WISSMANN

University of Tasmania

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ACKNOWLEDGEMENT OF COUNTRY

In the spirit of reconciliation, the University of Tasmania respectfully acknowledges the lutruwita nations. The University also recognises the Aboriginal history and culture of the land, and acknowledges and pays respect to the Traditional Owners and to Elders past, present and emerging of the land on which all UTAS campuses stand.

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Amina is an Associate Professor in Digital Health within the School of Public Health and Social Work at QUT. Her research strengthens the global digital health agenda, enabling health stakeholders to adopt an evidence-based approach to mitigate patient safety risks associated with technology while maximising efficiency benefits.

Profile: Queensland University of Technology



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Brooke Macpherson is a Health Information Manager with over 20 years of experience in the Australian health system at the

local, state, and federal level. Brooke's experience includes roles in hospital data analysis and reporting, website development, program monitoring and evaluation, and health classification (including development of ICD-11). Since 2014, Brooke has been involved in international health classification activities with the World Health Organization (WHO) Family of International Classifications (FIC) Network, serving as Secretariat for its Family Development Committee (2014-2018) and Classification Statistics and Advisory Committee (2020-2024). Brooke's current role is responsible for analysis and reporting of primary health care data.

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Profile: University of Tasmania



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Gina Banfield

Gina is an experienced leader in Health Information Management and Health Informatics, with a diverse background spanning both Australian and international health services. She currently serves as the National Health Information Manager for Ramsay Health Care, following her previous role as Queensland Health Information Manager. Before joining Ramsay, Gina held the position of Deputy Manager of Health Information at the Royal Flying Doctor Service (Queensland Section), where she contributed to the advancement of health information services within the section.

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Picture of author Helen Almond

Helen Almond

Helen is a passionate healthcare leader with more than 40 years of experience as a registered nurse and sick children's nurse. With a PhD in Digital Health and Informatics and an MSc in Clinical Nursing (Nurse Practitioner UK), she is a leading expert in digital health, informatics, and clinical nursing. As

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Dr Jennifer Ayton is a maternal and reproductive health researcher, qualitative researcher, and Senior Lecturer in Public Health at the University of Tasmania School of Medicine. As a social scientist, she holds a Ph.D. in Sociology, Master of Research (Midwifery), and is Registered Midwife and Nurse. Jennifer leads a collaborative research program that focuses on promoting gender equality, optimising women's, and their family's health from a public health perspective through research with and for women. ORCID: https://orcid.org/0000-0003-0092-437X

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Dr. Karima Lalani is the Program Director of both the master's and the bachelor's degree programs in Health Informatics and Health Information Management (HIHIM) at the University of Washington in Seattle, Washington, USA. Dr. Lalani holds a Ph.D. in Health Policy and Management from The University of Texas Health Science Center School of Public Health, and is a seasoned health informatics researcher and professional, with over 15 years of experience in healthcare workforce education and training, strategic planning, and digital health. She is a Fellow of the American College of Healthcare Executives (FACHE), and a Registered Health Information Administrator (RHIA). Prior to joining the University of

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Kerryn Butler-Henderson

Professor Kerryn Butler-Henderson is Head, School of Nursing, Paramedicine and Healthcare Sciences at Charles Sturt University. She is a well-respected digital health academic, with more than twenty years' experience working in health and higher education. She is known for her expertise in digital health, particularly in

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Profile: Charles Sturt University ORCID iD

Laura McVey

Laura McVey is a health information and privacy specialist with a keen interest in Digital Health. Laura has worked for a variety of healthcare organisations in Queensland and has recently been working as a Privacy and Data Governance Consultant. Laura holds a Bachelor of Health Science – Health Information Management from Queensland University of Technology, a Graduate Certificate in Health Management from University of New England and a Master's in Public Health from University of Queensland. Laura is currently working as the Health Information Manager at Royal Flying Doctors Service Queensland.

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Lachlan Hardy is a Teaching Fellow specialising in cyber security education, with a research focus on information systems and human-computer interaction. His academic work investigates the interplay between digital competency and technological self-efficacy to explore user experience and socio-technical systems. Lachlan is dedicated to enhancing inclusive and effective teaching practices, leveraging emerging technologies to support critical thinking, problem solving, and practical skill development in cyber security and information systems.

Profile: University of Tasmania



Maryann Wood

Maryann Wood is a consultant with expertise in health information management and clinical classification. She has most

recently been an academic at the Queensland University of Technology specialising in the area of health information management, quality management and project management. Maryann also has significant experience as an international consultant in these areas. She has been employed as a short term consultant on a number of occasions by agencies such as the World Health Organisation and the Department of Health and Ageing (Australia) in both the Pacific and South – East Asia regions. The work Maryann undertook during these consultancies involved provision of advice on health information systems, development of training modules in ICD-10 and hospital information systems, conducting "train the trainer" workshops in a variety of areas such as clinical classification (for mortality and morbidity). Nationally, she has provided consultancies services in mortality for child death review teams across a number of jurisdictions. She has also undertaken several international consultancies in project management during her tenure at the Australian Bureau of Statistics in the Solomon Islands and Nauru.

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Matthew Springer

Dr Matthew Springer is a Senior Lecturer in Information and Communication Technology at the University of Tasmania, with over two decades of experience in inclusive, student-centred education. His teaching and leadership are defined by a deep commitment to equity, diversity, and belonging, values that inform all aspects of his work across curriculum design, governance, and academic integrity.

Matthew has led innovation in digital learning, pioneering case-based and modularised delivery models that promote accessibility, engagement, and real-world relevance. His work exemplifies values-led leadership, ensuring digital transformation, inclusion, and academic excellence go hand-in-hand to create transformative learning experiences for all students. Matthew's ongoing contributions also support the development of digitally fluent graduates and stakeholder-informed curricula that respond to the evolving needs of the ICT and digital health sectors.

Profile: University of Tasmania



Rachel Fojtik

Rachel Fojtik is a data and analytics leader with over 20 years' experience in complex, highly regulated environments. She is currently a Leader in Data Governance at Rio Tinto, responsible for embedding governance frameworks and championing ethical data use. Rachel has held senior roles across healthcare, energy, and finance, including at Mater Health Queensland, where she led clinical and operational analytics. She co-authored the chapter on interoperability and user experience in Digital Health: A Transformative Approach and speaks regularly on applying data governance and storytelling to advance decision-making in healthcare settings.

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Sallyanne Wissmann

Sallyanne Wissmann is the Chief Executive Officer of the Health Information Management Association of Australia

(HIMAA) and is a Health Information and Information Management Executive Consultant. Sallyanne has over 30 years' experience as a leader in health information management in the public and private not-for-profit healthcare environments in Australia and New Zealand. Sallyanne is a fellow and life member of HIMAA, a Certified Health Information Manager (CHIM), a Certified Health Informatician Australasia (CHIA), and an Associate Fellow of the Australasian College of Health Service Management (AFCHSM). Sallyanne has previously served as the IFHIMA Western Pacific Regional Director during which time she served on the IFHIMA Board.

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Salma Arabi

Salma is a digital health academic with a dedicated focus on gender and leadership in the digital health workforce. She completed her PhD at RMIT University where she explored the challenges and opportunities that arose for participants of a cross-border collaboration within the healthcare sector. She used those insights to develop a conceptual framework that can be used to

guide future partnerships in healthcare. Through her work as a research and translational scientist, she continues to actively contribute to digital health knowledge advancement. In addition to her academic achievements, Salma is passionate about advocating for gender equity in the digital health field, where women and non-binary people are often underrepresented in leadership roles.

Profile: Charles Sturt University



Sandeep Reddy

Professor Sandeep Reddy is an experienced researcher in artificial intelligence implementation in healthcare. He serves as Professor and Head of Discipline for Healthcare Management and Health Safety and Environment at Queensland University of Technology's School of Public Health, and leads the Health, Human Biology and MedTech Theme at the Centre of Data Science. Prof. Reddy was previously on the WHO Digital Health Roster of Experts and Focus Group on AI for Health. He has authored several books on AI in healthcare and leads projects developing AI systems for clinical communication and medical education.

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Dr. Sheree Lloyd is a senior lecturer at the Tasmanian School of Business and Economics, with over 30 years of experience in academic and health service management roles. As a Certified Health Information Manager and Fellow of multiple prestigious institutions, including the Australasian College of Health Service Managers and the Australasian Institute of Digital Health, she has demonstrated exceptional expertise in digital health and healthcare innovation. Her accomplished career includes leadership positions such as Director of Health Information Service at Princess Alexandra Hospital and Regional Health Information Management at Metro South Regional Health Authority, where she successfully managed large-scale hospital information systems and activity-based funding projects. A passionate educator and researcher, Dr. Lloyd has been recognised with numerous accolades, including a Vice Chancellor's Award from Queensland University of Technology and teaching commendations from multiple institutions. Her PhD research on innovation and high

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Susan Fenton

Dr. Susan H. Fenton is the Dr. Doris L. Ross Professor and Vice Dean for Education at the UTHealth Houston McWilliams School of Biomedical Informatics. She is responsible for their certificates, master's, and doctoral degree programs. Dr. Fenton received the 2024 AHIMA Distinguished Member Triumph Award. She has received multiple teaching awards, including The University of Texas Regents' Outstanding Teaching Award in 2019 and the 2021 UTHealth President's Scholar Award for Teaching. Dr. Fenton's research focuses on ICD-11, workforce development, and optimizing HIT for

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Profile: LinkedIn



Trixie Kemp

Trixie Kemp is the Director of Health Information Management Services at the Department of Health Tasmania, bringing over 30 years of experience in both community and hospital settings. She provides expert guidance and education on information governance, policy, records management, digital health, data quality, and privacy to healthcare facilities and projects. Trixie leads a dedicated team of 150 full-time equivalents across four acute hospitals. Passionate about the critical role of health information management in patient safety, she is currently pursuing a PhD part-time at Charles Sturt University to further explore this vital contribution. Trixie looks forward to sharing her research findings in the coming years.

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Vicki Bennett

Vicki is the Head of the Pacific Health Information and Classification Support Unit at the Australian Institute of Health and Welfare. She has a degree in Health Information Management, and a Masters in Health Informatics and has had a diverse career both domestically and internationally. She has worked extensively across the Pacific over the past 20+ years. She is a member of the Universal Health Coverage Technical Advisory Group for the WHO Western Pacific Region, an Advisor to the Pacific Health Information Network Board and is currently the President of the International Federation of Health Information Management Associations.

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Usman Iqbal

Professor Usman Iqbal is a specialist in digital health, health informatics, and evidence-based practice. He is Professor at the

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Profile: Bond University



Willy Chan

Willy Chan brings over 17 years of experience to advancing healthcare in Australia. Willy operates at the intersection of technology and healthcare, specialising in Clinical Information Systems, Automation and AI. Working in New South Wales Health, Willy leads teams dedicated to optimizing consumer-centric systems that ensure patients receive timely and efficient care. Notably, he played a pivotal role in developing information systems used at the NSW Health Vaccination

Centre during the COVID pandemic, which won the 2021 NSW Premier's Award for customer focus. In 2022, he was honoured with the People's Choice Award as voted by his peers, recognising his outstanding leadership and dedication. His expertise extends internationally through his work with the World Health Organization, where he enhanced digital capabilities and literacy across the Western Pacific region and contributed significantly to shaping global standards in health information. His efforts include developing the Data Management Competency Framework for the region, providing vital technical support and capacity building to member nations. Willy continues to drive digital health improvements, significantly impacting healthcare outcomes both nationally and globally.

Profile: LinkedIn

INTRODUCTION

Sheree Lloyd; Sallyanne Wissmann; and Joel Scanlan

"Health information permeates healthcare delivery from point-of-care, across the continuum of care and throughout the healthcare system's policy, population health, research, planning and funding arenas. Health information managers (HIMs) expertly manage that information." (Robinson et al., 2023)

The effective management of health information is a key dependency for the provision of appropriate and safe healthcare and the management of a successful and efficient healthcare system. Information underpins decision making at all levels. A person's health information is created pre-birth and throughout a person's lifetime, providing the key indicators of a person's health and wellbeing. Created, accessed and used in multiple settings, by health and administrative personnel, the definition, integrity, timeliness, availability, accessibility, confidentiality, security, and appropriate use of a person's health information is critical to enable optimal population health and wellbeing outcomes.

In many parts of the world, today's health ecosystem is complex and data rich. Many local, national and international

initiatives are occurring to connect and share health information between health professionals and organisations as people are increasingly mobile and require health care advice, treatment and management from multiple providers. An aging population means that citizens in many countries are living longer and can have multiple chronic health condition where critical information is key to self-management and management by healthcare providers and clinicians.

Appropriate sharing of information based on legislative and ethical requirements, together with the desire for continuous improvement in health system efficiency, funding appropriateness, and health and wellbeing outcomes, necessitates the sharing of health information with governments, funders and researchers. These organisations use health information for planning, funding and to determine the performance of a healthcare system.

The increasing application of AI to augment healthcare workflows and diagnostic and treatment capabilities creates new challenges for the creation and use of health information. Simultaneously, the very real threat of health information being stolen by cybercriminals for extortion purposes and to expose the sensitive and confidential health information of individuals has the potential for adverse societal and individual impacts. The amount of health information generated is vast, as are the insights and secondary uses associated with the goals

of appropriate, effective and safe healthcare and the management of effective and efficient healthcare systems.

Health Information Management (HIM) professionals are equipped with the skills, knowledge and expertise to manage and govern health information in all settings and for all purposes. HIM professionals balance the interests of patients, organisation and government policy and priorities, legislation, and research ethics to oversee the definition, integrity, timeliness, availability, accessibility, confidentiality, security, and appropriate use of health information.

Not constrained to healthcare organisations, the skills of HIM professionals are valuable to enhancing the management of and insights derived from health information for other organisations such as government agencies, clinical repositories, cancer and disease registries, research, software vendors and consultancy services. Their skills are transferable and valuable to enhance information management and governance in the disability, community and aged care sectors.

HIM professionals work in a variety of roles and require knowledge and skills relevant to healthcare systems, medical science, classification, health information technology, privacy and confidentiality, funding, data and information governance, and the management of people, resources and technology.

This textbook has been written to provide a comprehensive introduction to the principles and practices of health information management, preparing students and

professionals to navigate the complex world of healthcare data, documentation and systems. Content in each chapter is shaped by the knowledge and experiences of a diverse group of health information, technology and clinical professionals whose work bridges the gap between theory and practice in health information management, digital health, and healthcare systems. Whilst some chapters are focused on the Australian context, principles and approaches can be applied in other contexts, informed by local policy, procedure and local requirements.

The text is organised into parts and chapters. Throughout the text, the authors have included opportunities for reflection, embedded activities, and case studies to maintain a practical focus while providing comprehensive discussions of both theoretical principles and real-world applications for health information management in today's healthcare settings.

Biographies for the contributors to the text demonstrate the depth and breadth of health information and informatics expertise of the authors.

Part 1. Healthcare and the Global Context of Health Information Management

This section explores the HIM profession and roles and helps readers understand both the historical context and future

trajectory of the profession, while examining how information management directly impacts patient safety and aligns with the global Sustainable Development Goals.

These chapters were authored by nationally and internationally recognised health information academics and practitioners. Authors have made significant contributions to advancing health information management education, health information professional workforce development, and professional practice standards globally. Researchers have advanced the field through their exploration of health information and informatics competencies, the usability of electronic medical records and improving healthcare outcomes through better information management practices.

Chapters included

- Health Information Management – The Foundation for Good Health

- The HIM Profession and Roles: Understanding our Path to Plan for the Future

- Patient Safety and Sustainable Development Goals through the Lens of Health Information Management

Part 2. Leadership in Health Information Management

This section examines strategic management principles and how to lead effective health information services. It addresses the development of critical skills for engaging stakeholders and building lasting partnerships across the healthcare ecosystem. It explores the specific span of control of the health information system leader and essential functions of planning, leading, organising and controlling, to deliver health information services, sustain a health information workforce, deliver high quality data, and protect patient confidentiality and privacy.

Authors in this part have contributed to health information management in Australia and advanced the professional identity of health information managers. They have conducted research in health informatics and electronic medical records in Australia, with contributions to understanding clinical information systems implementation and healthcare data management. Academic contributors are accomplished teachers in digital health, ICT areas including project management, systems strategy, and digital health, with a focus on digital literacy, leadership, and professional practice in complex environments.

Chapters included

- Leading Strategically in Health Information

Management

- Leading the Health Information Service (HIS)
- Engaging with Stakeholders and Partners

Part 3. Data and Information Management in Health

In this section, chapters explain how data serves as a foundation for decision-making in the healthcare system. It examines various types of healthcare data and information beyond traditional health records, followed by an in-depth look at healthcare classifications and terminologies. Special attention is given to First Peoples' health data, acknowledging the unique considerations and cultural sensitivity required in managing this information.

Authors and experts in classification and coding and with international profiles in health information management have authored these chapters in this part. Contributors are also prominent in the domains of health information, analytics and Indigenous data and continue to contribute to key health information bodies at a national and international level. With national and international contributions their experiences in education and the profession of information have contributed to the rich content of the chapters.

Chapters included

- Data: The Heart of the Healthcare System
- Beyond the Health Record: Alternative Sources of Healthcare Data
- Healthcare Classification and Terminologies
- First Peoples' Health Data (writing in progress)

Part 4. Health Informatics and Digital Health

As healthcare continues its digital transformation, this part explores the impact of health informatics and digital technologies on healthcare delivery and the role of the health information management professional. This part of the text provides a particular focus on electronic medical and health records and their increasing central role as the technological foundation of modern health.

Authors with profiles in national and international spheres have made significant contributions to digital health through research on artificial intelligence in healthcare, health informatics, clinical decision support systems and predictive analytics. Collectively authors have advanced the field of health information management and digital health through their work on electronic health records implementation, digital health literacy, healthcare data governance, digital health

competencies, and the development of frameworks for effective health information exchange across healthcare systems.

Chapters included

- Navigating the Future: The Impact of Health Informatics and Digital Technologies on Healthcare

- Electronic Medical and Health Records

Part 5. Health Information Privacy and Security

Health data is our most personal data, and digitisation has presented society with a new frontier for risk – not primarily to our personal health, but to privacy. This part addresses cybersecurity in health and cyber risk management, ensuring readers understand both the threats facing the health and care sector and are well placed to participate in developing strategies to protect against them. Authors are well known nationally and internationally and are experienced researchers, teachers and practitioners in cyber, ICT, privacy and health information management.

Chapters included

- Health Information Law, Privacy and Ethics

- Cybersecurity in Health
- Cyber Risk Management

Part 6. The Future of Health Information Management

The future of health information management presents opportunities and risks. As technology changes how we deliver care, The Future of Health Information Management explores the tools and the health information management implications relevant to their use in the delivery of healthcare services.

Healthcare needs of both individuals and the population will continue to evolve with changes in demographics, workforce and new technologies. Many healthcare organisations are integrating technology to support new models of care, improve efficiency and integrate consumer needs. The The Future of Health Information Management chapter explores the technologies and how the profession is responding and the need to adapt for the future. Artificial intelligence and machine learning have the potential to revolutionise data analytics and clinical decision support. The chapter addresses the evolution of health records into more sophisticated, interoperable and usable platforms that can benefit both consumers, clinicians, help to understand health system performance and inform population health needs.

Each chapter in this text has been peer reviewed by subject matter experts who evaluated for relevance and clarity. Suggestions to strengthen chapters were actioned by authors to incorporate recommended improvements. The Glossary included in the textbook provides definitions for important terms and specialised vocabulary used throughout the chapters. This helpful reference tool enables readers and students to look up unfamiliar words and concepts, ensuring comprehension of the subject matter.

We trust this textbook serves as a learning tool for those currently working in health information management, those aspiring to work in the field, those seeking to update their knowledge on contemporary practice, and those seeking to understand the field. Together with our contributing authors, we have strived to create a useful resource that balances theoretical foundations with practical applications, ensuring you are well-equipped for both academic and real-world challenges. It represents a point in time while looking to the future, enforcing that the principles of health information management are timeless while needing to be continually adapted to the changing health environment. As you embark on reading the text, each chapter represents an opportunity to grow, learn, and make meaningful contributions to the advancement of knowledge in our discipline.

References

Robinson, K., Barraclough, S., Cummings, E., & Iedema, R. (2023). The historiography of a profession: The societal and political drivers of the health information management profession in Australia. Health Information Management Journal, 52(2), 64-71. https://doi.org/10.1177/18333583211070336

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ACCESSIBILITY INFORMATION

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PART 1 HEALTHCARE AND THE GLOBAL CONTEXT OF HEALTH INFORMATION MANAGEMENT

HEALTH INFORMATION MANAGEMENT

The Foundation for Good Health

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Learning Outcomes

- Understand the features of healthcare systems and the principles, benefits, and practices of health information management.
- Analyse the various health information management contexts and forms, including national and international settings.
- Describe health information uses in evaluating health system performance, implementing data-driven resource allocation, and leveraging data for scientific and clinical research advancements.

Introduction

Health information from information systems is essential to managing and delivering healthcare. It helps clinicians

diagnose, plan treatment, and manage ongoing care, while supporting managers and leaders in decision-making, planning, and resource allocation. Health information aids government departments, private companies, and agencies that set policies, strategies, and funding for healthcare providers. It allows them to understand health system performance, plan services, and respond to emergencies. The World Health Organization (WHO) outlines six components of strong healthcare systems: health information systems, service delivery, a capable health workforce, access to essential medicines and technologies, health financing, and effective leadership and governance. These services should be safe, effective, equitable, and available to everyone when required. Many countries' citizens do not have universal health coverage leaving people vulnerable when exposed to illness or injury (UHC2030, 2024). Good health is fundamental to both community and individual prosperity.

Health information systems support diagnosis and personalised treatment by providing healthcare professionals with comprehensive, up-to-date records. Health information systems improve patient safety by alerting providers to potential risks, such as drug interactions or allergies (Stukus, 2019; Woods, Canfell, et al., 2023). Importantly, healthcare information systems contribute to public health improvements and disease monitoring. Aggregated data from health information systems enable disease surveillance and monitoring of population health trends, aiding in the early

detection of disease outbreaks and demographic trends, and informing health policy and planning. Researchers use health data to study disease patterns, develop treatments, and improve healthcare delivery (Hardy, 2024; Woods, Canfell, et al., 2023). Predictive analytics enable the identification of at-risk populations, assisting healthcare providers and policymakers to implement preventive measures and allocate resources efficiently (Van Calster et al., 2019; Woods, Canfell, et al., 2023).

Understanding the structure and operation of healthcare systems is fundamental to working as a health information management professional. This chapter begins by describing the organisation of healthcare systems, highlighting how they are constituted and function to deliver services and provide patient care. Health information management (HIM) principles, benefits, and practices are then described, emphasising their critical role in governing and maintaining organised, accurate, and accessible health data. HIM supports clinical, strategic, managerial, and operational decision-making through the provision of high quality, complete, and timely information. HIM professionals play a critical role in information governance and designing systems, policies, and procedures to protect data privacy and security.

The various HIM contexts and forms include understanding the work completed by HIM professionals in national and state governments, hospitals, general practices, registries, consultancies, and the impact of HIM at local,

national, and international levels. By comparing how HIM works in these varied contexts, we can better understand the diverse approaches to managing health information and the related challenges and opportunities. This chapter discusses the various types of health information management, from traditional paper-based records to electronic medical and health records (Electronic Medical Records (EMRs)/Electronic Health Records (EHRs)) and integrated health information systems.

The chapter introduces health information uses and explores how health data can be utilised to evaluate health system performance. We will explore the significance of the foundational nature of data and its role in decision making in healthcare. The chapter describes the importance of collecting data to accurately track activities such as admissions, diagnoses, and episodes of care, and how this supports clinical care, safety, quality, planning, decision making, and resource allocation. Health information also plays a key role in research, driving scientific and clinical advancements. Understanding these uses highlights the role of health data in shaping healthcare.

According to the WHO (World Health Organization, 2021a), several foundational elements are essential for building strong healthcare systems, including a well-trained and motivated health workforce, governance, health information systems, robust infrastructure, and a reliable supply of essential medicines and technologies. Adequate funding,

strong health plans, and evidence-based policies are also crucial components. Primary health care is widely recognised as underpinning a resilient health system, bringing services closer to communities and ensuring that health care is accessible to all (UHC2030, 2024; World Health Organization, 2021b).

Australia has a strong healthcare system by international standards, providing access to a range of services via universal health insurance schemes supported by taxpayer contributions (Commonwealth Fund, 2024). Australia's healthcare system ranks highly compared to similar countries and excels in care processes and equity (Commonwealth Fund, 2024). However, there is room for improvement, and the Australian healthcare system faces challenges in access to care, particularly regarding wait times for specialist appointments and elective surgeries (Commonwealth Fund, 2024).

Social Determinants of Health and Healthcare Systems

Understanding the social determinants of health (SDH) is important because they influence health outcomes. SDH are the conditions in which people are born, grow, live, work, and age. These conditions are influenced by factors such as economic policies, social norms, and political systems (World Health Organization, 2025). They cover things such as education, access to health services, housing conditions and poverty. Addressing the SDH is crucial for improving health

equity, and research indicates that SDH can be more influential than healthcare or lifestyle choices in determining health outcomes (World Health Organization, 2025).

Improving SDH can reduce burdens of disease and mortality (World Health Organization, 2025). Indicators reported by the WHO (2025) through the global health observatory provides a valuable source of intelligence. The observatory reports on priority health issues; for example, disease mortality and burden, HIV/AIDS, immunisation, malaria, tuberculosis, water and sanitation, non-communicable diseases and risk factors, health systems, environmental health, violence and injuries, and equity (World Health Organization, 2025).

SDH impact healthcare systems by affecting resource allocation, access to care, and health outcomes. Healthcare policy makers and governments in Australia often work with sectors such as education, housing, and transportation to address SDH. Collaboration across sectors can improve health interventions and create a more supportive environment for maintaining the health of communities and the population.

Universal Health Coverage (UHC)

UHC is important and ensures that all individuals have access to essential healthcare services without financial hardship, promoting healthier societies and reducing inequality (UHC2030, 2024). Good health and access to UHC fosters

economic growth by improving workforce productivity and reducing the economic burden of untreated illnesses (UHC2030, 2024). Different countries will fund and organise UHC in ways that support the achievement of healthcare goals. In Australia, UHC is provided through Medicare [opens in new tab]. Medicare covers the eligible population for a range of health services, including medical consultations, hospital services for public patients, surgical procedures, prescription medicines, eye tests, pathology tests, and diagnostic imaging and is funded through a taxation levy.

In Indonesia, the government has implemented Jaminan Kesehatan Nasional, a national health insurance program aiming to provide UHC for its population (Maulana et al., 2022). In contrast, Singapore uses a multi-tiered healthcare financing system, including compulsory savings through MediSave, risk pooling via MediShield Life, and government subsidies to achieve affordable and sustainable healthcare for its citizens (Chopra, 2024).

In the United Kingdom, the National Health Service (NHS) is a publicly funded healthcare system that provides comprehensive health services to all UK residents. It was established in 1948 with the founding principles that services should be comprehensive, universal, and free at the point of delivery (Harris & Cresswell, 2024).

When individuals are unwell, a robust healthcare system can provide healthcare services when and where they are required. Strong healthcare systems also prioritise prevention and health

promotion, focusing on preventing illness and encouraging healthy lifestyles through public health initiatives (Health Foundation, 2019). Addressing health inequalities by tackling social determinants that impact health such as housing, education, and income to reduce disparities in health outcomes is also critical. Involving local communities in the design and delivery of health services is vital to ensure they meet local needs and preferences (Health Foundation, 2019). Mature healthcare systems ensure that care services are well-coordinated and can respond to emergencies such as floods, fires, disease outbreaks and pandemics. Effective leadership and management are crucial for maintaining high-quality services and efficient resource use within any healthcare system.

Data and Information

Health data are crucial for improving healthcare safety, quality, and efficiency and essential for evaluating healthcare system performance, identifying areas for improvement, and implementing evidence-based policies. Health data also help track outcomes and health trends, enabling tailored interventions to improve safety and quality. Effective use of health data ensures efficient resource allocation to address the most pressing health needs. Health data play a critical role in strengthening healthcare systems by informing policy decisions, helping governments develop strategies to improve

health outcomes, and achieving UHC. It is crucial for monitoring health system performance, identifying gaps, and evaluating the impact of health interventions. Health data supports disease surveillance and response, enabling timely detection and management of health threats. Routine health data supports continuous improvement in service delivery, addressing challenges such as waiting times and health inequalities. Health data drives innovation by providing insights that lead to new treatments and technologies. It also enables personalised care by helping healthcare providers understand individual patient needs and preferences. Information is a valuable asset in the health sector (Hanson, 2011) and is data that has been processed, organised, or interpreted to have meaning and relevance.

Activity: Understanding the Australian Health Performance Framework

Objective

- To understand the key components and indicators of the Australian Health Performance Framework (AHPF) [opens in

new tab]
- Access the Australian Institute of Health and Welfare (AIHW) website [opens in new tab].

Introduction

Visit the AIHW website and read the overview of the AHPF. Focus on its purpose and importance in assessing health and healthcare performance in Australia.

Exploring the Framework

1. View the AHPF conceptual framework diagram.
2. Identify the four key domains: determinants of health, health system, health status, and societal impacts.
3. Note down one key indicator from each domain and briefly describe what it measures and why it is important.

Reflection

Reflect on how these indicators provide a comprehensive assessment of health and healthcare performance. Reflect on data sources and quality.

Write a short paragraph summarising your

understanding of the AHPF, the role of data, and how the framework guides health policy and improves health outcomes.

What is Health Information Management (HIM)?

> **'Good health information needs to be seen as an asset. To fully appreciate the value of information, health facilities need to recognise the importance of a clear vision for information management and how it can support the overall transformation of Health' (Hanson, 2011).**

HIM is a discipline focused on managing health data and information to support patient care, healthcare planning, and funding. It involves collecting, classifying, analysing, and reporting clinical and administrative data to meet medical, legal, ethical, and administrative requirements (Health Information Management Association of Australia (HIMAA), 2024). HIM professionals [opens in new tab] have expertise in health record management, clinical coding and classification, information management, human resource management, and healthcare processes. They play key roles in ensuring data integrity, information governance, and health

informatics, while continuously modernising HIM core foundations of HIM (Kemp et al., 2021). HIM professionals work across a variety of sectors and roles, including healthcare, academia, research, health IT, and others (Kemp et al., 2021). These professionals have a unique set of knowledge and skills encompassing biomedical sciences; information science and technology; the legal aspects of health information management, including privacy; and the integration of clinical and financial information (Canadian Institute for Health Information, 2024).

HIM professionals develop information practice specialisation within eight core areas, applicable in multiple settings: health classification, clinical documentation integrity, health information privacy, health record and health information service management, digital health and health informatics, health funding and performance information management, health data and information governance, and health information teaching, academia and research (Health Information Management Association of Australia (HIMAA), 2025b). Health Information Managers can work within and across all six areas of specialisation as well as in broader roles such as in project, business development, patient safety and quality, and executive management (Health Information Management Association of Australia (HIMAA), 2025).

Benefits and Uses of Health

Information Management

Health System Performance – Metrics for Evaluating Efficiency, Effectiveness, and Safety

HIM professionals are responsible for collecting, analysing, and managing health data, which is essential for assessing technical and allocative efficiency. Technical efficiency measures how well health inputs are converted into outputs, while allocative efficiency assesses whether resources are allocated in a way that maximises health benefits for the population (Nassar et al., 2020). HIM professionals are custodians of health data used to inform decisions and identify areas for improvement. By ensuring the accuracy and completeness of health data, they enable tailored interventions to improve safety and quality. Key performance indicators such as infection rates, hospital-acquired complications, and the number of serious events investigated are common measures used to determine how care is being delivered and to evaluate healthcare system performance (Lloyd et al., 2021).

Funding – Data-Driven Resource Allocation

In the context of data-driven resource allocation, HIM professionals are instrumental in the provision and use of data

and analytics to inform budgeting and resource distribution decisions. Their expertise in the acquisition, classification, management, and analysis of health data ensures the efficient and effective allocation of resources to address the most pressing health needs (Health Information Management Association of Australia, 2025b). In Australia, clinical data and documentation play a crucial role in disease classification by ensuring accurate and comprehensive coding of patient diagnoses and treatments using the ICD-10-AM and ACHI system (Shepheard & Groom, 2020). Documentation underpins the Australian Refined Diagnosis Related Groups, which group patients with similar clinical conditions and resource usage, facilitating efficient hospital management and funding allocation (Shepheard & Groom, 2020).

Research – Data for Research, Scientific, and Clinical Advancements

HIM professionals are integral to supporting researchers in accessing health information for research (Shepheard & Groom, 2020). Data provides insights into disease patterns, treatment outcomes, and healthcare utilisation (Riley et al., 2024; Riley et al., 2023). HIM professionals' expertise in managing large datasets and ensuring data quality is essential for conducting accurate and efficient research (Henderson et al., 2025). (Henderson et al., 2025) stated that recognition of

research is important as a valuable professional development activity for the HIM profession.

Recent advancements in artificial intelligence (AI) and big data have the potential to significantly enhance the precision and efficiency of disease diagnosis, personalised medicine, and drug discovery (Mukhtar et al., 2024; Scott et al., 2021; Scott et al., 2024) . HIM professionals are integral to this process, as they manage the health data that AI systems learn from and analyse to identify trends and correlations. Their work supports the transformation of clinical trials by automating processes such as study screening, data extraction, and quality assessment.

Interoperability and Integration

HIM professionals play a critical role in ensuring interoperability across different health information systems to enable the seamless integration of healthcare information systems and data sharing across hospitals, clinics, and other healthcare facilities. By promoting the standardisation of data formats and ensuring compliance with frameworks such as HL7 FHIR, they overcome challenges related to data siloing. This enhances care coordination, allowing healthcare providers to access comprehensive patient data for timely, patient-centred care (Li et al., 2022). Initiatives such as openEHR (2024) provide a set of open specifications, clinical

models, and software that integrate with software systems to standardise and improve interoperability.

Patient Empowerment and Engagement

HIM professionals work with clinicians and information technology specialists to facilitate patient empowerment by promoting access to health data through tools like patient portals (Dendere et al., 2019). Patient portals and mobile apps allow patients to monitor their health, manage chronic conditions, and actively participate in their care decisions, aligning with global trends in higher-income countries toward patient-centred care, fostering better health outcomes and stronger patient-provider relationships (Hägglund et al., 2022; Havana et al., 2023).

Information Governance, Privacy, and Security

With increasing digitisation, HIM professionals safeguard sensitive health data through ethical practice and by implementing and maintaining robust privacy and security frameworks (Henderson, 2021; Sher et al., 2017). Their expertise ensures compliance with privacy regulations while protecting against data breaches (Henderson, 2021). By prioritising data security, HIM professionals uphold patient

trust and mitigate risks to patient safety, ensuring the ethical handling of health information (Rinehart-Thompson et al., 2009).

Information governance practices are designed to meet privacy and security requirements and ensure data integrity (Kwan et al., 2022). Information governance frameworks also embrace measures to manage health information and data from creation to disposal. Implementation complexity and costs have been described as major obstacles (Kwan et al., 2022). It is imperative that healthcare providers take preventive measures to minimise unauthorised access to patient information. Kwan et al (2022) emphasised the need for implementing robust privacy and security compliance, more audits (including for electronic records), and improved data management.

Policy Development and Advocacy

HIM professionals use health data insights to influence public health policies and healthcare reforms. Data shapes legislation, informs resource allocation, and can address disparities, ensuring interventions have a meaningful impact on population health (World Bank, 2023). HIM professionals act as advocates and advisors to ensure that policy decisions are based on accurate and actionable data. The International Federation of Health Information Management Associations (IFHIMA)—the international association for the HIM

profession—has official relationships with the WHO, working in the field of health records and health information (IFHIMA, 2024). Health information managers play a key role in revising health classification systems. In Australia, health information managers are active advocates for standard definitions for principal diagnosis, the need for episodes of care to better reflect resource homogeneity, and improved data quality (Lloyd, 2023; Reid et al., 2000). The Figure below outlines HIM practices.

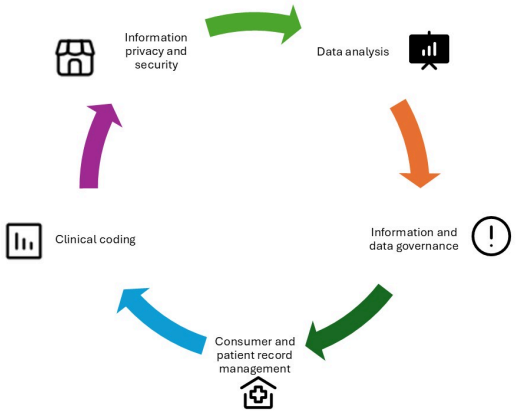


Figure 1. Health Information Management Practices. Source: Adapted from Figure 10.1 in Abdelhak & Haendel (2022). [Go to image description]

Health Information Management Contexts

HIM encompasses a spectrum of contexts, each with unique challenges and opportunities, from local healthcare facilities to regional and national networks, and even international exchanges.

Local/Care Provider Settings

This is the most immediate context, where health information is managed within a specific healthcare facility, such as a hospital, clinic, or primary care provider. The focus is on ensuring accurate, timely, and secure information for patient care within that setting.

Sharing With Other Healthcare Providers

This level involves the exchange of health information between different healthcare providers, such as between general practitioners, specialists, or allied health professionals. This is crucial for coordinated care where a consumer's information needs to be accessible to all providers involved in their treatment.

In England, healthcare providers can access and share patient records across clinical systems via GP Connect—a NHS initiative to enable coordinated care (NHS, 2024).

Networked/Regional/State

At this level, health information management expands to cover a broader geographical area such as a health network or region. Information is shared across multiple facilities and providers within the network to support integrated care, reduce duplication of tests, and improve patient outcomes.

Operating as an integrated health system, Kaiser Permanente shares patient data across its 40 hospitals in the US, with a unified electronic health record that supports care coordination and reduces duplication of services (Kaiser Permanente Institute of Health Policy, 2024). Similarly, in Australia, NSW and Queensland state governments delivering hospital and community services have implemented electronic health record systems that allow a single instance of a patient's record (NSW Health, 2023; Woods, Dendere, et al., 2023).

National

This involves the standardisation and sharing of health information across an entire country. National health information systems may be used for public health

monitoring, national registries, or national EHRs, ensuring that data are consistent and accessible across the country.

The Danish National Patient Register, considered the largest collection of healthcare data internationally, contains comprehensive data on all medical examinations and treatments in Danish hospitals over the past 40 years, supporting public health monitoring and improving nationwide care delivery (Healthcare Denmark, 2023). In Australia, My Health Record, an opt-out system, holds summary health information for eligible citizens (Australian Digital Health Agency, 2024). The Australian Institute of Health and Welfare and the Australian Bureau of Statistics also hold data and statistics about the status of the population's health, performance of the healthcare system and health workforce (Australian Institute of Health and Welfare, 2025a, 2025b)

International

At the international level, health information management involves the exchange of health data between countries. This can be important for global health initiatives, research, tracking of diseases, and ensuring continuity of care for patients who move between countries (World Health Organization, 2025). It requires adherence to international standards and protocols for data sharing, privacy, and security. The World Health Organization reports data on the burden of

disease and mortality through the Global Health Observatory (World Health Organization, 2025).

The European Union has implemented a cross-border health data exchange framework through the eHealth digital service infrastructure that facilitates the sharing of health information with member nations, ensuring continuity of care for citizens travelling within the European Union (European Commission, 2024).

Reflective Activity – Exploring the Global Health Observatory

Instructions

1. Visit the Global Health Observatory website [opens in new tab].
2. Navigate through the main sections: indicators, countries, data API, map gallery, and publications.
3. Spend at least 10 minutes exploring each section to understand the type of data and resources available.

Reflect on the following questions

- Data utilisation: How can the data available on the GHO website be utilised in your current role as a health information manager?
- Indicators: Identify three key health indicators relevant to your region or area of work. How can these indicators inform health policy and decision-making?
- Future applications: Consider a future project or initiative you are involved in. How can the GHO data support this project?

Write a short reflection

Summarise your findings and reflections in a short paragraph (200–300 words). Focus on how the GHO can enhance your work and any insights gained from exploring the website.

Forms of Health Information Management

Health information management (HIM) professionals in Australia play a vital role in the healthcare system by managing and safeguarding health information (Henderson, 2021). This includes organising, overseeing, and protecting data and

ensuring that both traditional and digital data are accurate, accessible, and secure. HIM professionals are trained in information technology applications, often serving in roles that connect clinical, operational, and administrative functions (Health Information Management Association of Australia, 2025a).

The scope of practice for HIM professionals in Australia is diverse and can include tasks such as compiling, organising, maintaining, and protecting confidential records; designing health information systems to comply with medical, legal, and ethical standards; and entering and maintaining information in EMRs (Health Information Management Association of Australia, 2025b). They also monitor information in EMRs for accuracy; observe trends in audits and denials from payers; analyse clinical data for research, process improvement, reporting, and more.

HIM professionals work with various types of information, including:

- **Patient health information** – this encompasses symptoms, diagnoses, clinical and social histories, test results, and procedures
- **Clinical information** – this encompasses clinical investigation, diagnosis and treatment modalities and documentation such as referrals, letters and care summaries
- **Safety information** – this encompasses patient and

clinical metrics against benchmarks and standards
- **Patient administration information** – this includes patient identification, contact and payment information
- **Health system information** – this includes booking, scheduling and activity information

HIM professionals in Australia find employment in a variety of settings, including hospitals, primary care, clinicians' offices, cancer and population registries, pharmaceutical firms, insurance companies, software companies, residential aged care settings, government agencies such as the AIHW, and consulting firms.

Australian studies have found that graduate HIM professionals have high employability and utilise most or all of the specialised domains of professional knowledge and skills (Gjorgioski et al., 2025; Riley et al., 2020). These studies identified broad categories of position titles for health information managers, reflecting the foci of positions (Gjorgioski et al., 2025; Riley et al., 2020), as shown in Box 1 below.

1. HIM focus: This category groups positions that have health information management as the role descriptor. It includes

responsibilities such as the management of staff, records, and forms, Freedom of Information and patient/client access to information, patient admissions, and other administrative components of patient flow.

2. Health classification, including financial focus: These positions identify health classification, colloquially termed "clinical coding", as the major role. This also includes health insurance industry–based work involving health classification.
3. Data management and analytics focus: The major activities here relate to the management, interpretation, analysis, and reporting of health data.
4. Health information systems focus: This category groups positions where the role's primary focus is information systems that manage health information; for example, systems administrator or implementation manager.
5. Other foci: This category represents roles that do not fit into the above categories or

incorporate several categories equally: for example, academic, project officer (non-ICT), or policy officer.

Source: Focus of Health Information Manager roles in Australia. Adapted from (Riley et al., 2020) Riley M, Robinson K, Prasad N, et al. Workforce survey of Australian graduate health information managers: Employability, employment, and knowledge and skills used in the workplace. Health Information Management Journal. 2020;49(2-3):88-98. doi:10.1177/1833358319839296

The Healthcare Record

Healthcare records are essential for documenting an individual's clinical history, treatments, and outcomes. Their purpose is to facilitate communication among healthcare providers and support clinical decision-making. Healthcare records date back to ancient times, with the earliest known medical documentation found on Sumerian clay tablets (Dalianis, 2018; Gillum, 2013). In Ancient Egypt, Papyrus

provided detailed medical recommendations dating back to 1550 BCE, (Dalianis, 2018; Gillum, 2013). The practice of keeping patient records evolved significantly with the contributions of the Greek physician Hippocrates. Medical records handwritten on paper posed challenges in terms of storage, accessibility, and data loss. The transition to digital systems began in the 1960s, with the advent of EMRs revolutionised patient care by enhancing efficiency, accuracy, and accessibility (Gillum, 2013). General practitioners, hospitals, residential aged care organisations, primary care providers and specialists all maintain healthcare records.

The Australian Commission on Safety and Quality in Health Care (2021) outlines that healthcare records should be available to healthcare providers at the point of care, support accurate and complete record-keeping, comply with privacy and security regulations, and facilitate patient access to their healthcare records. Healthcare records often share a similar composition worldwide (Lorkowski & Pokorski, 2022). In Australia, AS2828.1 and 2:2019 are the relevant Standards for health records (Standards Australia, 2019a, 2019b) and shown in the Box below.

AS2828.1:2019 specifies the requirements for the physical aspects of paper health records. This

includes aspects such as size, quality, reproducibility, layout, colour, division, methods of fixing, and cover. The standard aims to ensure that paper health records are fit for purpose, easy to use, consistent, and meet legal, safety, and quality requirements. It also provides advice on the design of forms for incorporation into health records, covering areas such as health record forms, dividers, health record covers, filing, retention, and destruction.

AS2828.2:2019 focuses on the digitisation (scanning) of paper health records. This standard provides technical specifications, data capture, and implementation principles, as well as quality control measures. It also offers guidelines on best practices for the safe storage, security, conformance, and reproducibility of digitised health records. The main sections of AS2828.2:2019 include digitisation of health records, processes for digitisation, and digitising health record systems. This standard ensures that digitised health records maintain the integrity and accessibility required for effective healthcare delivery.

Source: Standards Australia AS2828.1:2019 [opens in new tab] and AS2828.2:2019 [opens in new tab]

Ownership of Healthcare Record

Ownership of healthcare records varies internationally and often involves a distinction between a physical or electronic record and the information it contains. Typically, the physical or electronic record is owned by the healthcare provider or the institution responsible for creating it. The information within the record is often considered the property of the consumer (McGuire et al., 2019). This dual ownership concept allows consumers the right to access their healthcare information, fostering transparency, and empowering consumers in their own care. These principles are mirrored in many healthcare systems; in Singapore, the National Electronic Health Record ensures healthcare records are accessible across both public and private health providers, giving consumers and providers a consolidated view of medical history (Ministry of Health Singapore, 2025). In the United Kingdom, the NHS App ensures consumers can view their healthcare records from their general practitioner (NHS, 2024). Similarly, Australians have a longitudinal health summary that can be personally controlled

(Australian Digital Health Agency, 2024). The Australian Digital Health Agency acts as the system operator, managing the My Health Record system (Australian Government, 2012).

The Personally Controlled Healthcare Record

Australia's My Health Record is a digital health record system that integrates data from various sources, including healthcare providers, to provide a summary of an individual's health information (Australian Digital Health Agency, 2024). The components of My Health record include pathology and diagnostic imaging reports, prescription and dispensing information, hospital discharge summaries, allergies and adverse reactions, immunisation history and advance care planning. Individuals can also add their own information. Individuals with a My Health Record can personally control what is included and who can access their records. My Health Record is crucial for ensuring continuity of care as it provides healthcare professionals with the necessary information to make informed decisions about a patient's treatment (Australian Digital Health Agency, 2024).

Global Challenges and

Drivers of Change

The sustainability of a healthcare system is a critical concern in today's world. Ensuring that healthcare systems can continue to provide high-quality care without depleting resources or causing environmental harm is paramount. This involves everyone, including health information professionals, adopting practices that reduce waste, improve efficiency, and promote the use of renewable resources. Technological advancements and digital transformation play a crucial role in achieving sustainability. For example, the implementation of EMRs/EHRs, telehealth, and other digital tools can streamline processes and reduce the environmental footprint of healthcare operations. This can be achieved through examples such as reductions in printing and improved flow of information.

Patient and consumer-centred care is essential for safe, high quality health services, today and into the future. Greenhalgh et al., (2010) argued that traditional healthcare often involves top-down directives and large-scale projects, whereas modern digital health solutions need to closely align with patients' attitudes, self-management practices, and identified information needs to be effective. This shift from industrial age healthcare to information age healthcare requires profound shifts in relationships and interactions between health and consumers as shown in the Figure below.

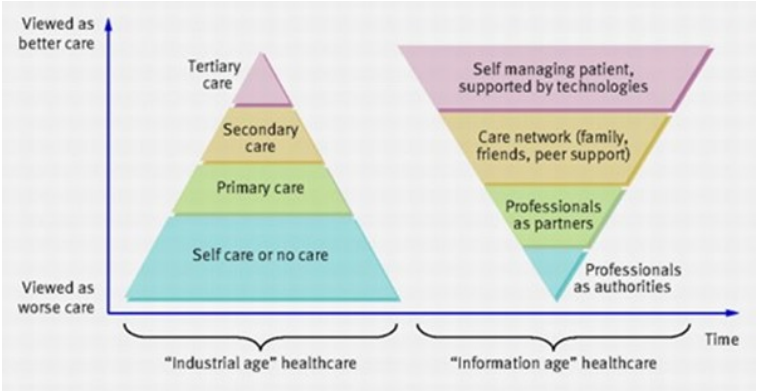


Figure 2. "Policy vision of specialist driven care shifting to patient driven care as information age replaces industrial age" by Trisha Greenhalgh, Susan Hinder, Katja Stramer, Tanja Braten, and Jill Russell, in Adoption, non-adoption, and abandonment of a personal electronic health record: case study of HealthSpace is licensed under CC BY-NC 4.0 [Go to image description]

Big data and analytics have become indispensable in modern healthcare. Big data refers to the vast amounts of data generated in healthcare, including patient records, treatment outcomes, and operational data. Analytics involves using these data to gain insights and make informed decisions (Abdelhak & Haendel, 2022). AI and machine learning can transforming healthcare by enabling predictive analytics, personalised medicine, and improved patient outcomes. These technologies can analyse large datasets to identify patterns and trends that would be impossible for humans to detect (Scott et al., 2021; Scott et al., 2024). However, data interoperability is essential for effective big data analytics. While ensuring that different

systems can communicate and share data seamlessly is a significant challenge, it is necessary for sharing and utilising the full potential of the data collected by healthcare organisations (Australian Digital Health Agency, 2023; Woods et al., 2024).

AI has the potential to revolutionise HIM by automating routine tasks, improving data accuracy, and enabling advanced analytics. AI applications in healthcare include clinical decision support, predictive analytics, personalised medicine, and administrative automation (Scott et al., 2021). Despite its potential, AI in healthcare also presents challenges, such as ensuring data privacy, addressing ethical concerns, and managing the integration of AI systems into existing workflows (Scott et al., 2021). Read chapter Navigating the Future to understand further the impacts of AI and Big data.

Achieving the Quintuple Aim (previously the Quadruple Aim) of health is a central goal in healthcare and digital health can help provide foundational data to monitor progress (Woods et al., 2023; Woods et al., 2024). The Aim focuses on improving patient experience, enhancing population health, reducing costs, and workforce well-being and safety, with a fifth aim of advancing health equity (Institute of Healthcare Improvement, 2022). Data play a critical role in achieving these goals. For example, data analytics can help identify areas for cost reduction, improve patient outcomes through personalised treatment plans, and enhance the overall efficiency of healthcare delivery (Canfell et al., as cited in (Almond & Mather, 2023). Real-time data exchange and

interoperability are crucial to achieving the Quadruple Aim, requiring robust data governance, privacy protections, and collaboration between different healthcare entities. HIM professionals are integral to the success of the Quintuple Aim by ensuring effective data use to improve patient experience, enhance population health, reduce costs, and improve healthcare providers' work lives.

Case Study – Blockchain Technology Transforming HIM

Bautista et al. (2023), working with an interdisciplinary team from the University of Texas at Austin, developed MediLinker, a blockchain-based decentralised health information platform, aiming to empower patients with greater control over their data and address interoperability and security issues.

The MediLinker platform provides a self-sovereign identity system that enables patients to manage and share their health information via digital wallets. Using the Hyperledger Indy blockchain framework, patients can securely store decentralised identifiers and verifiable credentials compliant with HL7 FHIR

standards, enabling seamless data exchange across EHRs. Read MediLinker: A blockchain-based decentralized health information management platform for patient-centric healthcare [opens in new tab] for further insights on the role of blockchain and health information management.

Digital Front Door

Many healthcare organisations are working towards the "digital health front door", which refers to using digital technologies to create a seamless and accessible entry point for individuals seeking healthcare services. It aims to provide patients with convenient access to a range of healthcare resources, information, and services through digital channels, such as websites, mobile apps, and telehealth platforms. The digital front door provides patients with greater access to their health information and enables them to play a more active role in their care.

Activity: Advantages of the Digital Health Front Door

Watch the below short video. Reflect on the advantages of the digital health front door for consumers and health providers.



One or more interactive elements has been excluded from this version of the text. You can view them online here: https://oercollective.caul.edu.au/health-information-management/?p=5#oembed-1

Feedback

The advantages of the digital front door for health providers are a streamlined approach to processes such as appointment scheduling, patient registration, and billing, allowing healthcare providers to operate more efficiently. This frees up time and resources that can be allocated to direct patient care, enhancing productivity.

Digital health front doors empower patients to take a more active role in managing their health by providing them with access to their health information, educational resources, and self-care tools. This can enhance patient engagement, foster

shared decision-making between patients and providers, and lead to better health outcomes.

Key Implications for Practice

Health information is essential for good health. Individuals can use health information to manage their health and control the factors that impact health. Accurate health information improves communication between patients and healthcare providers. Trusted, accessible, and reliable health information enables individuals and societies to lead healthier and more fulfilling lives.

The healthcare landscape is constantly changing as new technologies and regulations emerge. HIM professionals must be adaptable and open to continuous learning, the acquisition of new skills, and keep up to date with the core skills required for their work. The rapid transformation of digital health data, coupled with advances in technological capabilities, has led to an influx of new data sources such as wearable and remote monitoring devices, requiring HIM professionals to expand their skill sets. Expertise in data science, informatics, and governance is now essential to effectively manage and leverage these advancements.

Ensuring that HIM practices support patient-centred care

is crucial. This includes facilitating patients' access to their health records and ensuring data are used to improve patient outcomes. Effective data governance frameworks are essential to ensuring secure, accurate, and accessible data. This empowers patients to take control of their health and enables healthcare providers to make more informed decisions that enhance patient care.

The HIM profession is evolving beyond traditional roles in clinical coding and records management. HIM professionals are increasingly expected to take on responsibilities in data analytics, data stewardship, and leadership in information governance. These roles are pivotal to ensuring that health data are collected, analysed, and used to improve clinical outcomes and organisational decision-making.

As big data becomes more prevalent in healthcare, effective data governance and analytics are essential. HIM professionals must ensure the secure and efficient management of the large volumes of health information generated.

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Image descriptions

Figure 1: A circular diagram showing Health Information Management Practices as a process flow consisting of five segments. Each segment indicates a different area of focus in health information management, visually interconnected by the circle. Data Analysis begins at the top, then moves clockwise to Information and Data Governance, followed by Consumer and Patient Record Management, then moving to Information Privacy and Security, and finally Clinical Coding.

[Return to Figure 1]

Figure 2: The image features two pyramids set side by side. The left pyramid is oriented with the base at the bottom, labeled as "Industrial age" healthcare. It is divided into four sections from bottom to top: "Self care or no care," "Primary care," "Secondary care," and "Tertiary care." The right pyramid is inverted, labeled as "Information age" healthcare. This pyramid is also divided into sections from bottom to top: "Professionals as partners," "Care network (family, friends,

peer support)," and "Self managing patient, supported by technologies." Arrows at the top and left sides of the image indicate that time progresses from left to right and that the care is viewed as better at the top of the pyramids and worse at the bottom.

[Return to Figure 2]

THE HIM PROFESSION AND ROLES

Understanding our Path, to Plan for the Future

Kerryn Butler-Henderson; Trixie Kemp; Salma Arabi; Susan Fenton; and Karima Lalani

Learning Outcomes

- Describe the historical evolution and global development of the Health Information Management (HIM) profession.
- Analyse the current and emerging roles of HIM professionals within the Australian and international healthcare systems.
- Evaluate future challenges and opportunities for the HIM profession in the context of digital health, workforce trends, and leadership development.

Introduction

The health information management (HIM) profession has a history spanning more than a century, with the first peak body established in Australia more than 75 years ago (Health Information Management Association of Australia [HIMAA], 2024a). While the role title of the health information manager has changed over time, its primary function has remained the same—to oversee the governance of health data and information.

This chapter presents the history of the HIM profession and professional bodies, including their involvement in informing policy and systems in Australia and other countries, and international organisations. Next, the chapter draws on literature examining the roles of HIM professionals in Australia and other countries, much of which has been published by this authorship team. Lastly, the chapter explores the future of the profession and roles for the health information manager, including emerging roles and the evolution required of the profession in the evolving digital landscape. The chapter concludes with activities that allow the reader to test their knowledge of the topics covered in this chapter.

History of the Profession

Globally, the HIM profession has evolved significantly over the past century, driven by advancements in technology, changes in healthcare delivery, and the increasing importance of data in decision-making processes (Butler-Henderson, 2017). These changes have occurred at different rates across nations, often reflecting the maturity of a country's healthcare system and digital innovations. The origins of the HIM profession can be traced back to the early 20th century, when the need for standardised medical records became apparent. The birth of the HIM profession and the professional associations occurred in quick succession.

The creation of documentation standards in 1919 by the American College of Surgeons led to establishing the HIM workforce as stewards of recordkeeping (Abdelhak, 2015). A dedicated workforce was required to manage, sort, and catalogue health records. Following the Clinical Congress of 1928, the American College of Surgeons and representatives of the health record workforce established the Association of Record Librarians of North America. This organisation played a crucial role in setting standards for medical record-keeping and the professionalisation of the discipline. In 1942, the association split into the American Association of Medical Record Librarians and the Canadian Association of Medical Record Librarians (Abdelhak, 2015; Canadian Health Information Management Association, 2019). The United

Kingdom's association, now called the Institute of Health Records and Information Management, was formed in 1948 (Institute of Health Records and Information Management, 2025).

In 1949, the Australian Hospital Association invited Edna Huffman, a health records consultant and lecturer from Chicago, to share her expertise on records management with Australia's Medical Record Librarians (Watson, 2013). Huffman's visit resulted in the creation of state-based professional associations in Victoria and New South Wales (Watson, 2013). As the profession grew, so did the professional association, with the formation of a national association, the Australian Federation of Medical Record Librarians in 1955 (Watson, 2008). Other Australian states were encouraged to form associations and join the Australian Federation. With the formation of the Australian Federation of Medical Record Librarians, Australia had a voice in global developments for the profession, becoming an inaugural member of the International Federation of Medical Record Organizations in 1968 (Watson, 2008).

As the years progressed and the profession grew, the role of Medical Record Librarian changed to Medical Records Administrator in Australia in 1977, reflecting the increasing knowledge and responsibilities of the role. The Australian Federation of Medical Record Librarians became the Medical Record Association of Australia around the same time (HIMAA, 2024b). These changes reflected the evolving role

of the profession, and the change in training needs. The introduction during the 1980s of computerised systems, such as the patient master index system, changed how patient identification was captured and recorded (Watson, 2013). The introduction of casemix in the United States in the 1970s changed how data were collected and used. Introduced to Australia in the 1980s, the use of casemix data and activity-based management in Victoria in 1992 and Western Australia in the mid-1990s, with a national activity-based funding approach introduced in 2012, drove an increased need for qualified HIM professionals (Duckett & Willcox, 2015; Independent Health and Aged Care Pricing Authority, 2024, Watson, 2013). During the 1980s and 1990s, the qualifications required for a Medical Records Administrator changed from a diploma to a bachelor degree, as graduates required skills across health, information governance, data science, and informatics, requiring a university qualification to undertake the role. In 1991, the members of the Medical Record Association of Australia voted to change the professional title to HIM and to rename the peak body the Health Information Management Association of Australia (HIMAA) (Watson, 2013).

As healthcare systems around the world recognised the importance of accurate and accessible health information, the HIM profession began to expand internationally. The International Federation of Health Record Organizations (IFHRO) became the International Federation of Health Information Management Associations (IFHIMA), which has

been instrumental in promoting global collaboration and standardisation in HIM practices (Watson, 2019). IFHIMA's triennial congresses provide a platform for HIM professionals from different countries to share knowledge and best practices.

The digital transformation of health data has evolved the role of health information manager (Butler-Henderson, 2017). The transition from paper-based records to electronic health records has improved the efficiency, accuracy, and accessibility of health information. HIM professionals have had to adapt to new roles involving data management, clinical coding, and information governance (Butler-Henderson, 2017). The integration of health informatics and data analytics into HIM practices has further enhanced the ability to derive actionable insights from health data (Butler-Henderson, 2017). Professional organisations such as HIMAA and IFHIMA offer certifications that validate HIM professionals' competencies in these areas. Continuous professional development is essential to keep pace with the rapidly changing healthcare landscape (HIMAA, 2025). Despite the progress made, the HIM profession faces several challenges. Data privacy and security remain critical concerns, especially with the increasing use of digital health technologies. Ensuring the interoperability of health information systems across different countries and healthcare settings is another significant challenge. However, these challenges also present opportunities for HIM professionals to innovate and lead

efforts to improve health information management globally (Butler-Henderson, 2017).

The Role of the Modern Health Information Manager

The health information manager role is described as one that will "plan, develop, implement and manage health information services, such as patient information systems, and clinical and administrative data, to meet the medical, legal, ethical and administrative requirements of health care delivery" (Jobs and Skills Australia, 2025). This is a broad definition, as the HIM role is much more extensive. Simply put, where health data is captured, there is a need for a HIM professional.

The American Health Information Management Association career map (AHIMA, 2024) highlights current and emerging HIM roles within six domains. The six domains cover data quality (including coding and clinical documentation integrity), revenue cycle management, consumer health information, data analytics, informatics, privacy, and risk compliance. The career map supports HIM professionals in planning their career trajectory, understanding where their knowledge and expertise can be used across the breadth of HIM roles, and identifying where further education may be required.

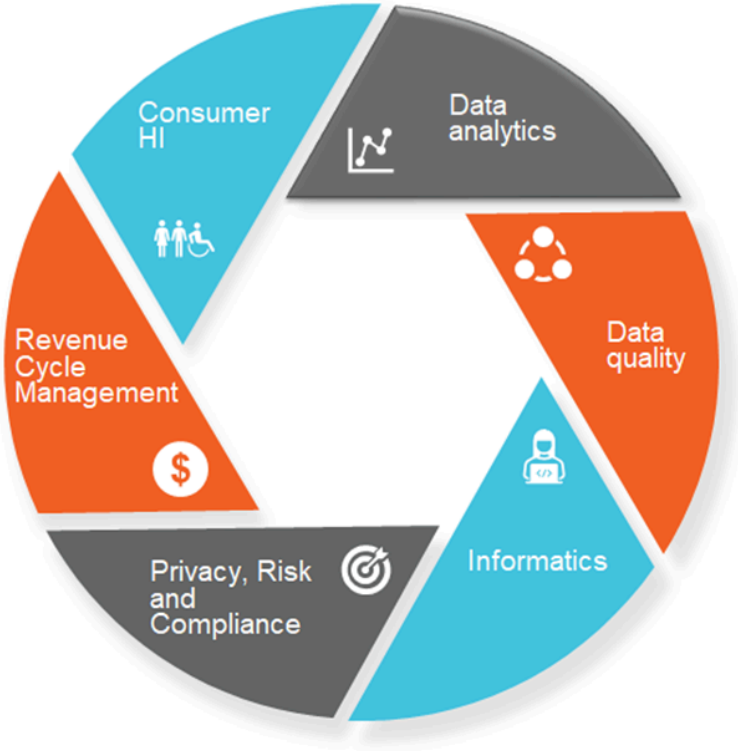


Figure 1. AHIMA HIM Career Map.
Source: Adapted from HIM Career Map in American Health Information Management Association (2024)

These domains differ slightly in Australia, where roles usually fall within four categories:

1. Classification and casemix.
2. Health informatics, including digital health.
3. Management, governance, and quality.
4. Academia and research (Butler-Henderson, 2017).

Classification and casemix roles include clinical coding (coder, auditor, educator, trainer), casemix analysts, data analysis, and clinical documentation integrity. In comparison, individuals who manage health records, including privacy and access to information, work within the domain of management, governance, and quality. The domain of health informatics initially focused on data standards, system management, and business analysis, but as electronic health records increased, more digital health roles aligned with this domain (Butler-Henderson, 2017). The last Australian domain is academia and research, which includes roles that educate others to become qualified health information managers and those working to create new knowledge through research such as research assistants, data managers, epidemiologists, and clinical research associates (La Trobe University, 2024; Queensland University of Technology, 2024; University of Tasmania, 2024).

HIM professionals are part of the specialist digital health workforce, also known as the HIDDIN workforce, being those specialising in *H*ealth *I*nformatics, *D*igital, *D*ata, *I*nformation and k*N*owledge (Butler-Henderson, Day & Gray, 2021). As it has in the past, the profession will continue to adapt and evolve in line with the healthcare system while maintaining core positions of clinical coder and health information manager, continuing to manage health data, records privacy, information access, and data reporting (Wissmann et al., 2024).

Competency Frameworks and Education Pathways

Competency and capability frameworks are important as they underpin graduate training needs and set out the graduate entry role. The creation of competency frameworks ensures that the workforce receives the academic foundation to effectively meet healthcare system information management needs. Therefore, competency frameworks must continually be reviewed and updated as the industry evolves to ensure graduates are job-ready (Ritchie et al., 2021).

HIMAA develops and maintains the Australian competency standards for the HIM profession. The competency framework provides a mechanism for educators, the industry, and third parties to understand the functions performed by the profession, in addition to the knowledge and skills of individuals from graduate to experienced (HIMAA, 2023). The competencies comprise 10 domains (Table 1) and three learning levels. Table 1 highlights the breadth of knowledge of a HIM professional and aligns with the broad role areas identified in the previous section.

The Australasian Institute of Digital Health (AIDH, 2022) maintains the Australian Health Informatics Competency Framework developed for the health informatics workforce. Another occupational group in the specialist digital health workforce, many HIM professionals work in health

informatics roles and undertake the Certified Health Informatics Australasia certification (McNeile McCormick et al., 2024). There are several similarities between the HIMAA and AIDH frameworks, as shown in Table 1. The overlap between health information management and health informatics is also reflected in the Global Academic Curricula Competencies for Health Information Professionals (Global Health Workforce Council, 2015).

Table 1. Mapping HIMAA Competency Framework to AIDH Domains (AIDH, 2022; HIMAA 2023)

HIMAA Competency Domain	HIMAA Competency Sub-Domains	Aligned to AIDH Competency Domain
Generic Attributes and Professional Skills	A1 Communication skills A2 Organisation and engagement A3 Information and communication literacy and knowledge management A4 Teamwork A5 Problem solving and decision-making A6 Lifelong learning A7 Ethical behaviour A8 Social and cultural awareness A9 Professional practice experience and expertise	
Health Information Science, including Health Records Management	B1 Health data and records B2 Healthcare information standards and governance	
Language of Medicine and Healthcare	C1 Medicine sciences C2 Medical vocabularies	Domain A. Health sciences

HIMAA Competency Domain	HIMAA Competency Sub-Domains	Aligned to AIDH Competency Domain
Healthcare Classifications and Terminologies	D1 Code systems, clinical terminologies and classification D2 Clinical coding D3 Casemix management and activity based funding methodologies	
Research Methods	E1 Research Methods	
Health Data Analytics	F1 Health data analysis F2 health data visualisations F3 Health data governance	Domain B: Information science Domain F: Core health informatics
Health Services: Organisation and Delivery	G1 Healthcare delivery systems G2 Quality safety, risk management and performance improvement	Domain A. Health sciences
Health Information Law and Ethics	H1 Healthcare privacy, confidentiality, disclosure, legal and ethical practice	Domain E: Social and behavioural sciences

HIMAA Competency Domain	HIMAA Competency Sub-Domains	Aligned to AIDH Competency Domain
Health Informatics and Digital Health	I1 Information and communication technologies I2 Data Security I3 Health information systems and health informatics	Domain C: Information technology Domain F: Core health informatics
Health Information Service: Organisation and Management	J1 Human resource management J2 Business/operations management J3 Project management J4 Financial and resource management	Domain D: Leadership and management

Within Australia, two core education pathways can lead to a career in HIM. A health information manager is a university graduate with either a Bachelor or Master in HIM (HIMAA, 2025). A clinical coder has two options: vocational education and training with a Diploma in Clinical Coding, or a Bachelor of Health Information Management degree. Both options provide the education to be employed as a qualified clinical coder and work in roles requiring classifications and casemix knowledge. Obtaining a qualification in HIM provides a solid foundation for a career working as a generalist or specialist in any of the domains previously discussed. Once working

in the field, a HIM professional can move throughout an organisation, working in roles with titles that include officer, analyst, manager, director, consultant, chief executive, lecturer, and professor. HIM professionals are committed to lifelong learning through self education, informal and formal education, mentoring and coaching, and educating others (Kemp et al., 2021).

Workforce Trends

The Australian Specialist Digital Health Workforce Census collects data about the broader specialist digital health workforce, and specifically the HIM profession, including comprehensive data about current workforce roles, as well as data about the demographics, training, professional development, and future intentions of this workforce (Butler-Henderson et al., 2017). The 2023 census data provides a snapshot of the HIM professional in Australia (Butler-Henderson, Gray & Arabi, 2023). An analysis of this data was undertaken for this chapter to provide a comprehensive picture about the HIM workforce in Australia.

The demographic and professional profile of HIM professionals in Australia reveals important insights into the workforce composition. Based on a sample of 133 participants, the data shows the workforce is largely comprised of older women, with 82.0% identifying as women and 66.9% aged 45

or older (average age 49.3 years). Most HIMs identify as non-Indigenous (97.0%), and those living with a disability is low (0.8%). Citizenship status demonstrates the predominance of Australian nationals in the field (93.2%), with 6.8% holding permanent resident status. This is reflective of the broader trend towards a locally-based workforce in health information management.

In terms of educational qualifications, most HIMs have attained a formal tertiary qualification (69.2%). Of those with tertiary qualifications, the majority hold a Bachelor's degree (56.5%). A large proportion (77.4%) of the workforce do not possess a formal credential, suggesting that credentialing is not a widespread requirement in the field. Despite this, the data suggests that years of experience in the workforce is positively associated with higher remuneration. Most HIMs earn between $2,000-$2,499 per week before tax (25.0%), followed by $1,500-$1,999 (19.4%). All respondents who earn above $5,000 per week hold a Master qualification.

Approximately half (47.0%) of HIM professionals identified having undertaken professional development in the last year, highlighting commitment to ongoing skill development in the profession in half of the workforce, but not an organisational need for staff in HIM roles to undertake continuous professional development. While nearly a third (29.7%) of individuals plan to remain in the workforce for 15 years or more, most have shorter-term plans to leave the workforce, with 24.7% intending to stay for five years or less

and 14.0% uncertain about their future in the profession. Notably, despite uncertainties around their future workforce intention, an overwhelming 88.6% of respondents would recommend a career in a digital health specialist role, indicating strong overall satisfaction and endorsement of the profession.

However, aspirations for senior leadership roles appear less common in HIM professionals than in other areas of the specialist digital health workforce, with 63.9% of respondents indicating they do not intend to pursue senior leadership positions. This presents a significant challenge for future leadership and strategic direction of the field, particularly in an era where the healthcare sector is rapidly evolving. If this leadership gap is not addressed, the HIM workforce may face difficulties in adapting to emerging challenges, influencing policy development, or leading innovation in digital health. This data highlights the need for younger graduates with a clearer pathway to senior leadership roles, and may also point to potential barriers preventing HIM professionals from pursuing leadership positions, such as a lack of mentorship opportunities, limited visibility of career advancement pathways, or inadequate support for developing leadership skills within the field.

Activity True/False questions

The average age of the profession is 40 years?

True
False

-
-
-
-
-
-

HIMs are a good fit for working in specialist digital health roles?

True
False

-
-
-
-
-
-

The majority of HIMs have a tertiary qualification?

True
False

-
-
-
-
-
-

In Australia, there is a higher proportion of females working in the profession than males?

True
False

-
-
-
-
-
-

Credentialing is mandatory for Australia HIMs?

True
False

-

-
-
-
-
-

The majority of HIMs aspire to work in senior leadership roles?

True
False

-
-
-
-
-
-



The interactive version of this H5P content is available at: https://oercollective.caul.edu.au/health-information-management/?p=62#h5p-17

Future Direction of the Profession

The HIM profession has evolved significantly over the decades, driven by advancements in technology, changes in healthcare delivery, and the increasing importance of data in decision-making processes (Butler-Henderson, 2017). The transition from paper-based records to electronic health records has revolutionised the HIM profession. The future of the HIM profession is likely to be shaped by several key trends. The increasing use of artificial intelligence and machine learning in healthcare will create new opportunities for HIM professionals to leverage these technologies for data science and decision support. The growing emphasis on person-centred care and population health management will also require HIM professionals to develop new capabilities. Moreover, the global HIM community will continue to benefit from international collaboration and knowledge sharing. Organisations like IFHIMA will play a crucial role in fostering these collaborations and promoting best practices in health information management worldwide.

While the role of the HIM professional today is clearly defined, the workforce data presented in this chapter shows an ageing workforce, and advances in technology will result in the automation of some operational functions. In order to maintain the sustainability of the workforce, HIM

professionals need to evolve from information operationalists to information strategists (Butler-Henderson, 2017). HIM professionals must engage in lifelong learning to keep pace with technological advancements and evolving healthcare needs. This includes obtaining certifications in emerging areas such as AI, machine learning, and data analytics. A greater emphasis must be placed on collaboration with other healthcare professionals, information technology specialists, and policymakers to develop integrated solutions for health information governance. The profession must also embrace new technologies such as artificial intelligence and machine learning to improve data management, security, and interoperability (Kemp et al., 2021).

The transition from paper to digital assets does not diminish the importance of HIM professionals. Health information managers are responsible for information governance, regardless of the medium. Given the accelerated adoption of digital health tools, the HIM professional's role has become increasingly vital to safeguarding data privacy and security (Kemp et al., 2021). It is therefore essential that they remain up to date with regulations and best practices to govern health data and undertake further continuous professional development. The HIM professional needs to lead efforts to standardise data structures in health information systems and ensure interoperability across different health and social care organisations, settings, and jurisdictions to facilitate the

seamless exchange of health data and improve health care (Butler-Henderson, 2017).

In addition to lifelong learning, it is also imperative that the HIM professional is recognised in the national and international classifications of occupations (Butler-Henderson et al., 2024). Recent research conducted globally has shown that most national-level classification systems did not classify health information managers as a professional occupation, but rather, as a technical occupation, and research has also shown that none of the classification systems reviewed used the term "digital health" (Butler-Henderson et al., 2024).

No innovation can be complete without a wide range of ideas and perspectives, and HIM professional leadership must promote diversity and inclusion within its workforce around the world (Butler-Henderson et al., 2024). Additionally, HIM professionals can lead advocacy efforts to promote policies that support the effective use of health information, and should collaborate with regulatory bodies to shape the future of the profession. The HIM profession has come a long way from its origins in medical records to its current iteration and focus on digital health and data analytics (Kemp et al., 2021). As the profession continues to move forward, it must embrace new technologies, address emerging challenges, and continue to advocate for the importance of accurate and accessible health information.

Conclusion

Global evolution of the HIM profession illustrates the changing nature of healthcare and highlights the essential role that health information plays in improving patient outcomes. The HIM profession has continually evolved to meet the changing needs of healthcare systems. As the profession moves forward, HIM professionals will need to embrace new technologies, address emerging challenges, and continue to advocate for the importance of accurate and accessible health information.

Activity Drag and Drop

Match the role to both the Australian and American profession domains.

HIM competencies

Classification and casemix

Data quality







	America	Australia
Privacy, risk and compliance Management, governance and quality	Clinical/medical coder	Clinical/medical coder
	Registrar disease registry	Registrar disease registry
	Release of information specialist	Release of information specialist
	Director HIM	Director HIM
Health informatics	Casemix of revenue analyst	Casemix or revenue analyst
Informatics	Digital health project manager	Digital health project manager
Research		
Revenue cycle management		

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able at:
bercollective.caul.edu.au/health-
nagement/?p=62#h5p-18

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PATIENT SAFETY AND SUSTAINABLE DEVELOPMENT GOALS

Through the Lens of Health Information Management

Trixie Kemp; Kerryn Butler-Henderson; Jennifer Ayton; and Salma Arabi

Learning Outcomes

- Explain the HIM professionals' crucial role in patient safety through the functions they perform.
- Analyse the impact of the HIM professionals' role in supporting a health organisation to achieve the Sustainable Development Goals.
- Evaluate health information and data-related solutions to address the challenges impacting patient care and patient safety.

Introduction

This chapter provides a comprehensive overview of patient safety and quality in healthcare, including its origins, how it is monitored and measured, and developments within Australia. References are also made to global work in patient safety. Examples of quality and safety initiatives are discussed through the lens of health information management (HIM) and how HIM professionals contribute to patient safety within the health system. The United Nations Sustainable Development Goals (United Nations, 2024c) (SDG) #3 *Good Health and Well-being* and #16 *Peace, Justice, and Strong Institutions (United Nations, 2024c)* are used to explore how quality health information improves population-level health outcomes.

HIM professionals are integral to maintaining robust health systems. They possess a distinctive blend of skills and knowledge that uniquely positions them at the intersection of health records and patient safety (Kemp et al., 2021a). Their involvement in managing health records and ensuring data quality, as well as their role in reporting and funding, demonstrates the direct application of their formal education for patient safety-related functions. HIM professionals' ability to interpret data at various levels and understand the healthcare system further underscores their relevance in addressing patient safety (Kemp, et al., 2021a).

Three examples are provided to explore patient safety through the lens of HIM, providing deeper discussion and

analysis of the relationship. Hospital-acquired complications are explored to show how HIM professionals are involved with identification and data monitoring, reporting, and trending. Electronic health records (EHRs) are then examined for data security and safety features and to demonstrate how HIM professionals contribute to system governance. Lastly, HIM professionals' roles in clinical governance are examined, including auditing and accreditation processes, education and training, and documentation.

The chapter concludes with insights from Australian HIM and patient safety leaders on how HIM professionals contribute to patient safety and the relationship to SDG #3 and SDG #16. These insights are taken from current research underway by the lead author on the themes of data, documentation, education, and records management.

Background

In simple terms, patient safety is the prevention of errors and adverse events associated with healthcare settings. The World Health Organization (WHO, 2024a) states, "Patient safety is a framework of organised activities that creates cultures, processes, procedures, behaviours, technologies and environments in health care that consistently and sustainably lower risks, reduce the occurrence of avoidable harm, make error less likely and reduce its impact when it does occur".

Patient safety is not new; it has been practised since Hippocrates' time with the "do no harm" principle (Kemp, 2021b). Patient safety has become a recognised field within healthcare over the last 20 years with the release of *The Quality of Australian Health Care Study* (1995) (Wilson et al., 1995), which discussed the prevalence of adverse events for 16.6% of admissions in Australian hospitals, and *To Err is Human: Building a Safer Healthcare System* report (Institute of Medicine Committee on Quality of Health Care in America, 2000), which revealed adverse events as the eighth leading cause of death. The WHO stated that patient safety is a global priority (WHO, 2019) and adopted resolution WHA72.6 on "Global action on patient safety" at the 72nd World Health Assembly. The Global Patient Safety Action Plan 2021–2030 (WHO, 2019) outlines seven strategic objectives, each accompanied by five corresponding strategies. The vision of this plan is "*A world in which no one is harmed in health care, and every patient receives safe and respectful care, every time, everywhere*".

In 2006, the Australian Commission on Safety and Quality in Health Care (ACSQHC) was established to coordinate national quality and safety improvement by providing information and resources and developing National Safety and Quality Healthcare Service (NSQHS) Standards, clinical care standards, and an accreditation scheme (ACSQHC, 2021). Accreditation is a formal process that evaluates and certifies that a healthcare organisation meets established standards

(ACSQHC, 2021). These standards are considered optimal and achievable, promoting continuous improvement (WHO, 2021). The Commission examines Australia's health system by monitoring sentinel events, mortality indicators, hospital-acquired complications, and hospital-based indicators (ACSQHC, 2019). Multiple data sources are used to monitor and report on the state of patient safety in the Australian healthcare system. The Commission also approves accrediting agencies such as the Australian Council on Health Care Standards to assess health services against the NSQHS Standards (ACSQHC, 2025). Similar programs also run in other countries, predominantly high-income countries, and globally, with some examples (not all) shown in Figure 1. The WHO has promoted accreditation in low-middle income countries to address healthcare quality (Nicklin et al., 2021). Low-middle income countries have adapted and implemented global accreditation programs, originally from high-income countries, to suit their local needs (Mansour et al., 2020). The sustainability of accreditation programs remains a challenge for low-middle income countries due to resourcing, which is dependent on a country's financial and political climate (Mansour et al., 2021).



Figure 1. World Map with Accreditation Bodies adapts "Blank World Map" by Canuckguy/SkyBon, licensed under CC BY-SA 3.0. This work is licensed under CC BY-SA 4.0 by Trixie Kemp.

Key to Map: Accreditation Bodies by Number

Number	Accreditation Body
1	Australian Council on Health Care Standards (2024)
2	National Committee for Quality Assurance (United States Government, 2005)
3	Accreditation Canada (2024)
4	Council for Health Service Accreditation of Southern Africa (2022)
5	Saudi Central Board for Accreditation of Healthcare Institutions (Saudi Central Board for Accreditation of Healthcare Institutions, 2024)
6	Care Quality Commission (2024), United Kingdom Accreditation Service (2024)
7	Health Information and Quality Authority (2024)
8	Haute Autorité de Santé (2024)
9	Accreditation Board for Hospitals and Healthcare Providers (National Accreditation Board for Hospitals and Healthcare Providers, 2024)
10	Taiwan Joint Commission on Hospital Accreditation (Joint Commission of Taiwan, 2023)
11	International Society for Quality in Health Care (2020) – Global
12	Joint Commission International (Joint Commission International, 2024a) – Global

While governance frameworks for monitoring patient safety differ across countries, the common element is the need for reliable information to understand the patient safety landscape

in all health facilities. Six international patient safety goals have been developed to monitor the most problematic areas of patient safety:

1. Identify the patient correctly
2. Improve effective communication
3. Improve the safety of high-alert medications
4. Ensure safe surgery
5. Reduce the risk of healthcare-associated infections
6. Reduce the risk of patient harm resulting from falls (Joint Commission International, 2024b).

The WHO (2019a) has linked patient safety to the Sustainable Development Goals (SDG), namely SDG-3, "Ensure healthy lives and promote health and well-being for all ages". The SDGs (Figure 2) were adopted by all countries in the United Nations in 2015 as part of the 2030 Agenda for Sustainable Development, which includes 17 goals and 169 targets (United Nations, 2024c). Progress in one goal impacts the attainment of other goals. For example, SDG-2 (WHO, 2024c) aims to achieve zero hunger and enhance nutrition, directly improving health and well-being (SDG-3). Additionally, SDG-16 (WHO, 2024c) promotes just, peaceful, and inclusive societies, aligning with fundamental human rights such as privacy and access to information while ensuring individuals feel safe in their daily lives. The health and well-being of individuals are

impacted by war, conflict, poverty, disease, and human rights abuses.



Figure 2. United Nations Sustainable Development Goals. United Nations. All Rights Reserved.

Activity – Drag and drop

Consider the Sustainable Development Goals (SDGs) (United Nations, 2024c), drag and drop the activity to the relevant SDGs.

Recycle, reuse and refurbish

to reduce waste

Access free online

educational resources (like
Support access to information
this text) for all people
while protecting privacy

Promote healthy lifestyle

activities and choices to look

after your health and those

around you







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https://oercollective.caul.edu.au/health-information-management/?p=64#h5p-15

Origin of Sustainable Development Goals

The SDGs were developed based on knowledge, experience, and work accumulated over 40 years through various programs and reports. Policymakers' lack of focus on environmental issues was the focus at the 1972 United National Conference on the Environment, which led to the creation of the United Nations Environment Programme (Virchow Foundation, 2021). Building on this work, the Our Common Future Report (Brundtland, 1987) addressed sustainable development for the first time by considering the impact and future generation needs (Virchow Foundation, 2021). Twenty years on from United National Conference on the Environment, the Agenda 21 action plan aimed to improve lives and the environment through global partnership (Virchow Foundation, 2021). In 2000, the Millennium Goals were created as a global effort to address extreme poverty, hunger, prevent deadly diseases and provide education to children (United Nations Development Programme, 2024). Despite work in the previous decades, more was required, and the SDG were created in 2015 as a 15-year plan to address the impact on everyone (United Nations Development Programme, 2024; World Health Organization, 2024c). Like any plan, data are essential to measuring progress. For health-related actions, these data are collected through a variety of

methods, for example, digital, paper, devices, and by staff and clinicians in the health system.

Examining SDG-16 (United Nations, 2024c) further, it aims to build strong and effective institutions to ensure justice and security from conflict, violence, human rights violations, and persecution. This goal progresses through 12 targets and is measured through 23 indicators (Global Goals, 2024). Everyone in society can contribute to SDG-16 by demonstrating compassion, following the law, being inclusive, and not committing violence (United Nations, 2024c). Specifically, Target 16.10 – *Public access to information and protect fundamental freedoms in accordance with national legislation and international agreements* (Global Goals, 2024; United Nations, 2024b), is relevant to HIM professionals, as they are the custodians of health information and therefore support access to information, while also protecting that information through privacy practices.

SDG-3 *Healthy lives and well-being for all*, comprises 13 targets and 28 indicators covering topics such as maternal mortality, neonatal and child mortality, infectious diseases, non-communicable diseases, substance abuse, road traffic deaths, sexual and reproductive health, universal health coverage, environmental health and tobacco control (United Nations, 2024a). The non-medical factors influencing health outcomes are social determinants of health. These are "conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the

conditions of daily life which include economic policies and systems, development agendas, social norms, social policies, and political systems" (WHO, 2024b). Achieving SDG-3 is related to addressing the many determinants that drive health outcomes (Keshavarz Mohammadi, 2022). Websites such as "OurWorldData" (Our World Data Team, 2023) bring together data from various sources to provide tables and visualisations on global progress. Most of these targets use metrics that require data captured in health records and through clinical coding, such as ICD-10 codes. Therefore, the HIM profession is vital in supporting health and well-being through the provision and availability of required data.

Despite advances in understanding the factors contributing to patient safety, challenges remain. Schiff and Shojania (2022) described these challenges within three themes: health system, settings of care, and staff. Some sub-themes are directly relevant to HIM. The "health system" theme includes issues with the validity of metrics that hinder meaningful improvement. The "settings of care" theme focuses on data collection but neglects the critical cycle of measurement and improvement. Additionally, it identifies multiple challenges with EHRs, a term also used interchangeably with electronic medical records (EMRs) in the Australian setting, including alert fatigue, complex decision support, difficulties in improving existing systems, clinical documentation with manual chart reviews, and closed-loop failures with tracking test results, referrals, and symptoms (Schiff and Shojania,

2022). Australian clinicians also report usability challenges, with initiatives to address sign-on issues, templates, and clinician decision support alerts identified as potential solutions (Lloyd et al., 2024). Finally, the "staff" theme addresses significant concerns such as staff shortages, lack of time and support, burnout, lack of interest, and detachment from staff and patients (Schiff and Shojania, 2022).

HIM professionals are at the intersection between health records and patient safety due to their role in managing health records, data quality, patient identification and matching, privacy and security, activity reporting, and funding (Kemp, et al., 2021b). Physicians have used health records for thousands of years to communicate information about illness, injury, and disease (Kemp, et al., 2021a). As health records evolved, they became a valuable tool for patient safety due to the information they contained (Kemp, et al., 2021a). The HIM profession is ideally placed in patient safety activities due to their knowledge and training in the healthcare system, patient anatomy, and physiology, which supports the interpretation of data at the patient, facility, organisation, state, and national levels. These data are crucial for monitoring patient safety. Continued efforts to advance the quality and safety of health services will lead to improved health and well-being of individuals (SDG-3) and stronger institutions (SDG-16). The three cases below provide deeper discussion and analysis into where the work of HIM professionals interfaces with patient safety and sustainable development goals.

Case 1 – Hospital Acquired Complications

A hospital-acquired complication (HAC) is defined by the Independent Health and Aged Care Pricing Authority (IHACPA) as "a complication that occurs during a hospital stay and for which clinical risk mitigation strategies may reduce (but not necessarily eliminate) the risk of that complication occurring" (IHACPA, 2024). The ACSQHC (2018) lists 16 HACs (included in Figure 3) monitored for patient safety and quality improvement opportunities using data captured within health records and systems. The diagram shows hospital acquired complications and the health information management functions that impact monitoring such as information governance, data quality, clinical coding and reporting.

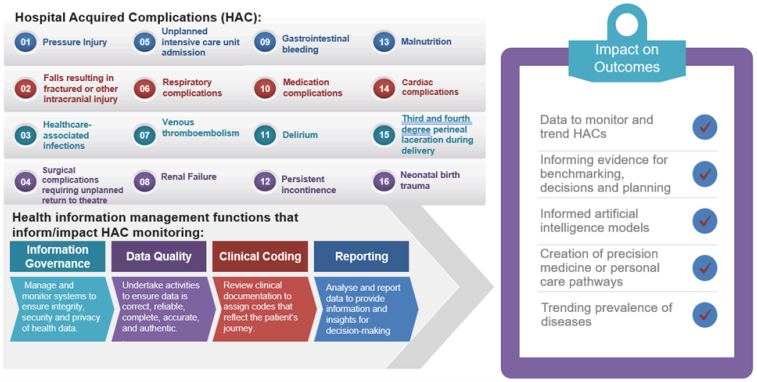


Figure 3. Monitoring Hospital-Acquired Complications: Key Types, HIM Functions & Outcomes by Trixie Kemp is licensed under CC BY-NC 4.0. [Go to image description]

HACs have an economic impact on health services, such as longer lengths of stay (Fernando-Canavan et al., 2021). The role of the HIM professional is to identify HACs during the clinical coding process and through specific audit activities. These data are then used to track, trend, and report on the frequency and location of HACs within the health service. The accuracy of the clinical documentation directly impacts this coded data (Davis & Shepheard, 2024). For example, a study at two Victorian hospitals identified that 48.89% of urinary tract infections had been incorrectly identified as hospital-acquired due to poor-quality clinical documentation (Liu et al., 2022). As shown in Figure 3, HIM professionals undertake a variety of functions that inform or impact HAC monitoring. HIM professionals work with clinicians and quality and patient safety staff to draw conclusions and insights from the data to support targeted efforts to address the frequency of HACs and take measures to prevent them. The clinical codes assigned represent a story; for example, J18.9 with a condition onset flag of 1 is hospital-acquired pneumonia; this is HAC#3 healthcare-associated infection. If multiple patients from the same ward or hospital have this code assigned, this could indicate a system issue that needs further investigation. Undertaking an audit on clinical documentation to check that skin integrity checks are completed on admission could show whether pressure injuries (HAC#1) are hospital-acquired or occurred prior to attending the hospital. By providing oversight and governance of

information, HIM professionals ensure data are available, reliable, relevant, and complete. Reliable data are essential for informed evidence-based care decisions, service planning and monitoring, and disease surveillance.

Case 2 – Electronic Health/ Medical Records

Regardless of their medium, health records are used for patient care and treatment, research, disease surveillance, funding, service planning, and benchmarking (IFHIMA, 2022). With the introduction of EHRs there has been an increase in the amount of data generated and digital health interventions that support patient care (Butler-Henderson, 2017). Multiple terms are used in Australian local health areas to describe EHRs; for example, digital patient chart, single digital patient record, and most frequently, EMRs. Some EHRs include electronic patient portals, information exchange, computerised order entry, electronic prescribing and decision-support systems (Shaw et al., 2018) (see glossary for definitions of the terms EHR and EMR). As EMRs evolve, they are becoming more sophisticated in how they support clinicians in providing safe health care, such as alerts for drug interactions, medication duplications, and same tests ordered within a nominated timeframe (Sittig et al., 2018). Future potential related to AI and personalised medicine will be directly linked to EMRs (Stanfill & Marc, 2019). Further, as data systems

become linked across health, social services, education and other sectors, they can create a complete picture across the social determinants of health, allowing monitoring and forecasting health outcomes and service requirements (Chen et al., 2020).

Oversight is required for EHRs to be used safely and effectively. Information governance outlines the principles, policies, and procedures for organisations to exercise stewardship of information assets, including technology (IFHIMA, 2021). The HIM professional is central to ensuring the confidentiality, data quality, accessibility, and management of the information within the EHR is properly governed through its lifecycle. Even in a fully digital health organisation, the role of the HIM professional is important for information governance, which then impacts safety (Kemp et al., 2025). For this reason, it is necessary for HIM professionals to hold formal qualifications and skills in these domains. When considering information governance with EHRs, HIM professionals are involved with managing duplicate patient identities, the privacy and security of information, data integrity and data standards, and structuring information for different uses (Kemp et al., 2021b). Without this expertise, the integrity of the central communication tool for safe patient care and source of data to inform the management and planning of health services could be compromised.

Case 3 – Clinical Governance

The ACSQHC (2021) defines clinical governance as a "set of relationships and responsibilities established by a health service organisation between its state or territory department of health, governing body, executive, workforce, patients, consumers, and other stakeholders to ensure good clinical outcomes. It ensures that the community and health service organisations can be confident that systems are in place to deliver safe and high-quality health care and continuously improve services".

Clinical governance frameworks provide organisations with a consistent approach to addressing quality and safety in patient care as they provide a clear delineation of roles, responsibilities, and accountabilities (ACSQHC, 2017). HIM professionals are directly and indirectly involved in the five elements of the Australian National Model Clinical Governance Framework (Figure 4). By participating in education and committing to quality and patient safety, employees contribute to the organisation's safety culture, addressing the first element of "Governance, Leadership and Culture". As HIM professionals produce the data and information to support quality assurance, monitoring, and improvement, their work aligns with "Patient Safety and Quality Improvement Systems" (Element Two). Element Three, "Clinical Performance and Effectiveness", is supported by providing education on good quality clinical

documentation and other health information-related topics. By reporting on trends identified with the data on HACs, HIM professionals identify areas for improvement that fall under Element Four "Safe Environment for the Delivery of Care". The final element, "Partnership with Consumers", is another area where HIM professionals are directly involved. They consider health literacy, flow, and format in the design of clinical forms completed by consumers. HIM professionals are the custodians of health records and have a vital role in protecting patient privacy while supporting access to health information by various parties.

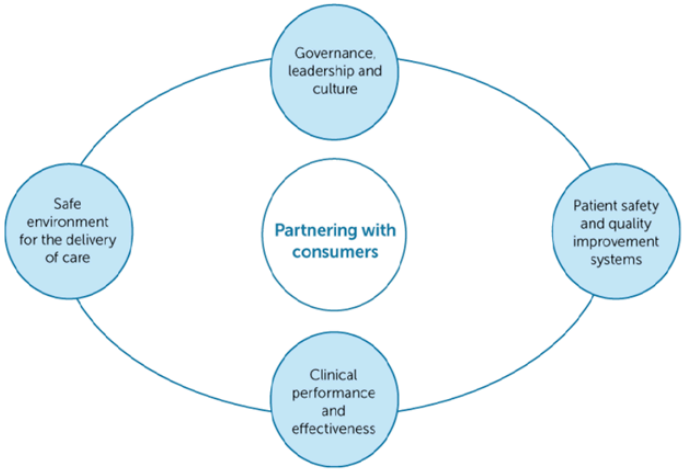


Figure 4. "National Clinical Governance Framework" by Australian Commission on Safety and Quality in Health Care, in National Model Clinical Governance Framework [PDF] is licensed under CC BY-NC-ND 4.0

HIM Professionals' Contribution to Patient Safety

The role of Health Information Management (HIM) professionals in the health system varies. Some HIM professionals are generalists and work across multiple HIM domains, and some specialise in a particular topic or area. Interviews were undertaken with experts in the fields of HIM and patient safety as part of a research project (Kemp et al., 2025) to understand the contribution HIM professionals make to patient safety. These interviews discussed activities related to clinical governance through the functions HIM professionals perform, aligning to Elements Two and Three in the above framework (ACSQHC, 2017), and to Action 1.16 of the NSQHS standards (ACSQHC, 2022). In addition to the examples above, interviews revealed that health information professionals also:

- Review health records to identify deficiencies and generate queries for clinicians to clarify documentation entries.
- Support the management of patient information, clinical records, information systems, and data for accuracy and completeness. Specific examples include managing duplicate records and patient identification mismatches.

- Provide education and training on documentation practices and standards, privacy and confidentiality, information systems, retention, and the disposal of health records.
- Undertake auditing of health records against documentation standards, coding standards, completeness of the health record, data quality, and validation.
- Develop policies and protocols related to health information and records.
- All staff are trained in and required to use the clinical incident management system for reporting incidents, risks, and hazards (Kemp et al., 2025).

In discussing HACs, interviewees specifically discussed that HIMs review health record to accurately capture the patient journey through clinical codes (Kemp et al., 2025). They undertake activities to ensure data are accurate and reliable. They work with clinicians, so they understand the data including how they are collected and used, to identify trends and nuances. Through the capture and provision of data, HIMs help clinicians and health executives understand what is happening in the health system to improve patient safety and quality. The research also identified that HIM professionals work closely with clinical governance departments/teams. Notably, during the interviews, a specific example was reported regarding an incident where a clinician copied and pasted

information within an EMR, the risk of this practice, and how it led to patient harm. Importantly, the research highlighted the collaborative working relationships between HIM professionals and those who work in clinical governance or patient safety and quality teams (Kemp et al., 2025).

HIM professionals play an integral role with EMRs, covering information governance, management of the patient master index, merging duplicate patient records, health record structure, ensuring information is in the correct location, documentation improvement, and the implementation of EMRs (Kemp, et al., 2021b). The activities performed by HIM professionals support complete, accurate, and accessible health information for patients, clinicians, health executives, and other users of the information (Kemp et al., 2025). This directly aligns with the requirements of the National Safety and Quality Healthcare Service Standard, Communicating for Safety, which requires healthcare providers to:

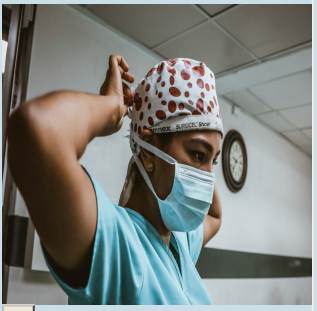
- Develop and implement systems to support the contemporaneous documentation of critical information in the healthcare record.
- Record the organisation's documentation policies and make them available to the workforce.
- Communicate to the workforce their roles and responsibilities for documentation (ACSQHC, 2021).

Activity – Click on each card to identify activities where HIM professionals are involved in patient safety activities.

Click on each card to identify activities where HIM professionals are involved in patient safety activities



Clinical governance



Provision of patient information at the point of care

Policies and protocols to protect privacy and confidentiality of health information

Card 1 of 4





Preventing and controlling healthcare-associated infections

Clinical coding of hospital-acquired complications to provide visibility of occurrences.

Participate in hand hygiene practices.

Card 2 of 4



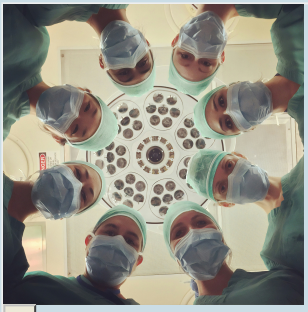


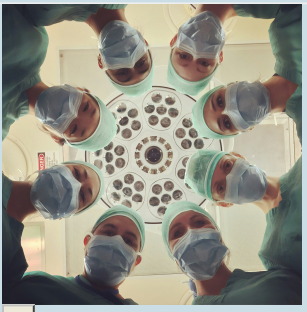
Comprehensive Care

Create a comprehensive care clinical form

Provision of trended data to support harm minimisation (i.e. falls, pressure injuries)

Card 3 of 4





Communicating for Safety

Provide education on clinical documentation practices.

Audit health records for completeness

Card 4 of 4

The interactive version of this H5P content is available at: https://oercollective.caul.edu.au/health-information-management/?p=64#h5p-1

Conclusion

HIM professionals play a vital role in the health system. They assist others to recognise that the information held within a health record is a valuable resource. EMRs are designed to be accessible and user friendly, with HIM professionals providing oversight for the management and protection of the content, as they also have access to the paper record. HIM professionals extract data used for measuring baselines, progress, and variance in performance indicators, such as those for patient safety and sustainable development goals. HIM professionals continue to ensure that, regardless of the format in which data are collected, the information is available and trusted, and the patient's story is told.

Activity Fill in the Blanks



Fill in the missing words. Choose from the following words : audits, benchmarking, clinical coding, clinicians, data, documentation, executives, reports, trends

HIM professionals provide the used for monitoring and reporting on in hospital-acquired complications (HACs). They do this via targeted or through accurate and routine processes. This information is used for purposes and to prepare meeting papers, , and presentations for clinical governance and standards committees, managers, and . HIM professionals work closely with , quality and patient safety staff, and clinical documentation specialists to ensure the accurately reflects the patient journey.



The interactive version of this H5P content is available at: https://oercollective.caul.edu.au/health-information-management/?p=64#h5p-14

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Image descriptions

Figure 3: A visual summary showing three grouped lists: one with sixteen hospital-acquired complications, another with four health information management (HIM) functions that support tracking and analysis of these complications, and a third titled 'Impact on Outcomes' that outlines how these HIM functions contribute to improving patient safety and healthcare quality.

The sixteen hospital-acquired complications (HAC) are:

1. Pressure injury
2. Falls causing fracture or intracranial injury
3. Healthcare-associated infection
4. Surgical complications requiring unplanned return to theatre
5. Unplanned intensive care unit admission
6. Respiratory complications
7. Venous thromboembolism
8. Renal failure
9. Gastrointestinal bleeding
10. Medication complications
11. Delirium
12. Persistent incontinence
13. Malnutrition
14. Cardiac complications
15. Third- and fourth-degree perineal laceration during

delivery
16. Neonatal birth trauma

The four health information management functions informing HAC monitoring are:

- Information governance (managing/integrity/security/privacy of health data)
- Data quality (ensuring data are correct, reliable, complete, accurate, authentic)
- Clinical coding (reviewing documentation to assign codes reflecting patient journey)
- Reporting (analysing and reporting data to provide information/insights for decision-making)

The five impacts on outcomes are:

- Enables data monitoring and trending of HACs over time
- Supports evidence for benchmarking, decisions, and planning
- Informs artificial intelligence models
- Helps create precision medicine or personal care pathways
- Enables trending prevalence of diseases

[Return to Figure 3]

PART 2 LEADERSHIP IN HEALTH INFORMATION MANAGEMENT

LEADING STRATEGICALLY IN HEALTH INFORMATION MANAGEMENT

Erin Roehrer and Matthew Springer

Learning Outcomes

- Learn about leadership theories and models relevant to strategic health information and healthcare management.
- Gain insights into strategic planning and change management in healthcare settings.
- Explore best practices for people management, including career development and succession planning.
- Understand how to measure and improve operational performance through key performance indicators (KPIs) and strategic alignment.

Introduction: Why is this topic important?

The Role of Strategic Leadership in Healthcare

Strategic leadership is essential in healthcare because it directly impacts patient outcomes, operational efficiency, and workforce engagement (Weston, 2022). Leaders need to adopt a proactive, forward-thinking approach in an environment with rapidly advancing technology, policy shifts, and evolving patient needs. Strategic leadership emphasises long-term vision, adaptability, and sustainability, instead of day-to-day operations (Fagerdal et al, 2022).

Modern healthcare systems are increasingly complex, with numerous stakeholders, regulatory requirements, and financial constraints (Dawes & Topp, 2022). The integration of digital health technologies, such as electronic health records (EHRs) and artificial intelligence (AI), presents both opportunities and challenges (Nianga, 2024). In addition, demographic shifts, including aging populations and workforce shortages, require leaders to think strategically about resource allocation and service delivery (Dawes & Topp, 2022).

Strategic leadership is directly linked to improved patient care, higher staff satisfaction, and greater organisational efficiency (Dawes & Topp, 2022). Leaders who cultivate a

strong organisational culture, encourage professional development, and foster open communication contribute to a motivated workforce, enhancing patient experiences and outcomes.

What You Will Learn From This Chapter

This chapter provides health information management professionals with an understanding of strategic leadership principles, frameworks, and practical applications.

Strategic leadership in health information management requires a comprehensive understanding of various leadership theories and models. These frameworks provide the foundation for effective decision-making and guide leaders in navigating the complexities of modern healthcare systems. By examining these theories, readers can better appreciate the diverse approaches to leadership and their practical applications in strategic contexts.

The ability to engage in effective strategic planning and manage organisational change is a critical component of leadership. Leaders must be equipped to develop long-term plans that align with institutional goals while remaining adaptable to the dynamic nature of healthcare environments (Low et al, 2019). Change management strategies are essential for implementing new initiatives, improving service delivery, and fostering a culture of continuous improvement.

The management of human resources is equally important. Strategic leaders in health information management must understand best practices in people management, including methods for supporting career development and establishing robust succession planning processes. These practices ensure that healthcare organisations maintain a skilled and motivated workforce capable of meeting future challenges.

Operational performance is another key area of focus. Leaders must be able to identify, measure, and analyse KPIs to assess organisational effectiveness. Aligning these metrics with strategic objectives enables leaders to make informed decisions and drive performance improvements across the organisation. To bridge theory and practice, learners can engage with real-world case studies that illustrate the tangible impact of strategic leadership in healthcare settings. These case studies provide valuable insights into the challenges and successes experienced by healthcare leaders and offer practical lessons that can be applied in various contexts.

Finally, self-assessment activities should be integrated throughout the learning process to help individuals evaluate their own leadership capabilities. These reflective exercises encourage learners to identify personal strengths and areas for development, fostering a deeper understanding of their role as strategic leaders in healthcare.

By the end of this chapter, readers will be equipped with the knowledge and tools necessary to lead strategically in health

information management, ensuring both organisational success and improved patient outcomes.

Background and Context

The Healthcare Landscape

Healthcare is an ever-evolving sector influenced by demographic shifts, technological advancements, policy changes, and economic factors (Dawes & Topp, 2022). With an ageing population, rising demand for services, and increased public expectations, healthcare leaders must continuously adapt. The push towards patient-centred care and learning-based integrated service delivery further highlights the importance of strategic leadership in ensuring that healthcare systems remain efficient and effective (Symons et al, 2021).

The Health Information Management Context

The profession of health information management (HIM) and its practice continues to evolve. HIM professionals in countries such as Australia, Canada, and the United States face challenges shaped by digital transformation, changes in the healthcare landscape, and growing demands for healthcare

services. A key concern is interoperability, as health information professionals work to advocate for and enable seamless data exchange across sectors and electronic health record systems.

The rise of AI and automation has potential to transform tasks such as coding and documentation. While these technologies offer efficiency gains, they also raise concerns about data accuracy, ethical use, and workforce impact.

Cybersecurity remains a priority, with increasing threats to patient data requiring robust protection measures and constant vigilance.

The workforce itself is under pressure, with growing demand for digital and analytical skills, alongside challenges in recruitment, workforce shortages, and retention.

Regulatory compliance continues to evolve, requiring HIM professionals to adapt to changing privacy and data governance standards across jurisdictions.

Regulatory and Policy Environments Shaping Healthcare Leadership

Healthcare leadership operates within a complex regulatory and policy framework (Osunlaja et al, 2024). Leaders must be well-versed in compliance, governance, and risk management to ensure their organisations meet legal and ethical obligations.

Additionally, policies related to digital health, workforce planning, and sustainability require leaders to take a long-term view when shaping organisational strategies.

Financial Pressures, Workforce Challenges, and Technological Advancements

Healthcare organisations face significant financial constraints, including funding cuts, increasing costs, and the need for efficient resource allocation (Osunlaja et al, 2024). Leaders must balance financial sustainability with delivering high-quality patient care. Workforce shortages, staff burnout, and recruitment challenges also place additional pressure on leadership, requiring investment in staff wellbeing and professional development (Weston, 2022). At the same time, emerging technologies such as AI, telehealth, and data analytics offer new opportunities to improve service delivery, streamline operations, and enhance patient outcomes (Nianga, 2024). Successful leaders leverage these advancements while managing associated risks and change resistance.

The Role of Leaders in Strategy and Planning

Healthcare leaders play a critical role in developing and

executing strategies that align with both organisational goals and broader healthcare priorities (Symons et al, 2021). Strategic planning involves setting clear objectives, analysing external and internal environments, and ensuring that resources are allocated effectively (Amer et al, 2022; Chmielewska et al, 2022). Health information leaders must engage stakeholders, including clinicians, organisational executives/leaders/managers, policymakers, and patients to ensure strategic initiatives are both realistic and impactful.

Balancing Long-Term Vision with Immediate Operational Needs

One of the key challenges for healthcare leaders is striking a balance between long-term strategic objectives and the day-to-day operational demands of running a healthcare service. It is crucial to plan, though addressing immediate patient care needs, workforce issues, and regulatory requirements cannot be overlooked. Effective leaders foster a culture of ensuring that short-term decisions contribute to long-term success (Fagerdal et al, 2022).

Strategic Versus Operational Leadership

Strategic leadership focuses on vision, innovation, and long-

term success, while operational leadership is centred on managing daily activities and ensuring efficient service delivery. Leaders who can integrate strategic thinking with operational expertise are better equipped to drive sustainable change, improve patient outcomes, and enhance organisational performance (Fagerdal et al, 2022). Understanding when to prioritise strategy over operations—and vice versa—is a crucial skill for healthcare leaders in today's complex environment. In the health information management context, it is important to understand technological and other changes that could impact upon strategy and direction. Strategic planning for health information management services could involve using tools and techniques such as environmental scanning, strengths, weaknesses, opportunities, and threats, or other approaches.

Theoretical Foundations: Leadership, Strategy, and Change Models

Strategic leadership in healthcare demands a nuanced approach. HIM professionals must navigate complex challenges while balancing patient care, staff needs, and operational efficiency. To effectively lead in this dynamic environment, healthcare leaders must access a range of leadership theories, strategic planning models, and change

management frameworks. This section explores several theories and models relevant to strategic leadership in healthcare, offering healthcare leaders tools and frameworks to guide their decisions and actions in an ever-changing landscape.

Leadership Theories Relevant to Strategic Leadership in Healthcare

1. Transformational Leadership

Transformational leadership is one of the most widely recognised leadership theories, developed by James MacGregor Burns in the late 1970s (Burns, 1978). It is effective in driving cultural change and improving staff engagement. There are many components to transformational leadership; however, the basic elements are where leaders create a relatable, inspirational, intellectually challenging working environment with the ability to support people through their individual contexts (Eaton et al, 2024). In healthcare, this style of leadership is crucial, as it helps to overcome barriers such as resistance to change, staff burnout, or stagnation (Fagerdal et al, 2022).

Transformational leaders create an environment that encourages collaboration and continuous learning, essential

in the rapidly evolving field of healthcare. By leading with empathy and enthusiasm, they empower their staff to go beyond mere compliance and strive for excellence in patient care (Labrague, 2024). For example, a hospital leader using transformational leadership might inspire and encourage staff to embrace new technologies or methodologies that improve patient outcomes, despite the initial reluctance to adopt new systems. Additionally, transformational leaders are adept at communicating the broader goals of the organisation, helping staff understand their role in achieving these objectives and improving patient care.

In the context of healthcare, transformational leadership also encourages a culture of inclusivity, where diverse ideas are valued, and creative solutions to problems are encouraged (Labrague, 2024). This leadership style aligns with healthcare's shifting focus on patient-centred and integrated care, as it nurtures collaboration across departments, improving communication and coordination within multidisciplinary teams.

2. Servant Leadership

Servant leadership is a leadership style focused on putting the needs of others, particularly employees and patients, first. The primary goal of servant leaders is to serve their teams by providing the tools, resources, and support necessary for them

to succeed, in simple terms – to lead as a 'servant' to others (van Dierendonck & Patterson, 2025).

This 'service' could involve providing mental health support for staff, ensuring that they have access to appropriate training and development opportunities, or advocating for patient safety and dignity in every decision. In healthcare settings, where stress, emotional exhaustion, and burnout are common, a servant leader's emphasis on empathy and support can help sustain the morale and commitment of staff.

This model of leadership encourages a focus on collaboration, humility, and empowerment, helping to build trust within teams. By prioritising the needs of others, servant leaders create a sense of shared responsibility and ownership of organisational goals, thereby fostering a positive work culture and improving overall performance (Demeke et al, 2024).

3. Adaptive Leadership

Adaptive leadership is particularly useful in healthcare, where leaders must respond to complex challenges and changing conditions. This leadership theory encourages leaders to remain flexible and responsive, promoting continuous learning and the ability to navigate ambiguity (Kuluski et al, 2021; Fagerdal et al, 2022). The healthcare environment is often characterised by uncertainty, whether due to emerging medical technologies, crises such as pandemics, or changes in

policy. Adaptive leaders can manage these dynamic challenges by promoting a mindset of experimentation and innovation.

A key component of adaptive leadership is the ability to encourage collaboration and shared problem-solving. Leaders separate technological solutions from adaptive solutions during times of change, and considering the assumptions made regarding behaviours and motivations to that change (Kuluski et al, 2021). Healthcare leaders must not only guide their teams, but also empower them to find creative solutions to emerging problems. Adaptive leaders embrace feedback and use it to drive improvements, recognising that the challenges healthcare organisations face often require solutions that emerge through trial and error, collaboration, and iterative processes.

Adaptive leadership also fosters resilience within teams by encouraging leaders to face challenges head-on and providing the resources and support needed to manage change effectively (Kuluski et al., 2021). In healthcare, where staff may feel overwhelmed by constant change, adaptive leadership seeks to position change as an opportunity for growth rather than a threat to stability. This view may be somewhat idealistic, as not all staff readily embrace change, particularly in high-pressure environments where workload demands, resource constraints, and change fatigue are ongoing challenges. Adaptive leadership provides a valuable framework for navigating complexity; however, its effectiveness relies on organisational culture, staff readiness, and the presence of adequate support

structures to enable meaningful adaptation (Kuluski et al., 2021).

Strategy and Planning Models in Healthcare

1. Mintzberg's (2007) Emergent vs. Deliberate Strategy

Mintzberg's (2007) theory of emergent and deliberate strategy emphasises the need to balance structured planning with the ability to adapt to real-world changes. Deliberate strategies are planned, with leaders setting clear goals and directives, while emergent strategies arise organically in response to unforeseen events or market shifts (Foss et al, 2022).

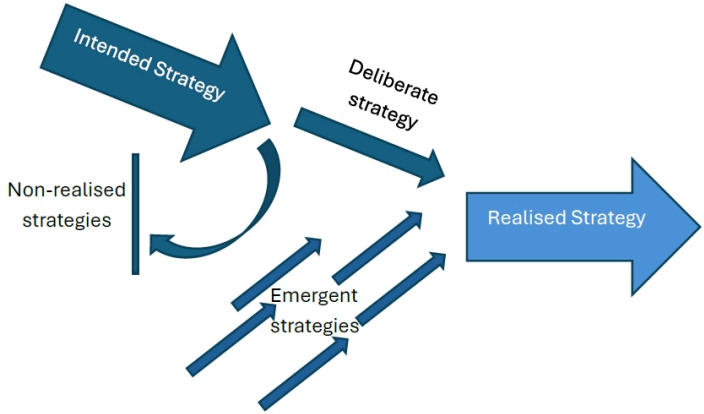


Figure 1. Emergent and Deliberate Strategies. Source: Adapted from Figure 1.2 in Mintzberg (2007). [Go to image description]

In healthcare, a deliberate strategy may involve long-term planning around financial management, service delivery, or regulatory compliance. However, healthcare leaders must also be prepared to adopt an emergent approach in response to unanticipated challenges, such as a sudden surge in patient volume, new healthcare regulations, or a public health crisis. The ability to respond effectively to such changes, while still adhering to the core principles of the organisation, is essential for success (Mintzberg, 2007; Foss et al, 2022).

By integrating both deliberate and emergent strategies, healthcare leaders can develop flexible, adaptable plans that allow for the execution of long-term goals while remaining responsive to immediate challenges.

2. The Balanced Scorecard Approach

The balanced scorecard approach is a comprehensive framework that helps leaders align business activities to the organisation's vision and strategy (Kaplan 1992). In healthcare, this model is used to improve performance measurement and management across four key perspectives: financial, customer, internal processes, and learning and growth (Amer et al, 2022).

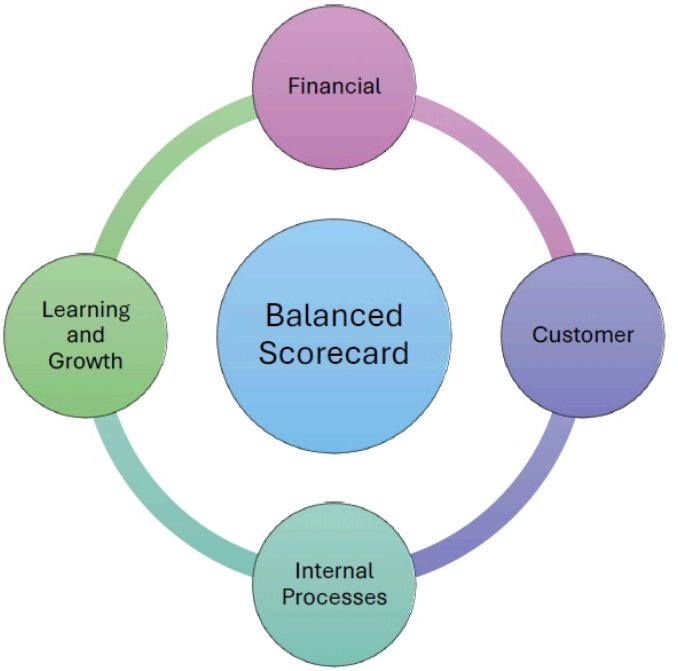


Figure 2. Balanced Scorecard.
Source: Concept derived from figure "ECI's Balanced Business Scorecard" in Kaplan and Norton (1992)

Healthcare leaders can measure and track progress toward organisational objectives across these diverse dimensions using the balanced scorecard. For example, from a financial perspective, leaders might assess the cost-effectiveness of treatment plans. From a customer perspective, the focus would be on patient satisfaction and experience. Internal processes would encompass the efficiency of service delivery; while learning and growth would involve staff development and knowledge-sharing initiatives.

Implementing a balanced scorecard approach allows healthcare organisations to gain a holistic view of their performance, ensuring that all areas are aligned with the organisation's strategic goals (Amer et al, 2022).

3. Porter's (1989) Five Forces and Competitive Strategy in Healthcare

Porter's (1989) five forces framework is invaluable for healthcare leaders seeking to understand market competition and develop a sustainable competitive advantage. The framework helps leaders assess the competitive pressures within the healthcare industry, including the threat of new entrants, bargaining power of suppliers, bargaining power of patients, the threat of substitute services, and the intensity of competitive rivalry (Mahat, 2019).



Figure 3. Five Forces Framework.
Source: Concept derived from Figure 10.1 in Porter (1989)

In a healthcare setting, this framework can be used to assess factors such as the increasing number of healthcare providers in the market, the influence of insurance companies, and the availability of alternative treatments. By understanding these dynamics, healthcare leaders can negotiate better partnerships, optimise service offerings, and create sustainable competitive advantages that allow them to deliver superior value to patients.

Change Management Frameworks

1. Kotter's (2012) 8-Step Change Model

Kotter's (2012) 8-step change model provides a structured, step-by-step approach to managing organisational change. It is one of the more popular change models used in healthcare, along with Lewin's (1947) change management model (Harrison et al, 2021). Kotter's (2012) model begins by creating a sense of urgency around the need for change and ends with embedding new practices into the organisation's culture. In healthcare, this model is particularly helpful for introducing new processes, technologies, or organisational structures. It then moves to building a guiding group that will then form a strategic vision to consult with a larger audience. The model's fourth step is focused on enlisting volunteers and then moving onto helping action/change to occur by removing barriers. Generating short term wins is the sixth stage, followed by ensuring motivation and momentum of change occurs. The last stage of Kotter's (2012) model focuses on embedding the change.

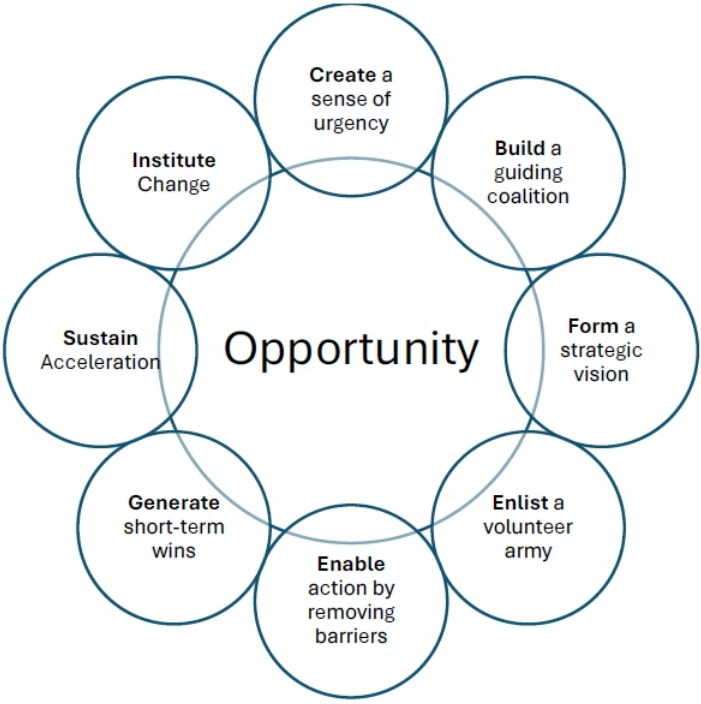


Figure 4. 8 Steps for Leading Change.
Source: Adapted from Leading Change framework in Kotter (2012)

By following Kotter's (2012) steps, such as building a guiding coalition, communicating the vision for change, and empowering action, healthcare leaders can ensure that the change process is carried out smoothly, with minimal resistance and maximum engagement from staff.

2. Lewin's (1947) Change Management

Model

Lewin's (1947) change management model is a simple yet effective framework for guiding organisational change. The model consists of three phases: unfreezing, changing, and refreezing (Lewin, 1947).

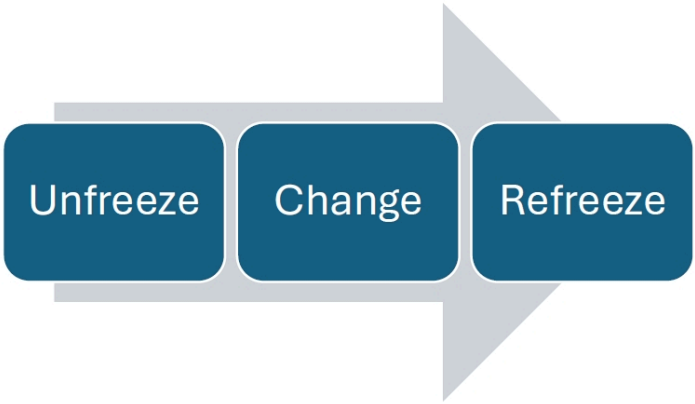


Figure 5. Change Management Model.
Source: Adapted from model in Lewin (1947)

The unfreezing phase involves creating the motivation for change and preparing the organisation for the transition (Lewin, 1947). The changing phase is where the actual transformation occurs, such as the implementation of new practices or systems. Finally, the refreezing phase focuses on stabilising the change and ensuring that new practices are embedded within the organisation.

In healthcare, Lewin's (1947) model is useful for guiding staff through transitions, ensuring that they understand the

need for change, are actively involved in the change process, and are supported as new practices are integrated into their daily work.

3. McKinsey's 7S Framework

McKinsey's 7S framework is based on the idea that seven elements, strategy, structure, systems, shared values, style, staff, and skills, must be aligned for an organisation to achieve its objectives (Peters & Waterman, 1985; Chmielewska et al, 2022). In healthcare, this model helps leaders assess the interdependencies between different parts of the organisation and ensure that all elements are working in harmony to support change.

For example, if a healthcare organisation is adopting a new electronic health record system, McKinsey's 7S framework helps leaders ensure that the strategy for implementation is aligned with the structure of the organisation, the systems in place to support the change, and the skills of the staff.

Strategic leadership in healthcare requires a thorough understanding of leadership theories, strategic planning models, and change management frameworks. By integrating theories such as transformational and servant leadership with tools like balanced scorecard and Kotter's (2012) 8-step change model, healthcare leaders can navigate complex challenges and drive sustainable improvements.

Key Implications for Practice

People Management in Health Information Management

Effective leadership in health information management relies heavily on people management, as the workforce is one of the most critical assets in any healthcare organisation. An engaged, skilled, and resilient workforce contributes to optimal patient care, operational efficiency in the health information service, and organisational success. Strategic leaders must invest in the development of their staff, from leadership programs to coaching initiatives, ensuring that the team is prepared to face the challenges of an increasingly complex healthcare environment.

Leadership Development Programs

One of the most effective ways to build a sustainable leadership pipeline within healthcare organisations is through structured leadership development programs. These programs are designed to equip emerging leaders with the skills and knowledge required to navigate the complex and often turbulent healthcare landscape. Given the fast pace of change in healthcare, leaders need to be agile, adaptable, and capable

of making decisions that affect both operational and clinical outcomes.

Leadership development programs typically combine formal education with experiential learning. Formal training may include courses on strategic decision-making, ethics, healthcare policy, and patient-centred care. These academic modules provide emerging leaders with the theoretical frameworks necessary for making informed decisions. In parallel, experiential learning opportunities, such as job rotations, shadowing senior leaders, or participation in strategic decision-making processes, help these individuals gain practical experience and develop leadership competencies in real-world contexts.

Activity

Read Leadership development in health information management (HIM): Literature review [PDF]

Identify the competencies to inform the development of a relational style of leadership described in the paper.

Succession Planning

Succession planning is another vital component of people management in healthcare. This proactive process helps ensure that an organisation is prepared for leadership transitions, reducing the potential for disruption and maintaining continuity in strategic decision-making (Low et al, 2019). Succession planning is especially critical in healthcare organisations, where leadership changes can have far-reaching implications for patient care, staff morale, and organisational stability (Dawes & Topp, 2022).

Effective succession planning involves identifying potential leaders early on and providing them with the necessary training, experiences, and exposure to strategic decision-making. By nurturing internal talent, organisations can create a pool of qualified candidates ready to step into leadership roles as the need arises, reducing reliance on external recruitment, which can be costly and time-consuming (Osunlaja et al., 2024). It also promotes a culture of career progression and stability within the organisation, boosting employee retention and engagement.

Healthcare leaders can identify potential successors by assessing their performance, leadership potential, and alignment with the organisation's values and strategic goals. Mentoring and coaching are key tools in this process, as they provide a supportive environment for emerging leaders to gain insight into the responsibilities of senior leadership positions.

Coaching and Mentoring

Coaching and mentoring programs are effective for fostering professional growth and development at all levels of an organisation. These programs facilitate knowledge transfer and help individuals enhance their skills, especially crucial in the fast-paced and ever-evolving healthcare sector (Low et al, 2019; Osunlaja et al, 2024). Senior leaders play a pivotal role in developing future leaders by offering guidance, support, and feedback, contributing to both career progression and overall organisational success (Dawes & Topp, 2022).

Coaching is typically focused on improving specific skills or addressing challenges faced by individuals, such as decision-making, communication, or team management. It is usually a one-on-one process in which a more experienced leader helps work through challenges, set goals, and identify strategies for personal and professional development.

On the other hand, mentoring is a longer-term relationship where senior leaders provide broader guidance and advice to junior staff. It often involves sharing experiences, offering career advice, and helping mentees navigate the complexities of the healthcare environment. A mentoring relationship can be invaluable in developing leaders who not only understand the technical aspects of healthcare, but also the organisational culture, values, and vision that drive the organisation forward (Low et al, 2019).

By encouraging coaching and mentoring, healthcare leaders

can build a culture of continuous learning and professional development, essential for long-term success.

Operational Performance Management in Healthcare

In addition to focusing on people management, strategic healthcare leaders must also prioritise operational performance. Achieving high levels of efficiency and effectiveness in day-to-day operations is crucial to ensuring that healthcare organisations provide high-quality patient care while maintaining financial and operational sustainability.

Key Performance Indicators (KPIs)

KPIs are powerful tools for measuring the success of operational strategies and initiatives. KPIs allow healthcare leaders to assess both the effectiveness and efficiency of their organisations, identifying areas that require improvement and driving accountability at all levels of the organisation (Amer et al, 2022; Kaplan, 1992). Common healthcare KPIs include patient satisfaction scores, wait times, staff turnover rates, and financial performance metrics, such as revenue and cost management. HIM professionals are frequently involved in generating and responding to KPIs within their organisations. Examples may include generating clinical indicator reports,

responding to KPIs around the clinical coding function (Low et al, 2019).

KPIs provide tangible benchmarks that healthcare leaders can use to guide decision-making and track progress over time. By focusing on these metrics, leaders can align operational efforts with strategic objectives and make data-driven decisions that lead to improved patient care and organisational performance.

Strategic Alignment of Operational Plans

In any organisation, it is essential that day-to-day operations align with the broader strategic objectives. In healthcare, this alignment ensures that operational decisions support the overarching goal of improving patient outcomes while maintaining operational efficiency (Amer et al, 2022; Weston, 2022). Leaders must ensure that the organisation's strategic direction is clearly communicated and embedded into daily workflows.

This alignment can be achieved through clear communication of goals, integration of strategic initiatives into daily practices, and fostering a culture of continuous improvement (Low et al, 2019; Harrison et al, 2021). For example, a healthcare leader might communicate a strategic goal to reduce patient wait times, and operational plans would then be adjusted to ensure that resources, processes, and staff

are aligned with this objective. Staff must be empowered to contribute to these goals by having the appropriate training and support to implement changes in practice.

Resource Management and Decision-Making

Healthcare leaders must make informed decisions about resource allocation, including workforce planning, budget management, and technology investments. Effective resource management ensures that the right resources are in place to support patient care and operational goals (Weston, 2022; Osunlaja et al, 2024). Given the limited nature of resources in most healthcare settings, leaders must prioritise and allocate them strategically. The health information service in a large hospital will be accountable for the budget allocated to them, and must manage within this budget and advocate through a business case when additional resources are required (Low et al, 2019).

Data-driven decision-making plays a key role in resource management. By leveraging performance analytics and input from stakeholders, healthcare leaders can make informed choices about where to invest resources to achieve the greatest impact (Amer et al, 2022). For example, investing in technology can streamline administrative tasks, reduce errors, and improve patient care, while careful workforce planning

can ensure that staff levels are adequate to meet demand without overburdening employees.

Case Studies

Case Study: Bringing a Hospital's Strategic Plan to Life

In 2022, St. Mark's Hospital, a major regional healthcare provider in Australia, set out to improve patient care and streamline operations through a new strategic plan. The leadership team, led by CEO Maria Sanchez, knew that every department needed to work together rather than operating in isolation for the plan to succeed.

A key challenge was that different teams were focused on their own tasks without a clear link to the hospital's broader goals. This lack of coordination led to inefficiencies and missed opportunities to improve patient outcomes. To tackle this, Maria and her team organised a series of planning sessions with department heads, clinicians, and staff to ensure that everyone understood the

hospital's priorities and how their work contributed to them.

During these sessions, teams identified practical ways to align their efforts with the hospital's strategy. For example, the IT team improved patient data systems to support better communication between departments, while nurses introduced new processes to reduce wait times. Regular progress reviews were set up, with each department reporting on their achievements and challenges every quarter.

Within a year, the hospital saw real improvements. Patient satisfaction scores increased by 15%, and clinical outcomes, such as reduced readmission rates, also improved. By focusing on collaboration, communication, and clear objectives, Maria and her team helped turn the hospital's strategic vision into real, measurable change.

Case Study: Navigating Resistance to Healthcare Technology Change

When Greenfield Medical Centre in New Zealand decided to introduce a new EHR system in 2021, Chief Information Officer Dr John Hayes knew it

would be a challenging transition. While the new system promised better data management, streamlined workflows, and improved patient care, many staff were hesitant to move away from the familiar processes they had used for years.

Dr Hayes recognised that resistance stemmed from concerns about the learning curve, potential disruptions to patient care, and fear of change. To address this, he focused on clear communication, hands-on training, and strong leadership support. He reassured staff that the new system was designed to help them, not replace them, and regularly highlighted its long-term benefits, such as reducing errors and making documentation easier.

A tailored training program was introduced, catering to different staff needs. Clinicians received practical, hands-on training with IT support on hand, while administrative staff attended workshops focused on data entry and system navigation. To minimise disruptions, the rollout was staggered, allowing teams to adapt gradually.

Despite these efforts, adoption was slower than expected. Some senior clinicians were reluctant to fully engage with the system, which influenced their teams' attitudes. Recognising this, Dr Hayes met

with department heads individually to address their concerns and demonstrate how the system would enhance patient care. Gaining their support was a turning point in encouraging wider acceptance.

Six months later, the hospital saw significant improvements. Documentation errors dropped by 30%, and staff reported greater efficiency in managing patient records. By focusing on communication, training, and leadership engagement, Dr Hayes helped the organisation successfully navigate a major technological change.

Activity – Interactive learning

Drag each engagement tool to the corresponding HIM challenge it helps address

Physicians resist a new digital documentation system

Policymakers are unaware of the role of HIM in healthcare data governance

Patients are concerned about how their data is being used
Healthcare executives are hesitant to invest in HIM technology
Insurers need assurance that HIM processes improve claim accuracy
Case studies and compliance reporting
Participation in advisory boards
Physician champions and peer training
Data storytelling with real-world impact
Educational campaigns and transparency reports



The interactive version of this H5P content is available at: https://oercollective.caul.edu.au/health-information-management/?p=67#h5p-20



An interactive H5P element has been excluded from this version of the text. You can view it online here: https://oercollective.caul.edu.au/health-information-management/?p=67#h5p-24

Summary

For health information management leaders, you will know if you are successful if:

As a leader in health information management, success is not just about achieving goals; it is about ensuring that your strategic initiatives translate into tangible improvements in health record documentation, clinical coding accuracy, integration of digital health tools, safety and quality of patient care, operational efficiency, and overall organisational performance. You will know you are successful if your strategic initiatives lead to measurable improvements in these areas and the health information services provided are integral to the successful operation of the organisation.

Another sign of success is the engagement and alignment of your team with the organisation's strategic goals. If your team members feel connected to the overall mission and are actively contributing to its achievement, this is a strong indication that your leadership is fostering a culture of collaboration and purpose. Successful leadership also involves the ability to effectively lead change while maintaining stability and staff morale. As a leader, you will know you are successful if you can introduce new processes, technologies, or strategies without causing undue stress or disruption. If employees feel supported, informed, and involved in the change process, this indicates that you are navigating transitions smoothly.

Lastly, measurable progress towards long-term

organisational objectives, as shown through KPIs, is a clear indicator of success. If the data reflect progress, whether in terms of patient outcomes, cost-efficiency, or staff performance, your leadership is on the right track. Achieving KPIs aligned with the organisation's vision ensures that your strategic direction is not only effective but sustainable.

Success as a health information leader is defined by the positive, measurable outcomes of your strategic initiatives, the engagement and development of your team, and the ability to lead change effectively while maintaining organisational stability.

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Image descriptions

Figure 1: The diagram illustrates Mintzberg's concept of how strategies form. On the left, a large arrow labeled "Intended Strategy" points right. Part of this arrow curves downward into a vertical barrier labeled "Non-realised Strategies," showing strategies that do not get implemented. The remainder of the intended strategy continues right as a smaller arrow labeled "Deliberate Strategy."

Beneath this, several smaller diagonal arrows labeled "Emergent Strategies" rise from the bottom toward the right, converging with the deliberate strategy. Together, these arrows

combine into a large arrow on the far right labeled "Realised Strategy," symbolising the strategies that are ultimately carried out.

This visual highlights that realised strategy is a blend of deliberate strategies (planned and implemented) and emergent strategies (developed in response to changing circumstances), while some intended strategies are never realised.

[Return to Figure 1]

LEADING THE HEALTH INFORMATION SERVICE

Sallyanne Wissmann; Sheree Lloyd; and Gina Banfield

Learning Outcomes

- Understand a leader's responsibilities and behaviours and how they are applied to leading a health information service to achieve its purposes.
- Understand the principles of strategic leadership, performance management, financial management, risk management, functional management, change management, people management, and stakeholder management and how they are applied to leading a health information service.
- Recognise the requirements for an effective health information service, including health record management, information privacy management and compliance, producing accurate timely clinical coded data, maintaining high standards of data quality and reporting, and effective management of health information systems.

Introduction

Health information professionals work in various roles and settings requiring different responsibilities, accountabilities, and spans of control. In this chapter, you will learn about leading the health information service (HIS) within a hospital context; however, the leadership and managerial principles outlined are also applicable in other contexts.

The management of patient data and information is critical to the effective functioning of a healthcare service (Abdelhak & Hanken, 2016; Hardy, 2024). Patient information is routinely collected and created while providing healthcare to a patient (Abdelhak & Hanken, 2016; Hardy, 2024). Healthcare organisations also use and generate data for research, funding, and reporting. Governed by statutory requirements and healthcare standards, patient information needs to be carefully and consciously managed to ensure both compliance and organisational and strategic needs are met within a best practice framework (Abdelhak & Hanken, 2016; Hardy, 2024).

Health information management includes the management of people, processes, and systems associated with patient information. Effective leadership is required to ensure all of these components function optimally to meet patient, organisational, and external needs for patient information.

Leaders hold the ultimate responsibility for the performance of the health information service. They need to

set vision and direction, motivate and inspire, make timely and appropriate decisions, be effective communicators, delegate and collaborate, and empower others to succeed within the context of personal accountability, insight, and empathy.

This chapter explores how leadership theories – including strategic leadership, performance management, financial and risk management, and people and stakeholder management – relate to leading the health information service. It also examines how these approaches influence organisational behaviour in the context of health information management.

The chapter examines the core functions of health information services, including health record management, compliance with medico-legal requirements and information privacy laws, clinical coding, maintaining high standards of data quality and reporting, and health information system management.

By addressing these topics, this chapter provides a guide for current and aspiring leaders in health information services, equipping them with the knowledge and skills required to effectively lead the health information service.

The Effective Leader

Leadership is an individual's ability to influence, motivate, and enable others to contribute to the organisation's effectiveness and success (Radtke, 2024; Smith et al., 2020a, 2020b)

Contemporary leadership thinking showcases leader behaviours, considering how leaders use personal influence to develop and inspire others in the organisation to develop and inspire people to achieve organisational goals, while also making a difference in the community being served (Olley, 2023c).

Authentic Leadership

While many leadership theories exist, authentic leadership and ethical leadership theories remain popular. Authentic leaders understand their purpose, practice professional values, establish connected relationships, and demonstrate self-discipline while demonstrating the characteristics shown in the figure below (Olley, 2023c).



Figure 1. Authentic Leader Characteristics.
Source: Adapted from "The Cardinal Qualities of Authentic Leaders" by Richard Olley (2023c) in The Theories of Leadership, licensed under CC BY-NC 4.0

Authentic leaders improve the job satisfaction of those they lead (Braun & Peus, 2016). The following depicts the dimensions of authentic leadership (Olley, 2023c).

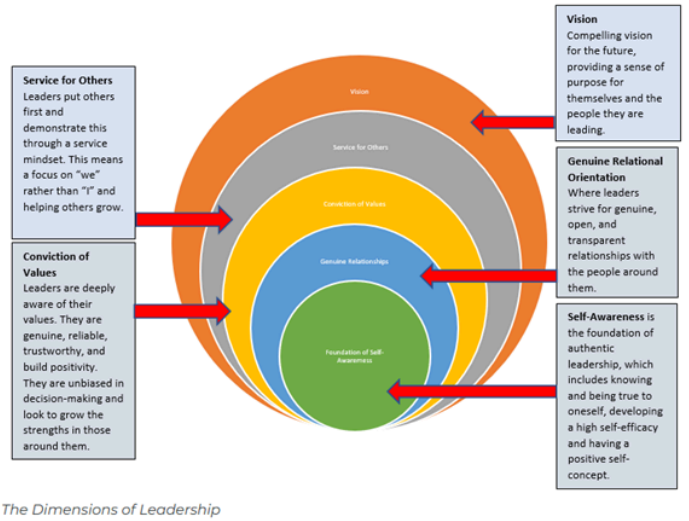


Figure 2. "The Dimensions of Leadership" by Richard Olley, in The Theories of Leadership is licensed under CC BY-NC 4.0. [Go to image description]

Ethical Leadership

Ethical leadership is associated with authentic leadership and is founded upon the practice of leaders' decisions and deliberations being influenced by moral or ethical considerations (Olley, 2023c). Examples of such decisions include allocating scarce resources, colleague and workforce issues, meeting performance targets, improving organisational

culture, disclosure responsibilities, and transparency to identify errors or misadventures (Edwards, 2024; Olley, 2023c). Ethical leadership centres around respect for others' ethics, values, rights, and dignity; and the leader's honesty, integrity, trust, and fairness in leadership practice (Olley, 2023c).

Leadership Behaviours

A leader's behaviour directly impacts the culture of the work team and the delivery of outcomes. Positive leader behaviours cultivate a positive work environment, where team members feel valued, empowered, and equipped to do the work required and can contribute to shared goals of the organisation where they work (Olley, 2023c). Effective leadership behaviours include:

Vision and Direction

Leaders set a clear vision and direction for their team or organisation. They articulate goals and inspire others to work towards them (Olley, 2023c; Radtke, 2024). They also manage the delivery of the vision, sometimes directly or through teams and other individuals, and build and coach teams towards delivery of strategic and operational goals and objectives (Olley, 2023c). The chapter on Leading Strategically in

Health Information Management discusses this in further detail.

Influence

A leader's effectiveness comes from their ability to influence others at all levels of an organisation; hence, the ability to positively influence is an essential leadership skill (Olley, 2023c). It is fundamental to success, providing the impetus for accomplishing team goals and fulfilling team responsibilities (Olley, 2023c).

Empowerment

This is an important act of leadership, to empower others and involves encouraging team members to take ownership of their work. Leaders should support teams by providing the necessary resources and fostering independence and innovation. Delegating challenging tasks and offering mentorship supports team members' development and confidence (Smith et al., 2020b). The best leaders make a deliberate choice to empower everyone they lead, whoever they are, wherever they are (Boris, 2021).

Timely Decision Making

Leaders are responsible for making important decisions that

affect their team or organisation by analysing information, considering alternatives, and choosing the best course of action (Cole, 2024). Leaders will not always get things right, but making timely decisions is effective leadership behaviour. Decisive leaders apply techniques to guide decisions and actively seek out the appropriate information they require to make ethical and sound decisions (Edwards, 2024). Decisive decision making is an important attribute of effective leaders (Cole, 2024).

In any moment of decision, the best thing you can do is the right thing, the next best thing is the wrong thing, and the worst thing you can do is nothing. **– Theodore Roosevelt**

Effective Communication

Clear and effective communication is crucial for leaders. Leaders must convey their vision, expectations, and feedback to their team and stakeholders and listen to their concerns and ideas. Various communication methods can be utilised to ensure messages are conveyed, understood, and appropriately responded to (Smith et al., 2020b).

Empathy

Empathy is important in leadership because it increases trust,

communication, and a sense of worth for team members (Hofmeyer & Taylor, 2021; Jian, 2022).

Growth Mindset

Leaders should both possess and foster a growth mindset, encouraging their teams to embrace challenges, learn from feedback, and persist in the face of setbacks. In comparison to a fixed mindset, a growth mindset fosters continuous improvement and resilience, enabling people to develop their abilities and achieve their full potential (Dweck & Hogan, 2016). This approach not only enhances individual development, but also contributes to the overall success and resilience of the organisation (Dweck & Hogan, 2016).

Lifelong Learning

Effective leaders will engage with ongoing professional development across their career (Hardy, 2024). Lifelong learning is the continuous pursuit of knowledge and skills throughout an individual's professional life, driven by personal and professional growth. Lifelong learning fosters adaptability, creativity, equips individuals with new and emerging skill requirements, and builds resilience, enabling individuals to thrive in an ever-changing world.

It is encouraging that the development of the specific skills, knowledge, attributes, and abilities required for successful

leadership can be learned and enhanced through training, coaching, mentoring and personal growth for existing and emerging leaders (Smith et al., 2020a, 2020b; Olley, 2023).

Health Information Service (HIS) Leaders

A HIS is responsible for the functions associated with patient information in a hospital setting. This extends to influencing how patient information is managed and governed within the organisation. Health information leaders can also work in registries, community health organisations, insurers, government, and information technology (IT companies) (Health Information Management Association of Australia, 2025a, 2025b) This chapter focuses on leadership requirements that can be applied to the HIS, but are also applicable to the different settings where health information leaders are located.

A HIS is usually led by a professional with specialised expertise, skills, and knowledge in health information management. In Australia, degree qualified health information managers collect, classify, and manage health data to meet the medical, legal, ethical, and administrative requirements of health care organisations (Australian Bureau of Statistics, 2024). This includes competencies in managing and leading

health information services (Health Information Management Association of Australia (HIMAA), 2023).

Leading a HIS includes applying the following areas of leadership and management theory:

- Strategic leadership
- Performance management
- Financial management
- Risk management
- Change management
- Functional management
- People management
- Stakeholder management

A strategic vision, operational expertise, and a commitment to health data and information are necessary to effectively lead a HIS. A proactive, forward-thinking approach is essential to support innovation and lead change. Leaders must stay informed about emerging technologies and advancements, such as artificial intelligence, new classification systems, government and organisational strategies and policies, and new ways of working that can enhance service delivery. A commitment to continuous quality improvement, optimisation of workflows, integration of new digital tools, and adapting to changing organisational and external drivers is essential. To be successful in their role, a HIS leader must demonstrate effective leadership behaviours to gain the trust

and respect of staff, leaders, and colleagues. Leaders need to be comfortable with leading and managing change and inspiring others to work towards a common vision for the health information service.

Strategic Leadership of a Health Information Service

Strategic leadership involves setting the strategic direction for a health information service in the context of the organisation's vision, mission, and strategic direction. Strategic leadership involves keeping informed and involved in organisational change and positively leading resultant change and impacts for the health information service functions and workforce (Smith et al., 2020a). A HIS leader should be involved in the development of relevant organisational strategic plans.

Strategic planning involves identifying risks and considering future internal and external impacts to the health information service and the management and use of its valuable information asset (Hanson, 2011; Lloyd & Craig, 2023).

A HIS strategic plan may be developed as standalone or be incorporated into a broader organisational strategic plan. Either way, it is important that there this a documented vision and strategic intent for the HIS functions for the next 3–5 years.

When developing a strategic plan, key questions for a HIS leader to answer include:

1. How does the health information service contribute to the organisation's strategic aspirations and how will this be articulated?
2. What organisational and external changes and drivers will impact health information management and services within the organisation?
3. To what extent is the strategic plan visionary, setting a future direction, and inspiring?
4. How will progress and success be measured, reported, and celebrated?

It is critical that the strategic plan is developed with team members and internal, and where relevant external, stakeholders, and that operational performance management is aligned with its requirements (Edwards, 2024; Smith et al., 2020a, 2020b).

Strategic leadership involves proactively seeking out information and building relationships with other leaders within and outside the organisation, being curious, and being available to be involved in strategic related conversations and initiatives. To be an effective strategic leader, a HIS leader should have well developed influencing, persuading, and negotiation skills. An effective HIS leader will be respected and sought after for their knowledge and expertise in health

information management, including as it relates to digital initiatives (Edwards, 2024; Smith et al., 2020a, 2020b).

Performance Management of a Health Information Service

A HIS leader is required to develop and deliver against operational plans and key performance indicators and be transparent in the reporting of performance as they have accountability for health information both within and outside the health information service (Radtke, 2024; Smith et al., 2020a, 2020b). A HIS leader is accountable for the performance of the health information service. The types of tools that can be used to establish, monitor, and inform performance management include:

Business/Operational Plan

Business and operational plans are used to identify the operational requirements of a HIS. Business plans will include goals or expected outcomes of the service used to assess service performance (Radtke, 2024; Smith et al., 2020a, 2020b). These should be developed with key customers and approved by health service management to ensure they meet the requirements of the health service. Goals should be measurable because they will be used to inform the key performance

indicators of the service (Jani & Chaudhary, 2023). Business plans must include the operating hours of the services, resource requirements, and budget. Business plans are usually reviewed annually to identify changes in demand for services that impact operational budgets and priorities such as increased activity or planned capital works in the health service that could impact services and operational demand.

Key Performance Indicators (KPIs)

KPIs are used to measure an organisation's success or service in achieving their goals. When establishing KPIs, it is important that they are clearly defined and measurable. KPIs should measure the HIS's productivity and performance to inform progress against the HIS's business and strategic plans (Domínguez et al., 2019; Radtke, 2024). Consideration needs to be given to identifying the **key** performance indicators that represent the HIS's key deliverables, rather than a lengthy list of performance indicators that is cumbersome and time-consuming to measure and report.

HIS Reporting

Regular HIS performance reporting is important for executive leaders, staff, and stakeholders, each of whom has different

interests in the data being reported. Reporting demonstrates accountability and commitment to achieving the HIS's KPIs, operational goals, and strategic objectives. Examples of HIS reporting, depending on the scope of functions of the HIS and the KPIs that are been determined, include:

- Strategic management – the progress of strategic initiatives and projects
- Financial management – performance against the HIS budget
- Risk management – new risks identified, risk mitigation progress
- People management – staff retention, staff engagement, leave, and other human resource (HR) metrics
- Stakeholder management – meeting stakeholders' needs, key interactions, and working with stakeholders to deliver outcomes
- Operational management – key achievements and key issues, and reporting of KPIs, such as:
    - Health records – the volume provided or accessed, scanning volume, completion rates, throughput, and audit results
    - Information privacy – the volume by request type, completion rates within KPIs, casemix revenue generated
    - Clinical coding – volume, completion rates, throughput (per coder or per hour), casemix acuity,

audit results, documentation queries
- Data quality and reporting – duplicate registrations, key data quality metrics, reporting deadlines status

In Australia, My Health Record compliance often falls under the jurisdiction of a HIS leader, and compliance audit results in line with legislated requirements are reported to health service executives regularly to ensure ongoing access to health record information (Australian Digital Health Agency, 2024).

Financial Management of a Health Information Service

A HIS leader oversees the financial management of the health information service. This includes setting and managing budgets, developing business cases for capital expenditure, and contributing to the organisation's financial management through management of components of the organisation's funding model (Edwards, 2015; Radtke, 2024).

Health Information Service Financial Management

Effective financial management and budgeting are necessary

to ensure the sustainability and efficiency of HIS operations, as appropriate operational and resource models are dependent on available funding.

Budgeting provides a structured approach to planning and controlling financial resources. A comprehensive budget allows for funds to be allocated where and when required and to ensure essential health information functions are delivered. Budgeting should be undertaken in accordance with organisational policies and guidelines. The annual budget process enables operational planning to be informed through changes planned within the organisation that may impact on the demand for health information services (Edwards, 2015). Monthly monitoring of financial performance and labour metrics against budget is necessary to understand any variations in and the rationale for the financial results. Health information services may require capital funds for items such as new/refurbished/expanded office or storage space, new information systems or system upgrades, or new/replacement equipment (Edwards, 2015).

Capital expenditure usually requires the preparation of a business case to justify the capital spend in terms of outcomes and benefits, total cost of ownership, and return on investment. Considerations should include the project duration, human resources required, equipment or system configuration, testing and implementation, infrastructure requirements, software licences, and impacts on current and ongoing operational costs (Edwards, 2015).

HIS leaders should be the authors of their business cases and should review all organisational business cases that have an impact on health information management and governance (Smallwood, 2018).

Organisational Financial Management

A health information service provides data required for several strategic purposes including the organisation's receipt of activity-based funding. Activity-based funding in healthcare is a model where hospitals receive payments based on the quantity and variety of patients they care for (Independent Health and Aged Care Pricing Authority, 2025). For admitted patient activity, diagnosis related groups are required for activity-based funding, which is an outcome of the clinical coding process (Independent Health and Aged Care Pricing Authority, 2025). As a result, the accuracy and timeliness of items such as principal diagnosis, complications, co-morbidities and treatments required for coding and diagnosis related groups assignment is imperative (Health Information Management Association of Australia, 2024). These items are dependent on the quality and comprehensiveness of clinical documentation and attracts significant attention. For non-admitted patient care, the accuracy and timeliness of data reporting contributes to funding dependencies (Independent Health and Aged Care Pricing Authority, 2025). A HIS leader

needs to understand the data dependencies for the organisation's funding model where it relates to patient information and ensure all associated processes are efficient and provide accurate data.

Risk Management for Health Information Services

A HIS leader has a responsibility to identify and escalate organisational risks associated with health information, and to actively mitigate existing risks (NEJM Catalyst, 2018). Health information risks can lead to consequences such as patient harm, compliance breaches, loss of revenue, and reputational damage for the organisation if not effectively mitigated.

It is critical that a HIS leader is conversant with the organisation's risk management policy and requirements. This is expected to be consistent with ISO 31000, an international standard that provides principles and guidelines for risk management (International Standards Organisation, 2018). ISO 31000 outlines a comprehensive approach to identifying, analysing, evaluating, treating, monitoring, and communicating risks across an organisation. HIS leaders are encouraged to be familiar with ISO 31000 and their organisation's risk management policy and procedures.

Strong governance including risk management is essential for the management of information and data due to the

sensitive nature of health data and the increasing risks of cybercrime, data theft and the potential harm that these cause to individuals and health care organisations (Smallwood, 2018) (see other chapters for further information such as Cybersecurity in Health). Management of the information and data assets within healthcare organisations is key to controlling the risks associated with data loss and the protection of staff and consumer privacy. Good corporate governance systems should include information, data governance, and risk management (NEJM Catalyst, 2018).

The following table provides an example of a simple risk management plan to illustrate a risk management approach for the introduction of an information system:

Risk	Impact	Strategy to manage
Nursing staff not available for training	High	Develop a training plan in consultation with nurse unit managers
Hardware and software installation delayed	High	Work with vendors closely and align contractual requirements to health service needs. Clear communication requirements between vendor and health service.
Insufficient funding to complete project objectives	Low	The project budget was developed and agreed upon with project sponsor. Funding made available to achieve project scope. Monitor the budget throughout the life of project.

Figure 3. Simple Risk Management Plan. [Go to image description]

HIS leaders will identify, assess, and mitigate risks associated through the management and use of information assets. This involves conducting risk assessments to identify potential threats to data integrity, security, and availability, and evaluating the likelihood and potential impact of these risks. Information governance frameworks incorporate risk

management practices to develop strategies for minimising risks, such as implementing controls, establishing contingency plans, and regularly monitoring and reviewing risk exposure to ensure ongoing effectiveness. Effective, information governance involves collaboration across organisational departments and functions such as IT, health information management, legal/compliance, executive, clinical teams, and business units (Hardy, 2024; Hovenga & Grain, 2023) . It requires a combination of policies, training, technology, ongoing monitoring, and enforcement, to manage information through its lifecycle (creation and capture to storage, retrieval, and disposal). Maximising data assets while mitigating risks such as improper data handling requires input from clinical, professional staff and executive stakeholders.

Examples of HIS risks include:

- Breach of privacy due to missing patient records or data, inappropriate access to patient information, or non-approved disclosure.
- Theft of patient information due to cyber-attack. The risk of cyber-attacks on health services is on the rise with approximately half of the world's hospitals experiencing an IT shutdown due to a cyberattack in the first half of 2021 (PwC Australia, 2022).
- Computer downtime interrupting hospital and HIS services mitigated with robust downtime procedures.
- Availability of staffing resources, including clinical

coding and administrative teams.

- Physical damage to patient records or patient record departments where a physical record still exists. An example of this would be a water leak due to a burst pipe resulting in wet records and water damage to paper.

Change Management

Change management is the "...process, approach and set of tools for managing the people side of change so that business results are achieved, on time, and within budget – combines project management and human behaviour" (Health Information and Management Systems Society)

The introduction of new classification systems, health information solutions, digital health initiatives, and new procedures and policies often requires significant changes within healthcare organisations. Contemporary organisational theory argues that the culture and structure of some organisations are more conducive to change than others and that health organisations are not of the type where change is easily implemented (Braithwaite et al., 2017; University of Minnesota, 2017). Digital disruption, innovation and transformation are increasingly common in health organisations (Almond & Mather, 2023).

Change is inevitable in healthcare and industries. Many

changes fail for reasons such as poor planning, change-fatigued or unmotivated staff, deficient communication, or excessively frequent changes (Dendere et al., 2021; University of Minnesota, 2017).

Due to the challenges associated with change, HIS service leaders and managers understand that too much change or change that is too rapid can impact the workforce, resulting in fatigue, low morale, and dissatisfaction.

All healthcare providers, from the bedside to the boardroom, have a role in ensuring effective change. Using the best practices derived from change theories can help improve the odds of success and subsequent practice improvement (Barrow & Annamaraju, 2025).

Change Models

There are many theories and models for change management. No single change theory is considered "right". Current thinking is that change needs to be understood and tailored to fit the specific needs of an organisation within its cultural, economic, and political context (Barrow & Annamaraju, 2025; Day & Shannon, 2015).

Change can be planned, emergent, or adaptive. Planned change involves moving from one state to another in a structured manner. The implementation of an electronic medical record would be an example of planned change. However, depending on the scope and breadth of changes to

workflows, structures, processes, and culture could also involve transformation (Barrow & Annamaraju, 2025; Day & Shannon, 2015).

An alternative is to see change as fluid and emerging, as it is pervasive and continuous. Taking this view means you are more likely to manage change as part of what happens naturally in an organisation and see interventions as cyclical or iterative. This is commonly referred to as "emergent change". Adaptive changes are those small, incremental adjustments that individuals, teams, organisations, managers, and leaders to adapt to daily, weekly, and monthly challenges. When we make adaptive changes, they are usually related to fine tuning of existing processes and will not impact upon the organisation.

Planned change approaches rely more on assumptions that an organisation's environment is known. Change can then be planned to facilitate movement from one condition to another. In contrast, emergent change emphasises the need to be responsive and adaptive: that change is constantly around us. It may be that some changes can be seen as more stable and predictable moving from one state to another, while other change is more on-going.

Concepts including change vision, barriers and supporters, leadership, goals, and action plans are well documented within change theory. Depending on the type of change, it is normal to choose a change model or framework on which to base the approach and this can provide a stronger chance of success

(Harrison et al., 2021). There are many different models, with common change approaches described below.

Lewin's 3 Step Model

This simple model has high appeal with three-steps to change behaviour using the metaphor of melting and reshaping an ice cube. Lewin's model proposes that behaviours need to be unfrozen, changed to the desired state and refrozen to the new state and desired behaviours (Day & Shannon, 2015; University of Minnesota, 2017).

ADKAR Model (Awareness, Desire, Knowledge, Ability and Reinforcement)

This is a model developed by Prosci founder Jeff Hiatt after studying the change patterns of more than 700 organisations. This is a people-centred approach designed to facilitate change at the individual level (Prosci, n.d.).

Kotter's (2021) Eight-step Change Model

This is the most well-known change model. It is used to reduce resistance and accept change. Kotter's model has evolved and has an eight step methodology [opens in new tab].

1. Creating a sense of urgency
2. Build a guiding coalition
3. Form a strategic vision
4. Enlist a volunteer army
5. Enable action by removing barriers
6. Generate short-term wins
7. Sustain acceleration
8. Institute changes (Day & Shannon, 2015; Kotter, 2021).

Plan, Do, Check, Act (PDCA)

This model involves a cyclical and iterative change management process focused on continual improvement and is suitable for small improvement projects and can allow stakeholders to work together to incrementally improve systems and processes (Chen et al., 2021).

Service Redesign

Service redesign and clinical redesign are used to identify the cause of challenges and determine evidence-based solutions. Service redesign is fundamentally underpinned by working with those who know the work best or are impacted (clinicians, staff, and consumers) to determine the causes, reasons for delay, barriers, and enablers to care and service provision (Ben-Tovim et al., 2008). Redesign also recognises that problems may be the result of poor overall design and

disconnections between the stages of care that might cross multiple departments (Ben-Tovim et al., 2008). Service redesign follows several steps, including diagnosis, solution design, detailed implementation planning and planning, and rollout of solutions. Service redesign is a proven and valid approach to change (Ben-Tovim et al., 2008). The diagram below shows the steps in service redesign.

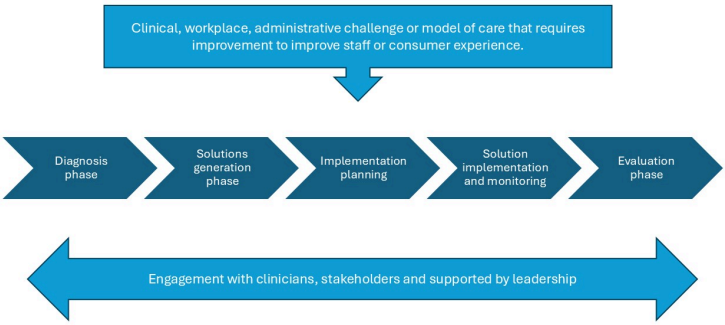


Figure 4. Steps in Service Redesign.
Source: Adapted from Box 4 "The phases of clinical process redesign" in Ben-Tovim et al. (2008). [Go to image description]

Activity – Service Redesign

Step 1: Read Patient journeys: the process of clinical redesign [opens in new tab]

- Summarise the key stages of clinical redesign as described in the article:
    - Engage
    - Diagnose
    - Design
    - Implement
    - Sustain
- Reflect on how these stages relate to your current or future role.

Step 2: Select a patient journey with **complex information flows**.

Choose a patient journey relevant to your context.

Examples:

- Elective surgery pathway
- Outpatient bookings
- Mental health intake and referral
- Chronic disease management (e.g., diabetes)

Step 3: Map the information flows:

- Where and how patient data is collected (e.g., ED triage, imaging, nursing notes)
- How it moves between departments
- Points where data is delayed, duplicated, or lost
- Systems involved (e.g., EMR, paper forms, verbal handovers)

Step 4: Identify Redesign Opportunities (15 minutes)

For each weak point in the information flow, ask:

- What causes the breakdown?
- How does it impact patient care or staff efficiency?
- What redesign could improve it? (e.g., automated alerts, shared dashboards, standardised forms)

Step 5: Implementation Planning

Outline a basic plan for implementing one of your redesign ideas:

- Stakeholders involved
- Resources needed
- Potential barriers and how to address them
- Metrics for success

Step 6: Reflection

Write a short reflection (300–500 words) on:

- What you learned about service redesign
- How this process could improve patient outcomes and staff satisfaction
- How you might apply this in your workplace or studies

Management of Health Information Service Functions

A HIS leader is responsible for ensuring that health information functions are efficient, timely, accurate, and effective (Health Information Management Association of Australia, 2025a, 2025b). The organisation will determine the functions required of the health information service and these will vary depending on size, location, and the types of healthcare services delivered. These functions may expand and constrict over time.

A HIS leader must understand legislative and compliance requirements and guide how patient information is created, accessed, used, stored, and retained throughout its lifecycle.

The management of health data is a critical responsibility of a health information service. A HIS leader needs to ensure that health information systems are robust, secure, and compliant with regulations, policy, and guidelines. HIS leaders are actively involved in health law and ethics, and work to address legal and ethical issues related to health information, including health records and the use of health information systems.

The delivery of HIS functions will be impacted by organisational policy, available technology, regulatory requirements, and other internal and external factors. A continuous improvement and change-receptive approach is required to continue to adapt and mature HIS functions.

A HIS leader needs to be aware of the following sources of regulatory compliance that may apply to the HIS functions dependent on the location of the service and type of healthcare organisation:

- Commonwealth legislation
- State/territory legislation
- State/territory government policy, directives
- National Safety and Quality Health Service Standards

It is recommended that HIS functions are managed through the mechanisms shown in the diagram below:



Figure 5. Mechanisms for the Management of Health Information Service Functions.

There is no singular approach to the reporting line of a health information service within healthcare organisations. The executive role responsible for the HIS may vary between clinical services, finance, and/or IT/digital services. Within some organisations, the functions of a health information service may be split under different executive portfolios. When this occurs, increased collaboration is required to ensure seamless cooperation between the different teams to meet their respective outcomes.

A HIS leader needs to collaborate with the health service executive to determine the extent of accountability and responsibility they have in relation to health information functions within the organisation. A Responsibility Assignment Matrix , or RACI matrix (which identifies those **R**esponsible, **A**ccountable, **C**onsulted, and **I**nformed) is a

useful tool for this purpose (Smallwood, 2018). A HIS leader will often be given the responsibility of custodian, that is, on behalf of the organisation, they are to take care of, apply and mature governance and assurance to information management disciplines and artefacts such as health records, information privacy and health data and information governance. An example RACI matrix for the implementation of a new health information system is shown below:

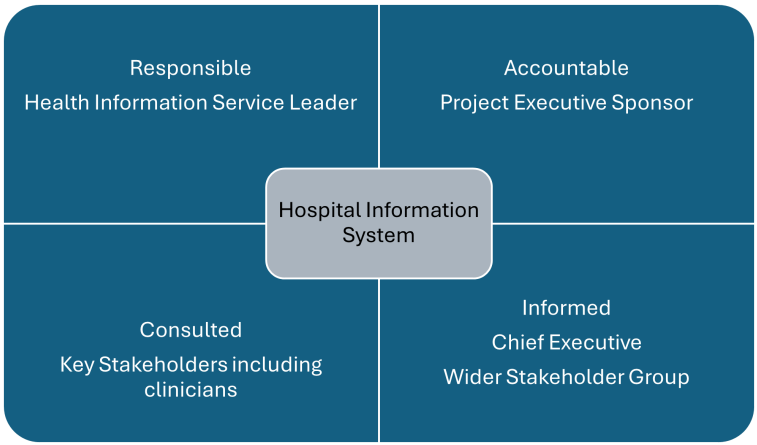


Figure 6. Responsibility Assignment Matrix. [Go to image description]

The typical functions of a hospital health information service are:

- Health record management
- Information privacy management
- Clinical coding

- Data quality and reporting
- Health information system management

Additional functions, not covered in this chapter, may include:

- Clinical transcription
- Clinical documentation improvement
- Information governance

Health Record Management

A health record is the collection of data and information gathered or generated to record the clinical care and health status of an individual or group (AS 2828.1: 2019) (Standards Australia, 2019a, 2019b).

A healthcare record includes a record of the patient's medical history, treatment notes, observations, correspondence, investigations, test results, photographs, prescription records and medication charts for an episode of care (Australian Commission on Safety and Quality in Healthcare, 2021). Essential information is documented in a healthcare record to ensure patient safety (Australian Commission on Safety and Quality in Healthcare, 2021).

A health service organisation needs to have healthcare record systems that:

- Make the healthcare record available to clinicians at the point of care
- Support the workforce to maintain accurate and complete healthcare records
- Comply with security and privacy regulations
- Support systematic audit of clinical information, and
- Integrate multiple information systems, where they are used (Australian Commission on Safety and Quality in Healthcare, 2021).

A health record may be in one or more formats including:

- Paper
- Digitised – A health record produced by converting source records into digital format (AS2828.2:2019) (Standards Australia, 2019b).

  Some health record services undertake the scanning of paper clinical documentation to convert it to scanned images for subsequent access and retention purposes. This requires comprehensive quality controls to be put in place.

- Electronic – An electronic health record is a health record with data structured and represented in a manner suited to computer calculation and presentation (AS 2828.1: 2019) (Standards Australia, 2019a). You can

read further about this topic in this chapter Electronic Medical and Health Records.

Best practice is to have a single health record for a patient, where all health information pertaining to the patient is available across all episodes of care for the healthcare organisation. If patient information is retained in multiple formats, these should be integrated into a single accessible patient health record via the most appropriate format.

The processes that need to be created, maintained, and managed for appropriate health record management include:

- Health record definition, creation, and content
- Health record register of health record components
- Authorised health record systems and position on collaboration and AI systems
- Health record internal request and access
- Health record management
- Health record retention and disposal
- Deceased patient notification
- Clinical forms management

- Patient alert management
- Clinical photography and clinical image management
- Electronic signatures

Information Privacy Management

Other chapters in this textbook explain the concepts and importance of information privacy and the risks of cybersecurity as it relates to health information. See chapters on Health Information Law, Privacy and Ethics, Cybersecurity in Health and Cyber Risk Management.

The processes that need to be created, maintained, and managed for appropriate information privacy management include:

- Information privacy policy
- Information privacy procedures, including release of information processes for all request types
- Managing a notifiable data breach incident
- Privacy impact assessment
- Information classification
- Personal information collection notification statement
- Patient information consent forms, including consent to clinical imagery
- Health information and system access, including for students and volunteers
- Use of generic vs named logins

- Use of patient data for system testing purposes
- Sharing information securely with external third parties. This may necessitate the need for legal agreements to be in place between parties.
- Advanced health directives, enduring power of attorney, and Office of the Adult Guardian
- Research requests

It is recommended that a mandatory education training module is created and made available to all staff within the organisation in relation to their information privacy obligations.

Clinical Coding

Clinical coding using the ICD-10-AM/ACHI/ACS classification system is undertaken for all admitted care in Australia (Independent Health and Aged Care Pricing Authority, 2025). Clinical coding is the assignment of codes that reflects clinical documentation following the application of the conventions, standards and rules used with a health classification system (Health Information Management Association of Australia, 2024). Abstraction involves the review and appraisal of clinical documentation to determine whether the assignment of relevant code(s) is warranted, or if there is vagueness or conflicting entries in the health care record that need to be clarified by the clinical author (Health

Information Management Association of Australia, 2024). You can read further about Healthcare Classification and Terminologies in this chapter.

The Clinical Coding Practice Framework [opens in new tab] provides a structure for those managing health services to support their workforce of clinical coders, clinical coding auditors and educators, health information managers, clinical documentation improvement specialists and other health information management professionals in producing high-quality clinical coded data (Health Information Management Association of Australia, 2024).

The processes that need to be created, maintained, and managed for appropriate clinical coding management include:

- Clinical coding process
- Clinical coding staffing plan
- Clinical coding audit strategy to ensure the quality of coding is of the required standard
- Clinical coding training and education framework
- Clinical documentation audit framework to ensure the clinical documentation reflects the care provided and meets the requirements for clinical coding accuracy
- Patient record audits to ensure all the required information is available to the clinical coding team within the timeframes required of the service.

Data Quality and Reporting

Data quality and reporting primarily concerns ensuring accurate and complete data are available for priority data items that are critical to patient care and internal and external reporting and analysis. Areas of focus often include:

- Patient registration and identification data
- Admitted patient data
- Non-admitted patient data
- Clinical data required to be reported for statutory purposes

Australian hospital reporting requirements include reporting to the:

- National Hospital Morbidity Database (public and private admitted activity)
- National Perinatal Data Collection (pregnancy and childbirth)
- Hospital Casemix Protocol (privately insured episodes)
- Private Hospital Data Bureau (private hospital admitted activity)
- State and National Cancer Registries
- Trauma, Injury and other Registries
- Benchmarking partners and organisations
- Safety and quality indicators

Reporting requirements will vary from country to country and parts of the healthcare system (primary care, rehabilitation, mental health).

The processes that need to be created, maintained, and managed for appropriate data quality and reporting include:

- Data governance plan
- Data quality requirements and audit plan
- Data sources and data map
- Data retention plan
- External reporting register

Health Information System Management

A HIS leader is often given the responsibility of being the business owner of one or more key systems that hold or process patient information.

Examples of such systems include:

- Patient Administration System
- Patient Master Index
- Health Record Scanning System
- Clinical Coding Systems
- Health Provider Directory
- Clinical Portal
- Patient Portal

- My Health Record
- Transcription Systems
- Electronic Health Records

As the business owner of an information system, a HIS leader plays a role in making sure the system meets organisational needs and evolves to meet new requirements. They are responsible for ensuring that the system's processes and solutions are suitable and remain effective over time. This includes making sure that the right policies, procedures, training materials, and communication tools are in place so that everyone understands how to use the system properly.

A HIS leader also ensures that users are using the system correctly and that the data entered are accurate and trustworthy. They work closely with users and their leaders to identify necessary changes and set priorities for improving the system, especially when the organisation's needs change or when new legislative or reporting requirements emerge.

A HIS leader contributes to broader decisions about the system's strategic direction. They collaborate with IT teams on system maintenance and upgrades, testing, implementation, optimisation, and planning for when new systems are required or current systems need to be replaced. When upgrades or replacements are required, a HIS leader may also write or help write business cases to support those changes (Hovenga & Lloyd, 2006).

The breadth of health information management professional responsibilities is shown in the figure below.

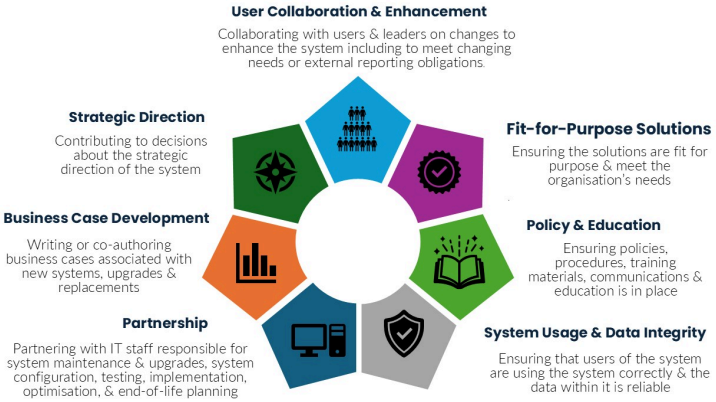


Figure 7. Health Information Manager Responsibilities.
[Go to image description]

Processes that need to be created, maintained, and managed for appropriate management of health information systems include:

1. Policies and procedures examples include:

    - Patient identity and registration
    - Health provider identification and registration
    - System access and training
    - System downtime procedures and forms
    - System management plan including decommissioning

2. Training materials

A HIS leader is well positioned to be an operational sponsor and key advisor for digital health projects. This involves writing and/or reviewing business cases, being involved in system selection, being part of project steering committees, providing guidance to the project manager and team, raising risks, and contributing to the project's success.

My Health Record

In Australia, the My Health Record is the secure online summary of a consumer's health information, managed by the system operator of the national My Health Record system (Australian Digital Health Agency, 2024). Clinicians can share health clinical documents to a consumer's My Health Record, according to the consumer's access controls. These may include information on medical history and treatments, diagnoses, medicines, and allergies.

In relation to the My Heath Record, the National Safety and Quality Health Service Standards (Australian Commission on Safety and Quality in Healthcare, 2021) mandate the following:

The health service organisation works towards implementing systems that can provide clinical information into the My Health Record system that:

- Are designed to optimise the safety and quality of health care for patients
- Use national patient and provider identifiers, and
- Use standard national terminologies AND

The health service organisation providing clinical information into the My Health Record system has processes that:

- Describe access to the system by the workforce, to comply with legislative requirements, and
- Maintain the accuracy and completeness of the clinical information the organisation uploads into the system

The *My Health Records Act (Australian Government, 2012)* prescribes a number of requirements for health service organisations who access and/or send patient information to the My Health Record. Health information services oversee this process.

People Management for Health Information Services

"One of the criticisms I've faced over the years is that I'm not aggressive enough or assertive enough, or maybe somehow, because I'm empathetic, it means I'm weak. I totally rebel against that. I refuse to believe that you

cannot be both compassionate and strong." Jacinda Ahern, 40th Prime Minister of New Zealand

Leading a multidisciplinary team is central to the role of the health information service leader. This involves continuous workforce planning, recruiting skilled coding and other professionals, and ensuring that staff are trained and have opportunities for ongoing professional development (Williams & Archdall, 2015). Modern workforce requirements require leaders to effectively lead intergenerational and diverse teams and to ensure safe and healthy work environments both onsite and at remote working locations (Dols et al., 2010; Sequeira & Aish, 2023).

Australia is facing a significant workforce shortage for many healthcare workers, including health information management, driven by an ageing workforce and lack of supply of qualified health information managers (Australian Institute of Health and Welfare, 2025). This leads to additional demands on workforce planning and the configuration and management of the staff mix required to meet service needs. The shortage of health information professionals and clinical coders exacerbates the healthcare system's ability to manage and utilise health data effectively.

The following are the key attributes of people management that need to be considered and managed to lead the health information service:

- **Workforce Planning**

Workforce planning includes determining the resource profile, budget, and sourcing of human resources required to achieve the outcomes required (Olley, 2023b). The resource profile includes determining what types of skills and competencies, responsibilities, and roles are required, how much work each role can achieve, and how many of each resource type is required. This will often require the collection of data and other evidence to justify the resource profile and is an ongoing activity (Olley, 2023b; Williams & Archdall, 2015).

A knowledge of relevant industrial awards and instruments is important to determine the budget required for each role, as well as the organisation's policies in relation to human resource management (Williams & Archdall, 2015). There are often budget constraints in relation to human resources highlighting the importance of role justification. A business case may need to be written to justify additional resources being included in the budget.

There are several options for sourcing the people required, including full-time, part-time, or casual employment, or contractors. Factors to consider include workforce stability and the risk of workforce turnover.

- **Intergenerational and Diverse Workforce**

Management

Recent HIM workforce studies has identified an aging workforce, with the majority of the workforce identifying as female (Marc et al., 2019). This can present challenges for managers when responsible for a workforce that is intergenerational and diverse (Briggs & Isouard, 2015). The importance of managing intergenerational relationships in the workplace is critical in preventing agism and ensuring knowledge and expertise of the older workforce is not lost to the organisation (Wu et al., 2025).

- **Training, Education, Professional Development and Career Development**

Training and education programs are important components of maintaining a workforce that is high performing and can provide accurate data and information. These programs need to ensure the workforce remains current with the latest standards and legislative requirements (Olley, 2023a; Patterson et al., 2023).

Professional development and career development in the workplace ensure employees feel valued and understand the career pathways available, leading to an

engaged and professional workforce (Olley, 2023a; Patterson et al., 2023).

- **Safe and Healthy Work Environments**

  Workplace health and safety is a legislative requirement in Australia, and although the legislation differs from state to state, the overarching principles are the same. Health information services need to ensure ergonomic factors are assessed and plans are in place to ensure staff are safe from injury, including manual handling techniques and training to avoid repetitive strain injury (Sequeira & Aish, 2023). Psychological safety in the workplace is increasingly important. Individuals should feel comfortable expressing themselves and sharing ideas or concerns without fear of rejection, or punishment.

  The evolving hybrid working model where team members can work remotely or onsite presents its own challenges. The employer is still responsible for workplace safety, irrespective of where the work takes place. Policies for remote working need to include minimum standards for desk set up and workplace safety. These are evaluated against remote working audit tools with photographic evidence provided of the work setting and compliance. These audits should occur annually or when there is a change in location (NSW Health, 2025).

Health Information Service Workforce

Health information services may have different staffing models depending on the health services and work environment. Health information services may be managed as standalone units, or their management structure may be part of a larger network of hospitals. The typical roles and key functions of HIS staff are:

Health Information Managers

As we have seen, degree qualified health information managers collect, classify, and manage health data to meet the medical, legal, ethical, and administrative requirements of health care organisations (Australian Bureau of Statistics, 2024). They have competencies in relation to professional skills; health information science, including health records management, language of medicine, and healthcare; healthcare classifications and terminologies; research methods; health data analytics; organisation and delivery of health services; health information law and ethics; health informatics and digital health; and organisation and management of the health information service (Health Information Management Association of Australia, 2025a, 2025b; Health Information Management Association of Australia (HIMAA), 2023). As a result, they are equipped to undertake any of the functions

and roles within the health information service including managerial and leadership roles.

Medical Record Officers or Health Information Officers

Medical record officers are responsible for managing paper and scanning health record processes, providing patient records to clinicians for patient care or for secondary uses such as research or quality audit. These teams are comprised of administrative workers who undergo on the job training. The increasing use of technology requires the workforce to be computer literate and work across multiple systems.

Privacy Officers

Privacy officers respond to enquiries and requests for patient information in accordance with organisational policies and procedures and under the supervision of a suitably experienced manager.

Clinical Coders

The clinical coding workforce can include both HIM qualified and diploma (or equivalent) staff. The use of activity-based funding across both public and private sectors has increased

the need high standard of clinical coding driven by a qualified and well-trained workforce.

The population is aging, increasing the burden of chronic disease (Australian Institute of Health and Welfare, 2025), and there is a current workforce shortage. Management of the clinical coding workforce has its challenges, with the increasing demand for data to inform funding models and service planning the clinical coding teams are often caught between high volume versus timely and accurate coded data. When managing these teams, it is necessary to provide the balance between demand, quality, and resources, ensuring senior management is aware of any shortfall in resources that could impact the productivity of the team (Briggs & Isouard, 2015).

In the private sector, external coding audits by health funds are used to assess the quality of the coded data to ensure insurance claims are an accurate reflection of the care provided. This can be intimidating to the coding teams, and it is the manager's responsibility to support teams through the process and ensure any learnings from the audit are presented to the team in a constructive and positive way.

Coding Educators

Coding educators are responsible for training clinical coders from graduate level through the stages of their career development. This may either be a component of a coding

manager role, a standalone role, or be part of a role that supports multiple hospitals and coders.

Coding Auditors

Coding auditors are responsible for conducting audits on completed clinical coding for quality assurance purposes. Given the dependency on quality clinical coded data for funding purposes, and the constraints associated with re-submission of coded data to private insurers, it is critical that clinical coding is accurate prior to billing and other secondary uses occurring. System based criteria should be used to identify the priorities for audit. Investment to address source issues of poor-quality coding outcomes needs to occur.

Data Quality/Reporting Officers

Data quality/reporting officers are responsible for identifying data quality issues, liaising with authors of the data for correction, identifying system edits and flags that can improve data quality, cleansing data, preparing data for reporting, and reporting data to authorised third parties.

Stakeholder Management for Health Information Services

Health information systems and digital health technologies—such as electronic health records, telehealth, wearables, artificial intelligence, patient portals and health information exchanges—offer significant potential to improve care quality, safety, and efficiency, their implementation often encounters resistance (Adjekum et al., 2018; Almond & Mather, 2023). This resistance can stem from the diverse and sometimes conflicting perspectives of stakeholders across the healthcare ecosystem. Please read further here about Engaging with Stakeholders and Partners.

Stakeholders include consumers, families, carers, clinicians, health service managers, IT vendors, policymakers, funders, and the broader community (Brownie & Holmes, 2015). Each group brings unique expectations, concerns, and levels of readiness for change. Although the technical components of health information system solutions are often well-executed, the human and organisational aspects—such as change management, communication, and training—are often not well addressed. When change is not managed well, and people are not involved, there is potential for failure and suboptimal achievement of intended benefits and anticipated value (Hovenga & Lloyd, 2006). A HIS leader needs to balance and

set realistic expectations of the intended benefits of any new health information system or technology.

Effective stakeholder engagement is essential from the earliest stages of health information initiatives. This includes structured consultation processes to explore how health information will be used, who will use it, and what new workflows or services will emerge. These discussions help clarify expectations, assess readiness for change, and align the intended benefits of digital solutions with stakeholder needs.

The goal of stakeholder engagement is to build consensus and co-create a shared vision for the digital health initiative. Achieving this consensus is critical to navigating the complexities of Australia's health system and balancing diverse priorities. A foundational step in this process is stakeholder analysis—identifying who is affected, their level of influence, and how best to involve them. This analysis should inform all phases of the project, from strategic planning and system design to implementation and evaluation.

A health information service leader routinely collaborates with a broad range of stakeholders with varying needs and complexity including information technology, vendors, senior organisational leaders, clinicians, and government. They need to be able to effectively influence administrative and clinical staff to adhere to health information policies and procedures.

While engaging with stakeholders and partners is discussed in another chapter in this textbook (Engaging with Stakeholders and Partners), it is important to recognise that

stakeholder engagement and management needs to be a high priority for the HIS leader.

Key stakeholders of the HIS include hospital executives, legal counsel, clinical governance, clinical heads/leaders, clinical staff, the billing team, administration managers and staff, IT team, authorised third parties who receive patient data, patients, third party requestors of patient information, external agencies who monitor/report on compliance with regulations and standards, and health funds (private hospitals). These stakeholders play crucial roles in ensuring the effective management and use of health information within the system and are shown in the figure below.

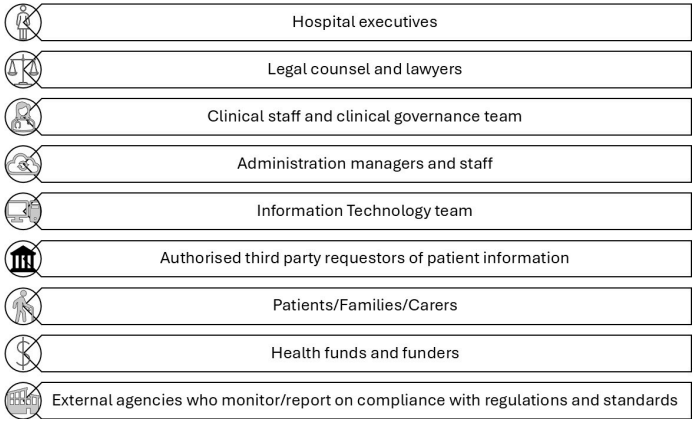


Figure 8. Key Health Information Service Stakeholders.

Key Implications for Practice

HIS leaders have broad, discipline specific and contextual

skills, knowledge, and experience. The following are key elements for effective practice to manage risk, people, diverse stakeholder groups, lead change, and the constantly evolving health and information management landscape:

- **Effective Leadership:** Authentic and ethical leadership are the mandate of modern leadership practice, requiring leaders to understand their purpose, practice solid values, establish connected relationships, and demonstrate self-discipline while demonstrating prudence, temperance, justice, and fortitude.
- **Strategic Management:** Leaders must understand the organisational context and drivers, set vision and direction, align operational performance with strategic goals, and ensure compliance with medico-legal and other requirements.
- **Performance Management:** Leaders must apply principles of performance management to demonstrate accountability, transparency, and commitment, celebrate success, and address areas for improvement.
- **Financial Management:** Leaders must steward organisational finances well, advocating for appropriate funding to service the needs of the organisation in the HIS functions, and contributing to organisational funding optimisation.
- **Risk Management:** Leaders must identify, assess, and mitigate risks associated with the management and use

of information assets. This involves conducting risk assessments, developing strategies for minimising risks, and ensuring strong governance to control risks associated with data loss and the protection of staff and consumer privacy.

- **Health Information Service Functions:** Leaders need to oversee core functions of health information services, including health record management, compliance with medico-legal requirements and information privacy laws, clinical coding, maintaining high standards of data quality and reporting, and health information system management.
- **People Management:** Leaders in health information services need to manage teams effectively, including health information managers and clinical coders, leading workforce planning, managing intergenerational and diverse workforces, investing in training, education, professional development, and career development, and ensuring safe and healthy work environments.
- **Stakeholder Management:** Effective leadership in health information services requires collaboration with key stakeholders such as IT departments and other healthcare staff to ensure effective data management and health information system use and implementation.

These implications highlight the important combination of

effective leader behaviour and expertise in health information management to effectively lead the health information service.

Activity – Test your knowledge

Test your knowledge with this short quiz on leading the health information system.

Which function involves directing and motivating employees to work towards organisational goals?

- Organising
- Controlling
- Leading
- Planning
- Monitoring
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What term describes the ability to understand and share the feelings of another, which is crucial for effective leadership?

- Manipulation
- Sympathy
- Empathy
- Apathy
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-

Health information is NOT classified as 'sensitive information' under this Act.

True
False

-
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Which talent management practices are most effective for improving employee retention? **Select all that apply.**

- Career development and growth opportunities
- Competitive salary

- Options for flexibility, including hybrid work arrangements.
- Strict disciplinary policies
- Annual performance reviews
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Which of the following best describes the primary goal of succession planning for leadership in people management?

- Developing training programs
- Creating a pipeline of trained, experienced and qualified candidates for key positions

- Reducing employee turnover rates
- Maximising employee salaries
- Implementing performance review systems
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When managing resistance to change, which approach involves actively including employees in the change process?

- Financial incentives
- Direct supervision
- Coercion
- Manipulation

- Participation and involvement
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The primary federal law that governs the privacy of health information in the United States is HIPAA?

True
False

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Which of these is a crucial first step in Kotter's 8-Step Change Model?

- Implementing the change
- Creating a sense of urgency
- Celebrating success
- Building the team
- Developing the vision
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Which management function involves setting goals, establishing strategies, and developing plans to coordinate activities?

- Organising
- Leading
- Coordinating
- Planning
- Controlling
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Which management function involves monitoring

performance, comparing it to goals, and taking corrective action when necessary?

- Leading
- Directing
- Planning
- Organising
- Controlling
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Which of these is NOT considered one of the key characteristics of emotional intelligence in leadership?

- Self-regulation
- Motivation
- Social skills
- Self-awareness
- Technical expertise
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The primary legislation that governs health information privacy in Australia at the federal level is the Privacy Act 1988

True
False

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The interactive version of this H5P content is available at: https://oercollective.caul.edu.au/health-information-management/?p=74#h5p-27

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Image descriptions

Figure 2: Five concentric circles represent the dimensions of authentic leadership, moving outward from the core:

1. Foundation of Self-Awareness – Knowing and being true to oneself, developing self-efficacy, and maintaining a positive self-concept.
2. Genuine Relationships – Leaders build genuine, open, and transparent relationships with the people around them.
3. Conviction of Values – Leaders are deeply aware of their values, are trustworthy, reliable, unbiased in decision-making, and encourage growth in others.
4. Service for Others – Leaders prioritise others' needs, demonstrating a service mindset that focuses on "we" over "I."
5. Vision – Leaders create a compelling vision for the future, inspiring purpose for themselves and those they lead.

The layout emphasises that self-awareness is the foundation, and each outer layer builds upon the previous to create effective, authentic leadership.

[Return to Figure 2]

Figure 3:

A table depicting a simple risk management plan for the

introduction of an information system. The table is divided into three rows, each with three columns labeled “Risk”, “Impact” and “Strategy to manage”.

- The first row uses unavailable nursing staff for training as an example of “Risk” and identifies the level of “Impact” as high. The strategy to manage this risk is develop a training program in consultation with nurse unit managers.
- The second row uses the delay of hardware and software installation as an example of “Risk” and identifies the level of “Impact” as high. The strategy to manage this risk is work with vendors closely and align contractual requirements to health service needs.
- The third row uses insufficient funding to complete project objectives as an example of “Risk” and identifies the level of “Impact” as low. The strategy to manage this risk is monitor the agreed upon budget for project.

[Return to Figure 3]

Figure 4: A horizontal process diagram illustrating steps in clinical process service redesign. At the top, a text box states: “Clinical, workplace, administrative challenge or model of care that requires improvement to improve staff or consumer experience.”

Below, five connected right-facing arrows represent sequential phases:

1. Diagnosis phase – identifying the problem or area needing improvement.
2. Solutions generation phase – brainstorming and developing potential interventions.
3. Implementation planning – outlining resources, timelines, and responsibilities for action.
4. Solution implementation and monitoring – executing the plan and tracking progress.
5. Evaluation phase – reviewing outcomes, measuring success, and making adjustments.

A large horizontal arrow runs beneath all phases, labeled: "Engagement with clinicians, stakeholders and supported by leadership," emphasising that collaboration and leadership support span the entire process.

[Return to Figure 4]

Figure 6: This diagram presents a **Responsibility Assignment Matrix (RACI)** for the implementation of a new Hospital Information System. The layout is divided into four quadrants, each representing a distinct role category in the RACI model: Responsible, Accountable, Consulted, and Informed. At the center of the diagram is a grey box labeled "Hospital Information System", indicating the focal project or initiative.

- The **top left quadrant** is labeled **"Responsible – Health Information Service Leader"**, identifying the

individual or group tasked with executing the work and ensuring the system is implemented.

- The **top right quadrant** is labeled **"Accountable – Project Executive Sponsor"**, denoting the person ultimately answerable for the success and outcomes of the implementation.
- The **bottom left quadrant** is labeled **"Consulted – Key Stakeholders including clinicians"**, referring to those whose input is actively sought during planning and decision-making.
- The **bottom right quadrant** is labeled **"Informed – Chief Executive, Wider Stakeholder Group"**, representing those who are kept up to date on progress and outcomes but are not directly involved in execution or decision-making.

The diagram visually reinforces the structured assignment of roles and communication responsibilities essential for successful project governance.

[Return to Figure 6]

Figure 7: This diagram shows seven key responsibilities for health information management (HIM) professionals.

1. User Collaboration and Enhancement: Collaborating with users and leaders to improve systems, meet changing needs, and satisfy reporting obligations.
2. Strategic Direction: Contributing to decisions on the

system's strategic direction.

3. Business Case Development: Writing or co-authoring business cases for new systems, upgrades, and replacements.
4. Partnership: Working with IT staff on maintenance, upgrades, configuration, testing, implementation, optimization, and end-of-life planning.
5. Fit-for-Purpose Solutions: Ensuring solutions meet organizational needs and are suitable for purpose.
6. Policy and Education: Developing policies, procedures, training materials, and communications to support system use.
7. System Usage and Data Integrity: Ensuring users follow correct processes and that system data remains reliable.

[Return to Figure 7]

ENGAGING WITH STAKEHOLDERS AND PARTNERS

Erin Roehrer and Matthew Springer

Learning Outcomes

This chapter will provide HIM leaders with:

- A clear understanding of who the key internal and external stakeholders in HIM are and what their interests and expectations may be.
- Strategies to ensure that all stakeholders are appropriately identified before engaging in any collaboration activities.
- Strategies for effective stakeholder collaboration, engagement, and advocacy to ensure HIM has a strong presence at the decision-making table.
- Insights into how HIM leaders can demonstrate their value proposition to both clinical and non-clinical stakeholders.
- Practical tools and methods for engaging with stakeholders in different organisational contexts.

- Case studies showcasing real-world examples of successful HIM stakeholder engagement.
- Self-assessment activities to help evaluate and refine your own stakeholder engagement strategies.

By the end of this chapter, HIM leaders will have a roadmap for strengthening their influence, securing support for key initiatives, and ensuring HIM remains a central player in the healthcare ecosystem.

Introduction: Why is This Topic Important?

In today's rapidly evolving healthcare landscape, health information managers and leaders are no longer just record keepers, they are strategic partners in patient care, compliance, and healthcare innovation (Robinson et al 2022, Fenton et al., 2017). Effective stakeholder engagement is critical to ensuring that Health Information Management (HIM) services are valued, supported, and integrated into broader healthcare decision-making processes (Teixeira et al ., 2021).

HIM professionals interact with a diverse range of stakeholders, from clinicians and hospital executives to policymakers, insurers, and patients. Each group has different priorities, expectations, and levels of influence (Petkovic et al., 2023). Failing to effectively engage stakeholders can lead to

challenges such as resistance to new technologies, compliance risks, and missed opportunities for HIM leadership to shape the future of healthcare information governance (Serrano et al., 2020).

Why This Matters for HIM Professionals

Traditionally, HIM teams have been seen as back-office support functions, managing patient records, and ensuring regulatory compliance (Fenton et al., 2017). However, as digital health, data governance, and patient-centred care come to the forefront of the success of the health industry, HIM leaders must position themselves as essential contributors to healthcare strategy and decision-making (He et al., 2021; Sheikh et al., 2021).

This means actively building relationships, communicating HIM's value proposition, and advocating for the role of HIM professionals in improving patient outcomes and operational efficiencies (Isidori et al., 2022). To achieve this, HIM leaders must move beyond transactional relationships and develop long-term engagement strategies that foster collaboration, trust, and influence (Fenton et al., 2017). Without strong engagement, HIM services risk being sidelined in healthcare decision-making.

Background and Context

The Changing Landscape of Health Information Management

HIM has come a long way from the days of paper records and filing cabinets. Today, it sits at the centre of a rapidly evolving healthcare system where digital technologies, data governance, and regulatory compliance shape how information is collected, stored, and used. With the increased presence of electronic health records (EHRs), telehealth, and artificial intelligence in healthcare, HIM professionals are no longer just managing data, they are helping drive strategic decision-making that affects patient care, operational efficiency, and regulatory compliance (Moy et al., 2021).

At the same time, the expectations placed on HIM leaders are higher than ever. Regulatory frameworks such as privacy laws, data protection mandates, artificial intelligence guidance and accreditation standards continue to evolve, requiring HIM professionals to stay ahead of compliance requirements, while also ensuring that health information is accurate, accessible, and secure (Secinaro et al., 2021). This shift means health information management is no longer a background function, and as described by Robinson et al (2022) HIMs are the 'expert and trusted custodians (of health information)'. They go onto say 'HIMs face challenges deriving from the multiplicity

of the medical record's contributors and stakeholders. Their governance of privacy in the EMR space extends to system and operational security including sensitivity of system design, aspects of cybersecurity, policies and procedures governing consent to access the record, anonymisation of data (for researchers and governments), standards and directives (Dill et al., 2016; Rezaeibagha et al., 2015 cited in Robinson et al (2022). In short, HIM is a key enabler of safe, effective, and efficient healthcare.

However, this comes with challenges. As technology becomes more complex and interconnected, HIM leaders must navigate competing priorities, organisational resistance to change, and the need for continuous upskilling. The ability to engage effectively with stakeholders, both inside and outside the organisation, has become an essential skill for ensuring HIM remains relevant and influential in shaping the future of healthcare.

Key Internal and External Stakeholders in HIM

Successful HIM leadership is built on strong relationships with a diverse range of stakeholders, each with different priorities and concerns (Segarra-Oña, 2020). Understanding who these stakeholders are, what they care about, and how HIM contributes to their goals is crucial for meaningful collaboration and engagement.

Internal Stakeholders

Within a healthcare organisation, HIM teams work closely with a range of professionals, as outlined below:

- Clinical staff (doctors, nurses, allied health professionals): who rely on accurate patient data for clinical decision-making and patient safety
- Clinical leaders: who drive initiatives dependent on insights from patient data and have a key role in sponsoring HIM initiatives
- Clinical governance: who oversee patient safety and quality monitoring, investigation and improvement
- Administration staff: who enter and manage data related to patient identity, booking and activity
- IT teams: who support the technology infrastructure for EHRs and clinical systems, cybersecurity, and data integration.
- Compliance officers, risk managers and legal counsel: who ensure regulatory and legal standards are met, reducing liability and enhancing data security.
- Hospital executives and administrators: who oversee financial and operational efficiency, requiring data insights to drive decision-making
- Project teams: who require HIM teams' input to ensure compliance with privacy and data governance requirements

External Stakeholders

HIM professionals also interact with external entities that influence healthcare policies, funding, reporting, and regulations, as outlined below:

- Patients: who are increasingly engaged in their own health data, requiring transparency, access, and security
- Healthcare third parties: who request/access patient data for patient care purposes
- Government and regulatory bodies: who set the rules and frameworks governing health data privacy, interoperability, and reporting
- Accreditation bodies: who ensure healthcare organisations meet quality and compliance standards, often requiring detailed HIM reporting
- Insurers and payers: who depend on accurate coding and documentation for reimbursement and fraud prevention
- Technology vendors: who provide **EHRs** and **EMRs**, patient administration and clinical systems, data analytics tools, and AI-driven solutions that must align with HIM workflows, assure confidentiality and meet compliance needs

HIM leaders must bridge the gap between these groups, translating technical and regulatory requirements into

meaningful, actionable insights (Low et al., 2019). By building strong stakeholder relationships, HIM professionals can ensure their expertise is recognised, their input is valued, and their role remains central to delivering high-quality, data-driven healthcare.

Engaging with stakeholders is not just about having conversations, it is about knowing who to engage with, how to prioritise stakeholders' needs, and how to communicate in a way that builds trust and collaboration with stakeholders (Kujala et al., 2022). To achieve this, HIM leaders can lean on a few well-established models that provide guidance on stakeholder management and decision-making.

Theories and Models: What the Evidence Says

Stakeholder Engagement Models

As there is no single approach to engaging with stakeholders; different models help HIM leaders determine who holds influence, how to balance competing interests, and how to align efforts with broader healthcare goals (Kujala et al., 2022).

Mendelow's Matrix (Power-Interest Matrix) – Who Matters Most?

Not all stakeholders have the same level of influence or interest in HIM initiatives, and that's where Mendelow's (1981) matrix comes in handy. This model helps HIM leaders map stakeholders based on two key factors:

- Power – How much authority or influence this stakeholder holds over HIM decisions.
- Interest – How invested is this stakeholder in HIM activities and outcomes.

Using Mendelow's (1981) matrix, stakeholders fall into four categories:

1. *High power, high interest (key players)* – These are the decision-makers who can make or break HIM initiatives (for example, hospital executives, clinical directors, compliance officers). They require active engagement and strategic communication.
2. *High power, low interest (keep satisfied)* – These stakeholders may not be deeply involved in HIM operations, but they can still influence outcomes (for example, government regulators, consumers of health services). They need periodic updates and reassurance.
3. *Low power, high interest (keep informed)* – These are

stakeholders who care about HIM processes but do not have much decision-making power (for example, clinical staff, patients). Providing them with consistent information keeps them engaged.

4. *Low power, low interest (monitor)* – These stakeholders do not need much attention unless their role shifts (for example, certain administrative teams). They require minimal periodic engagement.

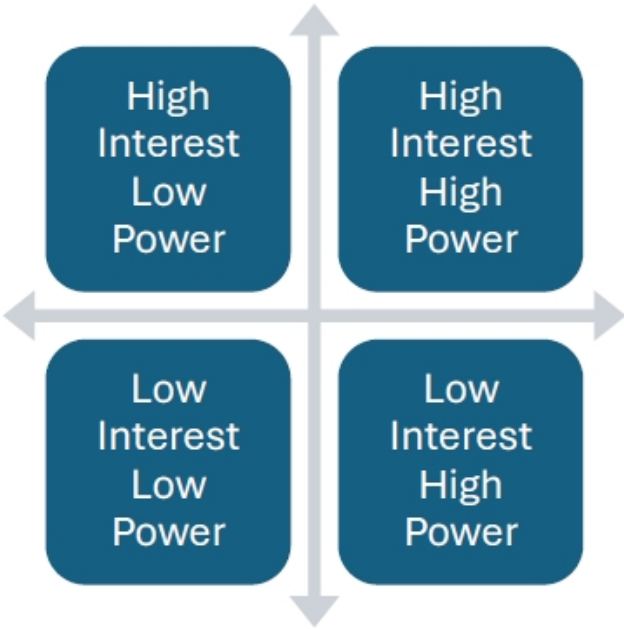


Figure 1. Interest Power Matrix.
Source: Adapted from matrix in Mendelow (1981).

By understanding stakeholders in this way, HIM leaders can prioritise their time and tailor their engagement strategies to each group's level of influence and interest.

Freeman's Stakeholder Theory – Balancing Diverse Needs

Edward Freeman's Stakeholder Theory (Freeman et al, 2010; Parmar et al, 2010) goes a step further by emphasising that every stakeholder group has a legitimate interest in how an organisation operates. Unlike traditional models that focus solely on shareholders or top decision-makers, this approach reminds HIM professionals that success is not just about meeting executives' needs—it is also about ensuring patients, staff, and external partners benefit from HIM practices.

In practice, this means:

- Listening to all perspectives – HIM decisions should consider feedback from clinical teams, users of EMR/EHR systems, IT, compliance, and patients when relevant.
- Balancing conflicting priorities – if executives prioritise cost-cutting while clinicians focus on workflow efficiency and patient care, HIM leaders must find solutions that address both concerns.
- Aligning HIM strategies with organisational goals – stakeholder theory reinforces that HIM's success is

linked to the broader success of the healthcare system—whether through better patient outcomes, financial sustainability, or regulatory compliance.

The Quadruple Aim Framework – The Bigger Picture

The Triple Aim Framework (Berwick et al., 2008) developed by the Institute for Healthcare Improvement, is a useful guide for ensuring HIM decisions contribute to healthcare's ultimate goals. It focuses on three interconnected priorities:

- Better patient care – ensuring data accuracy, security, and accessibility leads to better clinical decision-making and patient safety.
- Improved population health – effective HIM practices contribute to large-scale health insights, enabling better disease prevention and resource allocation.
- Cost efficiency – well-managed health information reduces administrative waste, prevents billing errors, and supports financial sustainability in healthcare organisations.

The Triple Aim Framework was expanded in 2014 to the Quadruple Aim (Lovén et al, 2024) by adding a fourth domain, professional wellbeing or satisfaction of health care workers. This expansion highlights that for quality care to be

provided to patients, care must also be provided to those who give it. Burnout in healthcare providers can lower patient satisfaction, increase healthcare costs and reduce overall health outcomes (Bodenheimer & Sinsky, 2014).

By framing HIM's role within the Quadruple Aim, leaders can clearly demonstrate how HIM initiatives go beyond data management and directly impact the quality, affordability, and effectiveness of healthcare.

Best Practices in Stakeholder Collaboration

Understanding stakeholder theory is one thing—applying it in real-world settings is another. Here are some tried-and-tested best practices that can help HIM leaders engage stakeholders more effectively:

1. Building Trust Through Transparency and Data Integrity

Trust is the foundation of effective collaboration. HIM leaders can strengthen relationships with stakeholders by:

- Ensuring data accuracy – clinicians and administrators rely on precise information for decision-making. Consistently high-quality data builds confidence in

HIM processes (Beesley et al, 2020; Sheikh et al, 2021).

- Communicating openly about risks and challenges – whether it is a cybersecurity concern or a new compliance requirement, keeping stakeholders informed (rather than reacting to problems after the fact) fosters trust (He et al, 2021; Petkovic et al, 2023). A good example here is the introduction of electronic medical records. It is important that realistic benefits are shared with stakeholders and functionality and benefits not oversold, leading to disappointment.
- Being a reliable source of truth – HIM professionals must be known for their integrity, presenting unbiased, evidence-based insights that support decision-making (Low et al, 2019; Serrano et al, 2020).

2. Using Evidence-Based Communication to Gain Buy-In

Getting stakeholders to support HIM initiatives often depends on how well the message is framed. Some effective communication strategies include:

- Tailoring the message to the audience – the Chief Financial Officer may want to hear about cost savings, while a clinician may care more about workflow improvements and functionality.
- Using data to tell a compelling story – instead of just

presenting raw statistics, translate data into real-world impact (for example, "Improving EHR usability led to a 20% reduction in physician documentation time, allowing more focus on patient care").
- Anticipating and addressing concerns – stakeholders may resist change. Acknowledge their concerns, provide evidence, and show how the proposed HIM initiative benefits them.

3. Implementing Participatory Decision-Making

One of the best ways to ensure stakeholder buy-in is to involve them early and often. HIM leaders can:

- Seek input during planning stages – rather than presenting a fully developed project for approval, engage stakeholders early to co-create solutions.
- Use stakeholder advisory groups – hold regular meetings with key stakeholders to ensure ongoing dialogue and support.
- Pilot new initiatives before full implementation – testing changes with a small group allows for adjustments before wider rollout, increasing the chances of success.

Bringing It All Together

Stakeholder engagement in HIM is not just about ticking a box, it is about building long-term partnerships that drive better healthcare outcomes. By using established models like Mendelow's (1981) matrix, stakeholder theory (Freeman et al, 2010), and the quadruple aim (Lovén et al, 2024), HIM leaders can strategically manage relationships, balance competing interests, and align HIM initiatives with broader healthcare goals.

Effective stakeholder engagement is not just about making HIM processes run smoothly, it is about ensuring that HIM actively contributes to a safer, more efficient, and more patient-centred healthcare system (Teixeira et al, 2021).

Activity

Watch this short video, that speaks to the different roles, health information managers can work in. Reflect on the different stakeholders, internal and/or external that these roles would interact with.



One or more interactive elements has been excluded from this version of the text. You can view them online here: https://oercollective.caul.edu.au/health-information-management/?p=78#oembed-1

Key Implications for Practice

Engaging stakeholders is not just a checkbox activity for HIM professionals—it is a critical strategy for ensuring HIM's value is recognised, supported, and integrated into broader healthcare decision-making. To achieve this, HIM leaders need to clearly define their value, establish their influence, advocate for change, and use the right tools to engage key stakeholders (Fenton et al, 2017).

Defining the HIM Value Proposition

One of the biggest challenges HIM professionals face is

making their contributions visible. While clinical teams are on the front lines delivering care, HIM professionals work behind the scenes ensuring data accuracy, security, compliance, and efficiency, all of which are essential for high-quality healthcare (Fenton et al, 2017). HIMs provide essential value through their expertise in managing health information systems, ensuring data quality, maintaining privacy and security, overseeing clinical documentation, and supporting healthcare delivery through analytics and reporting (HIMAA, 2025). Their role is crucial in maintaining regulatory compliance and facilitating evidence-based decision-making, ultimately contributing to quality healthcare delivery and improved patient outcomes. The key to effective engagement is being able to translate technical expertise into strategic contributions that resonate with decision-makers.

So, what is the HIM value proposition? At its core, HIM enhances patient care, compliance with Standards, Law and compliance, and financial sustainability by ensuring health data are accurate, accessible, and actionable (Teixeira et al, 2021). To make this tangible to stakeholders, HIM leaders should focus on three key messages:

1. Better decision-making through high-quality data – HIM professionals provide the foundation for clinical and operational insights by ensuring that health records are complete, accurate, and well-managed (Sheikh et al, 2021; Moy et al, 2021).

2. Cost savings and operational efficiencies – proper coding, documentation, and data governance reduce errors, prevent revenue losses, and streamline workflows (Fenton et al, 2017; Teixeira et al, 2021).
3. Risk mitigation and compliance – HIM ensures that health organisations meet regulatory requirements, protect patient privacy, and avoid costly penalties (Low et al, 2019; Serrano et al, 2020).

By consistently reinforcing these points, HIM leaders can shift the perception of their role from administrative support to strategic enablers of quality healthcare.

"Having a Seat at the Table" – Ensuring HIM Leadership Influence

For HIM professionals to drive change, they need more than technical expertise, they need visibility, credibility, and influence at the leadership level (Beesley et al., 2020). This means demonstrating HIM's impact on patient outcomes, financial health, and risk management in ways that resonate with senior decision-makers.

Communicating HIM's Impact on Patient Outcomes

Accurate health data directly supports clinical decision-making, reducing medical errors and improving care coordination (Sheikh et al, 2021; Moy et al, 2021). Efficient documentation practices enhance continuity of care by ensuring providers have access to complete and up-to-date patient histories (Beesley et al, 2020). Robust data governance ensures patient information remains secure, protecting against breaches and maintaining trust. When HIM leaders frame their contributions in terms of patient safety and quality of care, they create a compelling case for their role in healthcare leadership (Low et al., 2019). Read further about data and data governance in this Chapter Data The Heart of the Healthcare System.

Strengthening Relationships with Senior Leadership

To have a lasting impact, HIM professionals need to actively engage with healthcare clinicians, executives, board members, administrative staff, policy makers and senior administrators (Beesley et al., 2020). Some strategies to build these relationships include:

- Presenting data in decision-making discussions – providing executive teams with insights on risks, safety and quality, operational efficiencies, and financial issues ensures HIM expertise is factored into strategic planning (Sheikh et al, 2021).
- Engaging in hospital committees and advisory groups – having a presence in key meetings ensures HIM perspectives are included in policy development and organisational initiatives (Fenton et al, 2017).
- Proactively addressing challenges – instead of waiting for problems to arise, HIM leaders should anticipate issues, provide data-driven solutions, and position themselves as trusted advisors (Petkovic et al, 2023; He et al, 2021).

Advocacy and Influence Strategies

Beyond internal leadership, HIM professionals also have a role in shaping broader healthcare policies and standards. Advocacy is not just about promoting HIM—it is about ensuring the policies governing healthcare data support better patient care, efficiency, and innovation.

Building Coalitions with Clinical and Administrative Leaders

Advocacy efforts are more effective when HIM leaders collaborate with other influential stakeholders. Some ways to build strategic coalitions include:

- Partnering with directors of medical services, nursing leaders, government policy makers and IT directors to align HIM initiatives with broader organisational goals (Fenton et al, 2017; Freeman et al, 2010).
- Demonstrating how HIM-driven improvements (like better data interoperability or EHR usability enhancements) benefit clinical workflows and patient care (Sheikh et al, 2021; Moy et al, 2021).
- Engaging administrative leaders by linking HIM efficiencies to financial sustainability and regulatory compliance (Teixeira et al, 2021; Low et al, 2019).

Engaging in Policy Development

HIM professionals have a unique perspective on how healthcare regulations impact data management and patient care. To influence healthcare standards, HIM professionals should:

- Participate in professional associations that advocate for

HIM policies at national and international levels (Petkovic et al, 2023).

- Contribute to public consultations on data privacy laws, interoperability standards, and reimbursement policies (He et al, 2021).
- Work with legal and compliance teams to ensure health information and other relevant regulations are interpreted and applied in ways that support both compliance and efficiency (Kujala et al, 2022).

Showcasing Data-Driven Improvements

One of the most powerful ways to secure buy-in from stakeholders is by demonstrating measurable results. HIM leaders can:

- Present before-and-after data to demonstrate the impact of HIM initiatives (for example, "Implementing improved documentation standards reduced clinical incidents by 20%") (Moy et al, 2021; Amer et al, 2022).
- Use case studies and real-world examples to highlight successes in health data governance, patient outcomes, or cost savings (Teixeira et al, 2021; Beesley et al, 2020).
- Continuously measure and report on HIM performance metrics that align with organisational priorities (Kaplan, 1992; Amer et al, 2022).

Tools and Methods for Engagement

Even the best advocacy strategies require the right tools to be effective. HIM leaders should leverage a mix of communication techniques, technology solutions, and feedback mechanisms to engage stakeholders and drive impact.

1. Communication Strategies

- Storytelling with data – presenting health data in a way that tells a compelling story (for example, how improved documentation led to faster patient care).
- Executive summaries – providing leadership with concise, high-impact reports that clearly outline HIM contributions and recommendations.
- Stakeholder workshops – hosting interactive sessions to align HIM initiatives with stakeholder needs and gather valuable feedback.
- Delivering training and education – running or participating on training and education related to health information management, documentation, recording of diagnosis and procedures, use of electronic health record systems.

2. Leveraging Technology

- Dashboards and data visualisation – presenting key HIM and other metrics in clear, interactive formats that make insights accessible to non-technical stakeholders.
- AI-driven analytics – using predictive analytics and machine learning to demonstrate HIM's role in improving patient outcomes and operational efficiency.
- Enhancing EHR usability – working with IT teams to improve clinician workflows and reduce documentation burden, making HIM processes more integrated and user-friendly.

3. Feedback Mechanisms

- Surveys and stakeholder interviews – regularly collecting input from clinical and administrative teams to refine HIM strategies.
- Advisory committees – establishing dedicated groups that provide ongoing guidance on HIM initiatives.
- Stakeholder mapping exercises – regularly reassessing who holds influence and how engagement strategies should evolve.

Bringing It All Together

For HIM professionals, effective stakeholder engagement is

not just about being heard, it is about being a valued and trusted leader in healthcare decision-making. By clearly defining the HIM value proposition, building strategic relationships, using advocacy and influence techniques, and leveraging the right tools and engagement methods, HIM leaders can ensure their expertise drives meaningful improvements in patient care, compliance, and operational efficiency.

Having a seat at the table is not about waiting for an invitation—it is about demonstrating why HIM belongs at the heart of healthcare leadership (Beesley et al., 2020).

Case studies

Stakeholder engagement in HIM is not just a theoretical concept—it plays out in real-world challenges that HIM professionals face every day. The following two cases illustrate how strategic engagement can overcome resistance, drive change, and secure HIM's role in shaping healthcare policy.

Case 1: Implementing an EHR

Change – Engaging Internal Stakeholders

The Challenge: Resistance from Clinicians

A large teaching hospital was preparing to upgrade its EHR system to improve interoperability and streamline documentation. The HIM team identified a major challenge early on: many physicians and nurses resisted the transition, fearing it would disrupt workflows, increase administrative burden, and reduce time spent with patients. Several clinicians voiced concerns that the new system was being implemented without proper consultation and that it could introduce unintended inefficiencies.

Past IT implementations had reinforced this scepticism—previous system updates had caused disruptions, and some users still found workarounds rather than using official documentation processes. The HIM leadership knew that the project was at risk of failure without buy-in from clinicians.

The Solution: Early Involvement and

Continuous Training

Recognising that engagement had to start early, the HIM team shifted its approach. Instead of waiting until the system was ready to roll out, they:

- Formed a clinician advisory group early in the process, including doctors, nurses, and allied health professionals to co-design workflows that met both clinical and HIM needs.
- Held interactive workshops and usability testing sessions before the final system configuration, allowing clinicians to voice concerns and propose adjustments.
- Developed a “physician champion” program, enlisting well-respected senior doctors to act as peer mentors and advocates for the change.
- Created a phased training plan, combining hands-on practice, quick-reference guides, and live support teams available on the hospital floor during the transition period.

The Outcome: Increased Adoption and Improved Workflows

The early involvement strategy paid off. Clinicians felt a sense of ownership over the new system because they had been part of the decision-making process. The physician champions helped address scepticism among their peers, and the real-time support teams reduced frustration during go-live.

Within three months of implementation, the hospital saw:

- A 40% reduction in documentation errors compared to the previous system.
- A 20% decrease in time spent on EHR-related administrative tasks due to improved user experience.
- Stronger collaboration between HIM, IT, and clinical teams, leading to smoother updates in the future.

The key takeaway? Stakeholder engagement is not just about communication—it is about co-creation. When HIM leaders actively involve end users, they turn potential resistance into support and shared success.

Case 2: Advocacy for HIM in Policy Development

The Challenge: HIM Leaders Excluded from Policy Discussions

In a national healthcare reform effort , a government task force was developing new data governance regulations to improve privacy protections, interoperability, and patient data access. However, HIM professionals were not initially included in policy discussions—despite their expertise in medical records, compliance, and health data management.

Instead, the task force was primarily composed of policymakers, legal experts, and IT professionals, many of whom had limited knowledge of how data governance decisions would impact clinical workflows and patient care. The HIM community recognised a significant risk: policies might be created that, while well-intentioned, could be difficult to implement or even compromise data integrity and usability.

The Solution: Strategic Advocacy and Policy Engagement

To ensure their voice was heard, HIM leaders took a proactive advocacy approach, focusing on:

- Forming a coalition with professional HIM associations, patient advocacy groups, and healthcare organisations to demonstrate broad industry support for HIM involvement.
- Engaging with policymakers directly, requesting meetings with key decision-makers to explain how data governance affects frontline healthcare operations.
- Presenting case studies from international health systems, showing both the benefits and pitfalls of different policy approaches.
- Securing a role on advisory boards, ensuring that HIM professionals were formally included in the review and decision-making process.

The Outcome: HIM Representation in Health Policy Reforms

Through strategic, data-driven advocacy, HIM

professionals were successfully integrated into the policy development process. Their input helped shape regulations in ways that balanced privacy, accessibility, and usability, ensuring that new policies were both effective and practical for healthcare providers.

Key achievements included:

- Standardised HIM-led protocols for implementing privacy and interoperability laws.
- A national HIM advisory committee to provide ongoing guidance on data governance policies.
- Recognition of HIM professionals as essential stakeholders in future healthcare policy initiatives.

The lesson from this case? Advocacy is not just about making noise—it is about demonstrating expertise, building alliances, and showing decision-makers why HIM leadership is essential to shaping the future of healthcare.

Final Thoughts

Both cases highlight the power of proactive engagement. Whether it is leading change within an organisation or advocating at a national policy level, HIM professionals must be strategic, collaborative, and persistent in securing their place at the table.

By leveraging stakeholder engagement models, best practices in communication, and real-world evidence, HIM leaders can ensure that their expertise is recognised—and that their work continues to drive meaningful improvements in healthcare.

Self-Testing Quizzes and Activities

What is the most effective way to build trust with external stakeholders in HIM?

- Use transparent communication and demonstrate data

integrity
- Provide only the necessary information when asked
- Focus solely on regulatory compliance without stakeholder input
- Delay engagement until final decisions have been made
-
-
-
-
-

Which external stakeholder group is most concerned with ensuring compliance with data protection regulations?

- Hospital Executives
- Technology vendors
- Policymakers and regulatory bodies
- Patients
-
-
-
-
-

Question 3

- False
- True
-
-
-
-
-

Which of the following is NOT a recommended approach to engaging external stakeholders?

- Avoiding direct communication with insurers and policymakers
- Presenting evidence-based recommendations
- Participating in advisory committees
- Seeking input from patient advocacy groups
-
-
-
-
-

What is a key benefit of involving external stakeholders early in HIM initiatives?

- It helps ensure buy-in and reduces resistance to change
- It allows HIM professionals to avoid accountability
- It unnecessarily increases the complexity of HIM processes
- It slows down decision-making and causes delays
-
-
-
-
-



The interactive version of this H5P content is available at: https://oercollective.caul.edu.au/health-information-management/?p=78#h5p-21



An interactive H5P element has been excluded from this version of the text. You

can view it online here:
https://oercollective.caul.edu.au/health-information-management/?p=78#h5p-23

Drag each engagement tool to the corresponding HIM challenge it helps address
Physicians resist a new digital documentation system
Policymakers are unaware of the role of HIM in healthcare data governance
Patients are concerned about how their data is being used
Healthcare executives are hesitant to invest in HIM technology
Insurers need assurance that HIM processes improve claim accuracy
Participation in advisory boards
Case studies and compliance reporting
Physician champions and peer training
Data storytelling with real-world impact
Educational campaigns and transparency reports



The interactive version of this H5P content is

—— *available at: https://oercollective.caul.edu.au/health-information-management/?p=78#h5p-20*

Summary

Success in HIM is not just about maintaining accurate records—it is about having a recognised and valued role in shaping the future of healthcare. As a HIM leader, you will know you have truly made an impact when your expertise is not just acknowledged but actively sought out in decision-making processes.

HIM is Recognised as a Strategic Contributor in Healthcare Decision-Making

One of the clearest signs of success is when HIM is no longer seen as a back-office function, but as an essential part of strategic planning. If senior leadership includes HIM professionals in discussions about digital transformation, patient safety, and healthcare innovation, it is a strong

indication that the value of health information is fully understood at the executive level.

Stakeholders Proactively Seek HIM Input on Digital Health Strategies

You know you have built credibility when stakeholders—from clinicians to IT leaders—come to you first when making decisions about EHR optimisation, data analytics, privacy, and interoperability. Instead of HIM teams having to justify their role, they are seen as trusted advisors who help drive digital health initiatives forward.

There is Strong Interdepartmental Collaboration and Trust in HIM Processes

HIM's success is measured not just in policies and procedures, but in the relationships built across the organisation. When departments trust HIM processes and willingly engage in data-driven decision-making, it is a sign that collaboration is embedded into the culture.

HIM-Led Initiatives Lead to

Measurable Improvements in Compliance, Efficiency, and Patient Care

Ultimately, success is measured by impact. If HIM-led initiatives streamline workflows, improve safety and quality, reduce costs, and enhance patient care, then the profession has moved beyond being a support function to being a true driver of healthcare excellence.

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PART 3 DATA AND INFORMATION MANAGEMENT IN HEALTH

DATA - THE HEART OF THE HEALTHCARE SYSTEM

Rachel Fojtik

Learning Outcomes

- Describe and apply the healthcare data management lifecycle to ensure ethical, efficient, and compliant data handling.
- Evaluate the role of the 5 A's—Availability, Accessibility, Architecture, Ability, and Accuracy—in enhancing healthcare data usability and decision-making.
- Apply data governance principles to support high-quality, accountable, and sustainable data practices in healthcare.

Introduction

While health data have been managed and analysed in a handwritten format for centuries, the ability to analyse health data digitally is a much more recent development. Digital

systems now enable professionals to efficiently record, access, store, and analyse individual patient records. Prioritising analysis in the implementation of these systems will significantly enhance their effectiveness for improving patient outcomes. This chapter explores several factors influencing the use of data in patient care, framed as the 5 A's, which will serve as the backbone of our discussion on data usability from both data management and data literacy perspectives.

Understanding and managing the barriers to effective data use and the data management lifecycle—from creation to use and eventual destruction—is crucial for health information management professionals and health informaticians. Informed decision-making can significantly impact patient health outcomes throughout each phase of the data lifecycle. Although analysis of healthcare data has a long history, the digital analysis of health data is a relatively new advancement. As tools and processes for analysis have evolved, the sophistication and prevalence of digitally analysing health data have increased.

In this chapter you will learn:

- the fundamental concepts of data,
- the digital data management lifecycle,
- data governance principles,
- concepts of data analysis and turning data into usable information,
- data literacy, and

- visualisation.

This knowledge is essential for effective health information management in today's digital era.

What is Data and Data Analysis?

Data consists of individual attributes that, when unorganised, are simply random potentially unidentifiable numbers, words, or letters. The table below shows a taxonomy with analogies of what the terms data, information, knowledge and wisdom reflect. If we look at data the row in the table below, lists the attributes of a tomato without any context. In the second row of the table, these attributes are more clearly categorised, which makes it possible to identify a tomato. In the next rows building on from data and information and leveraging the quote from Matt Kington (2003) "Knowledge is knowing that a tomato is a fruit; wisdom is not putting it in a fruit salad". Similarly, data needs to be organised and understood to be useful. To take wisdom from knowledge it is necessary to add additional knowledge and expertise to it in the form of critical thought. (Zeleny 1987). This theory is known as Data, Information, Knowledge and Wisdom (DIKW) [opens in new tab] and is often portrayed in a pyramid.

Table 1. Analogy for Data, Information, Knowledge and Wisdom.
Source: Adapted from Table 1 in Zeleny (1987)

Taxonomy	Analogy	Processing & Storage Technology	Analytical Process
Data	Colour : Red, Shape: round, State: firm, contents:{juice, vitamin A, vitamin C}, Flavour : Sweet Plant : Vine	Tables, databases (random attributes)	Stored not analysed
Information	Tomato, grow on vines, high in vitamins A&C with a sweet taste	Information systems/ reports (organised data)	Search and compile
Knowledge	Fruit, healthy	Visualisation Systems Dashboards/ Annotated Charts, Storytelling	Analysis, Calculate and Compare
Wisdom	Do not put tomatoes in a fruit salad	Artificial intelligence, Large Language Models, Machine Learning	Judgement

Data analysis involves taking information from data and

organising it to gain insights. Everyday tasks, like crossing the street, involve data analysis. When crossing the street, we observe all objects around us, estimate distance and speed, and assess risk using our brain's algorithmic capabilities. Despite our brain's prowess, it has limits, making data processing tools essential to efficiently analyse vast amounts of data. The techniques used to analyse datasets and uncover patterns, trends, correlations, and other valuable insights are called data analytics. In more recent times, machine learning and artificial intelligence (AI) have greatly expanded opportunities for data analytics to improve patient outcomes (Reddy, 2023). Data analysis is the process of converting raw data into useful insights that can help generate wisdom (Zeleny, 1987), as examined later in this chapter.

The Importance of Data Analysis in Healthcare

In healthcare, practitioners evaluate a patient's condition by examining various attributes and integrate their knowledge with additional information to make informed assessments. The more data available, the more accurate the diagnosis and subsequent treatment. Knowledge requires data and its analysis. The greater the volume of relevant data, the higher the accuracy. Healthcare professionals often face time constraints and require efficient methods to quickly analyse

large data sets. Utilising data can significantly enhance the knowledge available to practitioners. Outcome data, for example a patient's return to mobility post hip replacement is essential for clinical practice and remains challenging to capture effectively. One significant obstacle is the lack of a consistent feedback loop into the healthcare system. A further barrier is resourcing to support advanced data analytics capabilities in our healthcare organisations. Data from personal wearable devices, while highly private, holds substantial potential for providing valuable insights. Envision the immense value of outcome data collected at scale, enhanced by diagnostic, acute care, and allied health data. The opportunity for improving patient outcomes becomes immense. The clinical uses for data are shown in Figure 1. Further uses and benefits are discussed throughout this chapter.

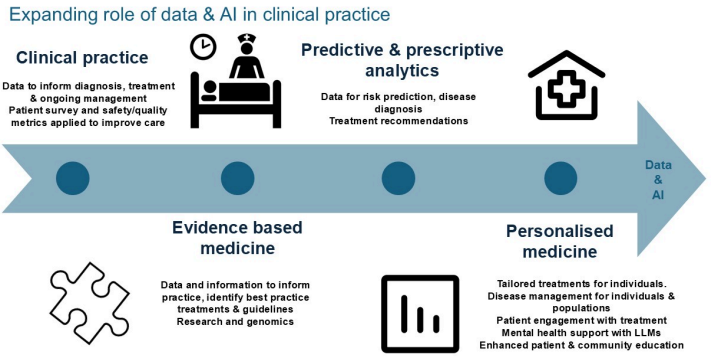


Figure 1. Expanding Role of Data and Artificial Intelligence in Clinical Practice. [Go to image description]

Historically, healthcare has generated vast amounts of data, primarily for record-keeping, patient care, and compliance with regulatory requirements (Raghupathi & Raghupathi, 2014). Currently, this data generation is further driven by wearable devices, genomics, and point-of-care diagnostics. When combined with AI, machine learning, and advanced models, these data sources present significant opportunities for enhancing healthcare (Alowais et al., 2023). Extensive data offers exciting opportunities for improving patient outcomes through enhanced care and medical research (Reddy, 2023). However, much of this vast data reservoir remains untapped. Five key factors impact whether data is used, which we will call the 5 A's, as shown below in Figure 2 below.

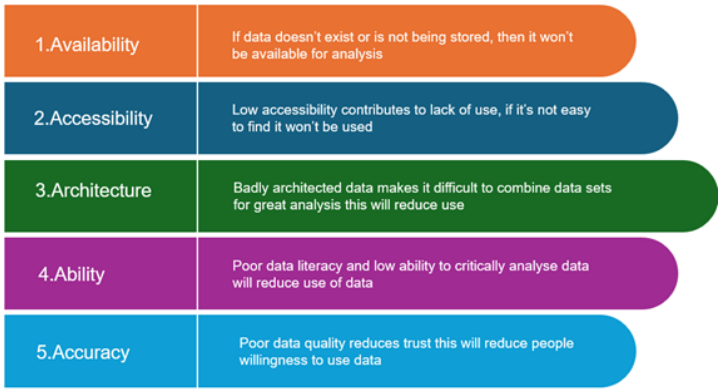


Figure 2. The 5 A's of Data Use. [Go to image description]

These five factors will be addressed throughout this chapter.

Many aspects of data management should be considered when gathering data for analysis, as shown in this Figure.



Figure 3. Data Management Aspects to Consider. [Go to image description]

Data Management is the practice that this is referring to and the next section will cover the data management lifecycle.

Data Management Lifecycle

The data management lifecycle refers to the process of the creation through to the destruction of data, and is relevant to large scale data implementations in organisations all the way through to small data implementations for research. There have been many well publicised cases of data breaches in the health industry where adequate protection around the

information asset has failed. To read further see chapters on Health Information Law, Privacy and Ethics and Cybersecurity in Health. Managing data is complicated and must be carefully considered throughout its entire life span. The figure below depicts the knowledge you require about the data you are using for decision making.

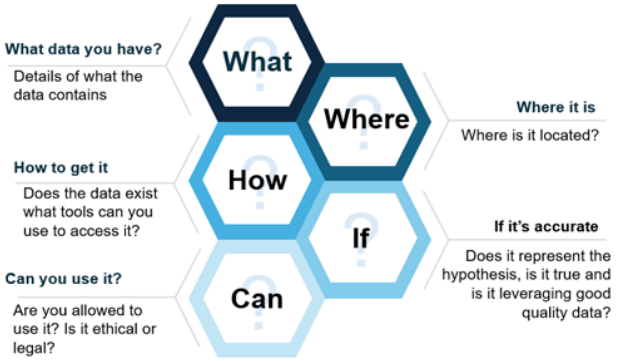


Figure 4. Data Management Requirements for Decision Making. [Go to image description]

As a valuable asset, data should be managed with care (Miller et al., 2018). Lifecycle models provide structured guidance on data management, with decision points facilitating preparation (Ball, 2012). Data storage and governance should be considered throughout the lifecycle; however, in many models, it is only a point in the lifecycle. The Research Data Management Lifecycle that suits research (Harvard, n.d.), and the Data Lifecycle Framework for data driven governments

model (Nayak and Puri, 2021) address broader needs when combined. The Figure below depicts a combined model adapted from these models to suit healthcare and research. The diagram shows the ways data is captured, cleansed and prepared, analysed, visualised and evaluated, shared and disseminated. Once data is no longer able to be used it is disposed of through archive and retention practices.



Figure 5. Data Management Lifecycle. [Go to image description]

This section discusses key areas relevant to the data management lifecycle from the Figure. At its centre are storage and data governance, which remain important throughout the data lifecycle. The arrows pointing outside the circle in the Figure above, indicate data leaving the control of its original environment. A common challenge when sharing data is

ensuring that once it is shared or disposed of, it enters another system or to individuals who will maintain similar levels of governance. Both the Data Lifecycle Framework and the Research Data Management Lifecycle approaches that this model was based on include planning as a stage, but here this is added as an input to the data management lifecycle, as the data do not yet exist. In the first stage, data are created, collected from another system, or edited in the existing system. They can then be stored or prepared for analysis, considering data integrity rules. Cleansed data go back to storage or to the analysis stage. Post-analysis, data return to storage or move to visualisation and evaluation. They can then be stored or shared, either fully analysed or as originally collected. Integrations typically receive data as collected or after minimal transformation. Once the data or analysis is no longer useful, it should be archived or disposed of.

Data Governance

Data governance is a practice that applies rules, standards, and guidelines specifically to ensure that data are well protected, accurate, and easily consumable for ethical decision making (Khatri & Brown, 2010). Data governance involves the allocation of decision rights and the accountability for decision-making concerning an organisation's data assets to

the areas of the business responsible for its entry and use (Khatri & Brown, 2010).

Unfortunately, this sounds easier than it is. Individuals that enter the data (clinicians, administrative staff and others) normally enter it throughout a process and are not normally the same people that use the data for decision making (potentially data owners). Individuals that store and manage the data (potentially data custodians or technical stewards) are often expected to be responsible for it, but do not create or use the data. This causes significant gaps in data quality, data security, and data availability, and this gap also results in a level of apathy in decision making on matters related to data governance that can only be resolved by clear roles and responsibilities with high levels of accountability and a very clear reason.

Gaining cooperation and support from data owners can be challenging due to time constraints and the additional costs required to ensure the correct procedures are followed. It is therefore essential to identify appropriate data owners and focus solely on important factors. Highlighting the significance of their responsibilities, the benefits for them, and incorporating data responsibilities into their job descriptions can contribute to effective data governance. Maintaining sustainable data governance requires integration with business processes and a focus on important factors.

Data governance involves determining the scope of what is being governed; who is responsible for the governance; the

rules, guidelines, and standards they must use; as well as where the rules may be relaxed. This often requires upskilling those responsible for creating data and also aligning data decision making with business process decision making.

In this context, data governance professionals are responsible for aligning owners, custodians, and stewards and ensuring that they are aware of and understand their responsibilities. This can be done by creating forums or councils for data owners, maintaining focus, holding them accountable, and providing visibility for what needs to be managed. A data governance manager must receive strong support from senior leadership, be persuasive, and excel at coordinating people.

To implement data governance many theories and frameworks can be leveraged. Two very well-known resources for such frameworks are the Data Governance Institute [opens in new tab] and DAMA International [opens in new tab].

Khatri and Brown (2010) proposed five data governance decision domains: data principles, data quality, metadata, data access, and data lifecycle.

Whilst many of the data governance frameworks being created for business today have commonly ten or so focus areas, Khatri and Brown's (2010) Decision Domains is a simpler model that comprehensively covers the subject areas of the more complex models. These are outlined in Figure 6.

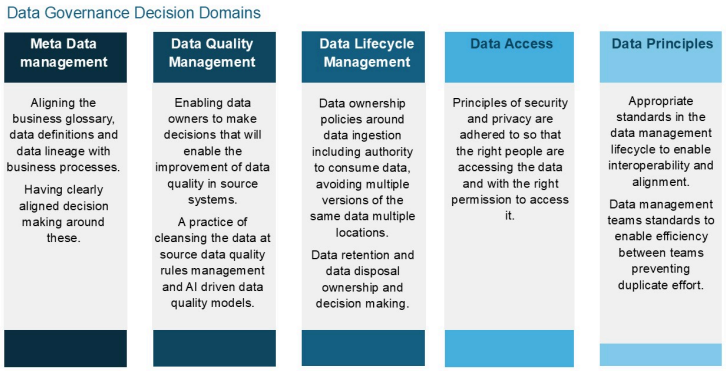


Figure 6. Data Governance Decision Domains. Source: Adapted from decision domain model by Khatri and Brown (2010). [Go to image description]

Data governance principles should assist healthcare organisations in the same jurisdictions to improve efficiency and reduce data analysis costs, as well as enhancing data quality and standardising data formats (Reddy et al., 2022). In addition to enabling analysis, they should also help to facilitate integration into software used across the same organisations (Reddy et al., 2022).

Data Storage and Retention

Effective data storage, capture, transformation, visualisation, and architecture requires reliable access to storage. Data storage options include hard drives (local to a PC, portable or

server-based), cloud storage (someone else's hard drive), USB sticks, CD/DVDs, mobile phones, among others. In health USB sticks and other portable media are not recommended due to potential for security breaches. Data types can be structured (e.g., data entered into structured forms) or unstructured (e.g., digitally scanned handwritten notes, voice recordings, videos, or photos). Structured and unstructured data may be stored in file storage (directory-based, accessed by paths), block storage (location-based, accessed by an ID), or object storage (typically for unstructured data, accessed via HTTP). The Table below outlines considerations around choosing appropriate storage types.

Usage Duration

How long you need the storage for will determine the level of effort and expense?

Access Requirements

How often does it need to be accessed and by how many people?

Sharing with multiple users may need more robust cloud level storage but shared storage locations may be sufficient if it only has one use.

Versatility

Diverse uses for the same data would require more robust data storage. For example, enterprise-wide data storage locations. Core data might be valuable for multiple data projects and should therefore be stored in a way that allows for diverse use.

Security Needs

The level of security required and the available budget for storage solutions must be considered. Unidentified aggregated information may need less robust storage solutions, but even short-term data needs with highly sensitive data, need robust storage security.



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Maintaining good data storage practices not only protects data

and reduces costs, but also enables researchers to justify and verify research outcomes, maximise future research potential, and minimise resource waste (NHMRC, 2019).

Standards

Adhering to established standards ensures that data are findable, accessible, interoperable, and reusable (NHMRC, 2019). Creating clear guidelines for naming and storage locations simplifies the process of locating the necessary data. Policies concerning ownership and control ensure that modifications and additions to, or removals from datasets are approved, facilitating the use of the data by others (NHMRC, 2019). Data integrity policies ensure that existing data are not altered and that any augmentations maintain the integrity of the original data.

Scalability

Healthcare data storage faces the challenge of rapidly increasing volumes from video, photography, and real-time monitoring (Villa, 2021). On-premise storage involves maintaining servers at healthcare facilities, and is generally not highly scalable due to the capital outlay required. However, if configured well, this can provide fast access to data. Edge data centres reduce latency by bringing data centres close to

the source (Zeydan et al., 2024), and tend to be more scalable as there is no capital outlay. However, edge data centres are more costly than cloud solutions. Scalable storage solutions include cloud storage or hybrid options; however, lower cost storage may incur higher costs for access. Balancing volume, accessibility and speed is crucial in storage architecture decisions. Tools such as Databricks, BigQuery, data warehouses, data lakes, and Elasticsearch manage and make medical data searchable via metadata or tags (Zeydan et al., 2024).

Australia's **data sovereignty** laws, while not as comprehensive as the EU's GDPR, require certain types of data to be stored within Australian borders and mandate specific protections for personal information under the Privacy Act 1988. The United States, has a more sectoral approach to data protection, Australia shares some similarities with Europe's data protection framework, though it generally maintains less stringent requirements and enforcement mechanisms.

Timeliness

Timeliness refers to how quickly data can be accessed after it is entered. Timely does not necessarily mean immediate, timing is relevant to its intended purpose (Australian Institute of Health and Welfare, 2018). When gathering large amounts of real-time data, it is essential to consider optimising storage. In some cases, keeping (for example) the most recent hour of data and then aggregating data every other hour may be more efficient. Only data essential for clinical care, subject to retention laws, computation, viewing or for analysis and reporting should be retained. When dealing with real-time data the speed of read and write operations is critical and consideration should be given to the computation power available for both data access and computation. The system must be well-planned with the right processing capacity and storage accessibility (Zeydan et al., 2024). Optimised data storage options such as **AVRO, Parquet, and Pbuffer** can increase performance when writing to or retrieving large volumes of near real-time data from storage for analysis (Zeydan et al., 2024).

Archival and Retention Requirements

Data retention is essential for lifecycle management, ensuring

organisations maintain necessary information, comply with legal requirements, and optimise storage through clear policies, structured schedules, and regular audits (Ige et al., 2024). Retention decisions involve determining whether to keep, archive, or destroy data, and how long it should be retained.

Establishing comprehensive retention policies provides a structured framework for consistent and legal data management, preventing unnecessary storage costs and legal non-compliance (Ige et al., 2024). These policies must consider legal and regulatory requirements, such as Australian privacy laws and guidelines from governing bodies like PHNs, Medicare, Private Health Insurers, and AHPRA.

Business needs also play a role in data retention. Some data may be valuable for strategic planning or improving medical outcomes, such as retaining 20 years of data for researching health outcomes of babies born with cerebral palsy. It is important to determine the appropriate level of detail for retained data.

Organisations implement retention schedules by classifying data, setting retention periods based on legal and business needs, and using technical controls to automate data deletion or archiving. Regular audits and reviews ensure compliance and adaptation to evolving regulations and business requirements, supported by data management tools that streamline the process and maintain policy adherence (Ige et al., 2024).

Collect, Capture and Create

"Collect, capture and create" refers to the process of entering data into systems of medical records, or temporary systems (e.g., surveys entered into an Excel spreadsheet) and collecting data from them. There has been an "explosion" in the volumes of health data generated and stored. Data sources include electronic health and medical records, medical imaging, genomics, sensors, and mobile-based health apps (Reddy, 2023). This growth continues exponentially through advancements in technology supporting healthcare. Read further about data sources in these chapters Electronic Medical and Health Records and Beyond the Health Record: Alternative Sources of Healthcare Data

Availability

If healthcare data are not available in a timely manner, it can be the difference between life and death for a patient. Data should exist, be stored in an accessible manner, and able to be restored if lost or damaged. The figure below lists key considerations for making data available.

Digital

Data should exist in digital form and systems should be designed to collect the data.

Stored

Data should be stored in appropriate locations like databases, data lakes, or warehouses with standards that ensure the contents are easy to search.

Connected

Databases should be easily accessible through reliable online connections with appropriate pathways to access.

Recoverable

Data should be recoverable (e.g., hard disk damage, data center fire, network failures) is crucial (Sun et al., 2014)



The interactive version of this H5P content is available at:
https://oercollective.caul.edu.au/health-information-management/?p=80#h5p-28

There are constraints to available data in healthcare and include cost, privacy, fragmented patient care, and human resources (Chen et al., 2020). Down-time procedures, redundancy, and backup systems are therefore essential to protect against system failures and ensure data availability. The Box below constraints to available data in healthcare.

Cost

Cloud storage and on-premise storage both come with considerable costs.

- Cloud storage costs increase with each retrieval, and multiple retrievals of each record during the process of analysis or tool interactions further elevate the costs.
- Factors impacting the cost of storage

include the volume of retrievals and vendor pricing (Chen et al., 2020).

Fragmented Patient Care

Fragmented care applies in multiple situations, including:

- Patients seeing healthcare professionals from different organisations and jurisdictions.
- Hybrid platforms (a mixture of paper and digital systems) to record patient data during their inpatient stay, including transitions across sites (e.g., from one hospital department to another or from a hospital to a rehabilitation centre) (Chen et al., 2020; Pastorino et al., 2019).
- Lack of integration of software used by departments within the same organisation, leading to fragmented data entry, miscommunication, and fragmented care (Chen et al., 2020b; Tan et al., 2015).

Human Resources

- Finding suitably trained and affordable

data engineers, analysts, and data scientists to manage all aspects of data can be challenging for any healthcare establishment, particularly for smaller and rural health organisations (Schaeffer et al., 2017). This can hinder the successful implementation of data analytics if not accounted for in workforce planning (Schaeffer et al., 2017; Chen et al., 2020).

Accessibility

For data to be accessible; systems need to be available, data needs to be managed in a way that it is readable (data management), users need to be granted access but to protect the data it needs to be controlled (access control and security) and the system needs to be useable (user experience).

Data Management

Data management is discussed in other sections of the chapter; however, in the accessibility context, it relates to easy identification of data elements. Well defined terms, good reference tables, metadata management standards, and data

architecture are critical aspects of data management that help to ensure that data are accessible by others.

Data Privacy

Privacy refers to individuals or groups' ability to seclude themselves or information about themselves and reveal them selectively (Sun et al, 2014). Privacy is a fundamental human right (OAIC, n.d). Personal health information is considered even more sensitive than most personally identifiable information, as it comes with significant risk to individuals if exposed has more stringent protection requirements. (Owens et al., 2023). Therefore, access to data must comply with standards, principles, and regulations around data privacy. Core considerations in privacy decisions relate to the purpose for data use, whether permission has been obtained, whether use is ethical, and whether the use aligns with the reasons given to patients, research participants, staff and so forth. Copyright and intellectual property questions must also be addressed to ensure the right to store and use the data and compliance with policies for its correct use (NHMRC, 2019). These topics are covered in more detail in the chapters on Cybersecurity and Health Information Law, Privacy and Ethics.

Cyber Security

Cybersecurity is the process of detecting and protecting against data breaches. Due to the sensitivity of personal health data and the increasing sophistication of hackers, healthcare organisations must prevent data breaches by using up-to-date antivirus tools, multifactor authentication, and encryption (Chen et al., 2020; Reddy et al., 2022). The types of attacks that require defence include service abuse, where hackers acquire extra data, destroy data, or overload systems; and denial of service attacks, which hijack networks and disrupt access (Sun et al., 2014). Security is discussed in more detail in this chapter on Cybersecurity.

Identity and Access Management (IAM)

Strong IAM is crucial to preventing fraudulent activity. This is just as important for small research projects as large enterprises, who hold personal, financial and other information about its patients or customers.

Identifiable

They are who they say they are.

Authorised

Permitted to access the system by setting user permissions.

Ethical/Legal

Accessing for a legal and ethical pre-agreed purpose.

Auditable

Their activities are auditable.



The interactive version of this H5P content is available at: https://oercollective.caul.edu.au/health-information-management/?p=80#h5p-29

Password management creates challenges for organisations, as users find regular changes difficult. Attempts to use other means to ensure they can remember their passwords can create more risk than not having regular password changes would

create (Glöckler et al, 2023). Multi-factor authentication enables organisations to reduce reliance on passwords alone and enables the ability to use facial, fingerprint, or voice identification from mobile devices.

Fraud management requires separation of duties, which is often used to ensure that only some of the steps of a critical operation are performed by one person. (Glöckler et al, 2023). Auditing is another aspect of identity and access management designed around fraud identification. Certain levels of auditing in systems are required by law and some by necessity. Data privacy breaches often require the need to trace back through audit logs to identify who did what and how. More proactive approaches to auditing may also include exceptions monitoring through AI to identify breaches that may not be distinguishable or go unreported.

Sharing across jurisdictions

Sharing healthcare data across jurisdictions is challenging due to privacy regulations and the difficulty of identifying individuals across different jurisdictions. Despite the benefits of data sharing for healthcare outcomes, particularly for rare diseases, stringent regulations often protect such data. The Australian Government has introduced measures to facilitate data sharing across organisations, including the *Data Availability and Transparency Act 2022,* which establishes a

best practice scheme for sharing Australian Government data to increase availability (Office of the National Data Commissioner, 2023). This Act should be considered when sharing public health data between networks.

Architecture

Data architecture describes how a system should be set up to enable quick access to insights from data. There are centralised and decentralised architectures and the choices made around this influence data literacy and data governance. Decentralised architecture enable data literacy, but are harder to govern. Centralised architecture is easier to govern, but reduces flexibility and freedom of accessing the data.

Principles of data architecture relate to interoperability, infrastructure, and enablement of data quality, and these can be researched further at DAMA [opens in new tab] using the Data Management Body of Knowledge. Architecture around the storage and flow of data was discussed in the data storage section. Infrastructures for data for accessibility can include Data-Warehouse, Data-Lake, Data-Vault, Lambda, Kappa, IOT-a, Microservices, and Zeta among others (Behera & Kalipe, 2023). Further reading on these systems is available in this paper by Behera and Kalipe (2023) [opens in new tab].

Data Management

In the architecture context, data management refers to the standards and engineering of the data, the lineage approach, and the way that the data are engineered for reporting, the way that the data assets are classified and documented, and decisions regarding approaches to connectivity. It also covers aspects of data quality management.

Interoperability

In this context, interoperability is the ability for systems to share information. There are three types of interoperability: technical interoperability, information interoperability, and operational or business interoperability (Owens et al., 2023), as defined in the Box below.

Foundational and Structural or Technical Interoperability is enabled through the use of agreed data exchange specifications to ensure consistency in data structure and format, simplifying system interactions and integrations. (AIHW 2018)

Information or Semantic Interoperability is defined as the capability of two or more systems to communicate and exchange information, for each system to interpret the meaning of received information, and to use it seamlessly with other data held by that system. (AIHW 2018)

Organisational or Business Interoperability is how business processes are shared impacts greatly the ability for data to be shared. Interoperable processes makes it possible for the systems to interact or teams to share data. Different processes with seemingly the same data may in fact require translation to be interoperable (Owen et al., 2023).

All of the types of interoperability in the Box above are important to healthcare. Technical interoperability, however, is critical to enable the sharing of information in such a way that systems across jurisdictions can understand it (Owens et al., 2023). Formats such as HL7 and SNOMED are important to this. Interoperability is discussed further in chapters on Electronic Medical and Health Records and Navigating the Future: The Impact of Health Informatics and Digital Technologies on Healthcare.

Accuracy

Maintaining data quality is crucial for any information system, as ensuring protection against unauthorised deletion, modification, or fabrication ensures the accuracy of the data. (Sun et al, 2014). The complexity in healthcare arises due to clinician workloads, poor user experience design in healthcare applications, volume of processes, and the individuals involved in data entry (Owen et al.,2023). Data quality management areas are listed in the Figure below and discussed in the following sections.



Figure 7. Five Areas of Data Quality.

Accuracy and Completeness

Accuracy refers to the correctness of information, while **completeness** ensures that all necessary information is included. Data gaps can arise for various reasons, including missing data and missing knowledge (Australian Institute of Health and Welfare, 2018). Several stages in the data management lifecycle can affect accuracy and completeness, as shown in the Table below.

Table 2. Accuracy and Completeness in some areas of the Data Management Lifecycle.

Collection	• Healthcare data is gathered from various sources and may be entered by staff without expertise in medical terminology (Chen et al., 2020b). • For instance, a patient diagnosed with delirium might inaccurately be recorded as "confused".
Storage	• Controls must prevent unauthorised edits by users with access to storage locations. • Changes to data should be made in the system of record through front-end user interfaces to maintain an accurate record. • Storing only latest data resulting in the loss of important historical context.

Integration	• Combining data with other sources or reference tables can impact accuracy due to varying interpretations or missing data. • Data mapping is crucial, as discrepancies in ICD10 codes between countries can pose risks in clinical decisions about patient care.
Analysis	• Analysts without clinical or medical training may misinterpret data, leading to inaccurate analysis outputs and conclusions. • Additionally, data that is not adequately integrated with other data sources may result in inflated or incorrect calculations.
Visualisation	• Errors in calculations can affect the accuracy of data visualisations. • Critical thinking is essential to determine if the data appears reasonable. • For example, an analysis showing 10,000 patients in an Emergency Department in one day is likely to be inaccurate.

Archival	• If key reference data is not stored with historical data, it's meaning may change over time. • For example, changes in healthcare financial data categories or changes to clinical coding systems can affect the consistency of resurrected data, leading to different interpretations than originally intended.

Reliability, Relevance, and Timeliness

It is important to recognise that trust plays a significant role in ensuring people use data to help inform decisions. Poor quality data will certainly erode trust. Identifying where in the lifecycle the issues arise and addressing them will enhance trust in the data. It is also important that the data are consistently available, current, complete, and suitable for the particular analysis. Matters of timeliness may include how frequently the data is updated (i.e., when analysing the current challenges for an emergency department, previous week's data may not be relevant, or timely).

Data remediation to achieve good quality data brings its challenges availability of clinicians to correct data entry issues

is a key one. Data fixes of clinical data are not easily passed to an administrator who has no knowledge of the clinical context. It often requires the knowledge of the specific clinician that entered that data. There are several places that data can be remediated and these are listed with a description in the Table below. Identifying data quality issues ordinarily requires a set of rules that are run over the data and a report generated from this (or through patient complaint). The advancement of AI may mean better data quality reporting can be achieved through more AI driven exceptions management that provides a list of anomalies.

Table 3. Options for remediating or avoiding data quality issues.

Option	Description
Cleanse at source	This involves ensuring that any data that needs correcting is corrected in the user interface of the applicable system. It is the best approach for ensuring the data is trustworthy as the reporting and operating systems will show the same information. It is also the most difficult to achieve.
Cleanse in data storage	Using rules to edit the data in the database to ensure accuracy. This can be ideal for reference data that is not in the main source system, but changing other data in this way will mean that data is not the same in the user interface as it is in the reporting interfaces. This is a risk although as it can be automated the process is more repeatable.
Cleanse in data extract	This involves cleansing the data once it is extracted. It is the easiest to achieve but it is often not a repeatable process, and the data once used in reporting systems is different from both the data in the operating system and the storage system. It is the least desirable approach to data cleansing and carries risk of low trust in its outputs.

Implications of bad quality data can have system-wide impacts;

for example, incorrect or incomplete maternity data being submitted to the National Perinatal Data Collection could result in incomplete or incorrect research outcomes.

Activity

Want to know more? Read the chapters from this text on Data Analytics for Public Policy and Management

- Data management
- Presenting data with charts
- Cloud computing

Ability

There are several areas to consider regarding ability or capability, such as technical skills, data analysis, critical thinking skills, communication, and collaboration.

Technical Skills

Technical skills include proficiency in using data analysis tools and software, knowledge of statistical methods and principles, data management skills, and data governance skills, including privacy and ethics principles.

These skills often require many years of practical experience, and it will be challenging to find one person with all of these skills. Creating systems for collaboration that will connect people with more advanced technical skills to those that have the more advanced domain knowledge will enable greater ability to gain insights.

Analytical and Critical Thinking, Communication, and Collaboration

Analytical and critical thinking skills include data literacy, critical thinking, problem solving skills, and, most important, depth of understanding of the subject at hand (domain knowledge), the Oxford English Dictionary (n.d.) describes critical thinking as "The objective, systematic, and rational analysis and evaluation of factual evidence in order to form a judgement on a subject, issue, etc." . Problem solving is the ability to find a solution to a problem, which would no doubt involve critical thinking. Domain knowledge is the

understanding of the field in which you are researching, studying, or working. Communication and collaboration involve sharing knowledge and working together, acknowledging that others can contribute valuable insights to the analysis. Effective communication involves using the results of your analysis to shape other people's thoughts and beliefs. As data literacy encompasses these skills, further explanation of this is provided below.

Data Literacy

According to Hassan (2014) "Data literacy is the ability to ask and answer real-world questions from large and small data sets through an inquiry process, with consideration of ethical use of data. It is based on core practical and creative skills, with the ability to extend knowledge of specialist data handling skills according to goals. These include the abilities to select, clean, analyse, visualise, critique and interpret data, as well as to communicate stories from data and to use data as part of a design process".

Several best practices for teaching data literacy have been identified, including workshops and labs that provide practical experience and allow students to refine their skills through trial and error. Module-based learning allows students to build on previously learned skills in a systematic way, fostering confidence and deeper understanding (Wuetherick et al., 2016). Lastly, using real-world data in project-based learning

helps develop technical and critical thinking skills (Wuetherick et al., 2016). Core subject areas are depicted in the Table below.

Table 4. Core subject areas for working in data analytics.

Skills	Description
Research	Developing and proving a hypothesis are essential skills for analysis.
Data Privacy and Ethics	It is essential that all people that leverage healthcare data for analysis should understand the sensitivity of the data they use, the ethics around using and the laws that govern it's use
Data Management	All people that analyse data need to practice data management so leveraging the standards and practices that exist mean that the data and analysis is re-usable
Data Analysis	Understanding the process of data analysis is a time saver for any data analyst and creates repeatability
Data Visualisation and Storytelling	The ability to identify the problem, articulate the solution and move hearts and minds to achieve an outcome all by leveraging data as evidence is a great skill to attain.

Effective instruction in data literacy requires partnerships between educators, organisations willing to share data, and access to data processing technologies (Wuetherick et al.,

2016). An ideal curriculum includes progressively challenging modules with hands-on learning and real data to foster critical thinking skills (Wuetherick et al., 2016).

The NHMRC (2019) code outlines responsibilities for research grants through NHMRC Section R4, which expects organisations to provide ongoing training and education that promotes and supports responsible research conduct for all researchers and those in other relevant roles. A data literate workforce requires that when clinicians and other healthcare stakeholders use graphical visualisations (pie charts, bar charts, line charts etc), they will be able to use critical thinking to evaluate whether the information presented is adequate and reliable, or whether more data is required to make more informed decisions. Without data literacy, they may accept biased interpretations as facts, leading to inaccurate knowledge, or worse, poor decisions (Hassan 2014).

Analysis

Data analytics involves using various techniques to analyse datasets and discover patterns, trends, correlations, and other valuable insights that can inform healthcare decision-making at both the patient and population levels. The advent of machine learning and AI has significantly enhanced the capacity to interpret complex health data (Reddy, 2023).

Analysis typically begins with a real-world hypothesis or a

business/medical issue that needs to be addressed. Relevant data elements are then collected to support or refute the hypothesis. This process involves understanding the problem, gathering and examining data from different perspectives to avoid bias, applying critical thinking to evaluate the information, and then presenting the findings.

Cross-Industry Standard Process for Data Mining (CRISP-DM)

There are established methodologies for data mining, including CRISP-DM. Developed in the late 1990s, CRISP-DM has become widely used across various industries, including healthcare (Martinez-Plumed et al., 2021). However, the term "data mining" has become outdated and "data science" is now the preferred term (Martinez-Plumed et al., 2021). Through her extensive cross-industry experience in data and analytics, the author of this chapter finds this process particularly useful. There are six phases of data mining (Wirth and Hipp, 1999), as shown in Figure 8 below.

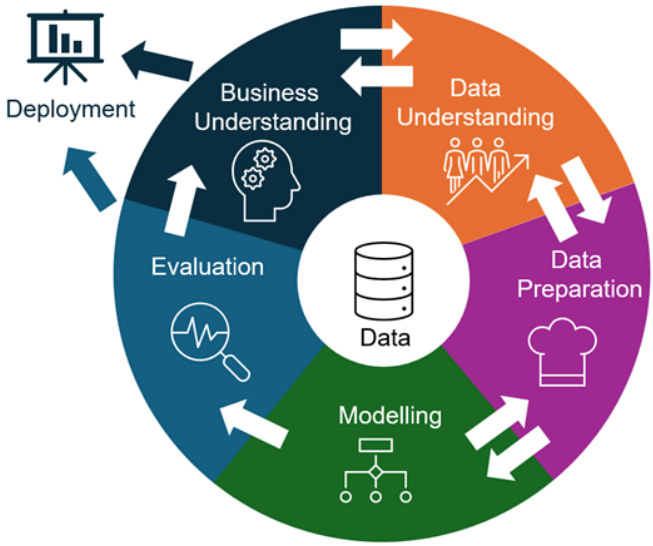


Figure 8. Phases of Data Mining – the Cross-Industry Standard Process for Data Mining (CRISP-DM).
Source: Adapted from Figure 2 in Wirth and Hipp (1999).

Value to Healthcare

The integration of data analytics into health informatics is transforming healthcare. It allows healthcare providers to deliver improved patient care, boosts operational efficiency, accelerates medical research, and enhances public health monitoring (Reddy, 2023). Utilising data analytics in healthcare enables the full use of data from various sources. Using a data science approach for data analysis helps identify trends and develop more accurate diagnoses and treatments

at higher quality and lower cost, leading to better patient outcomes (Raghupathi & Raghupathi, 2014). Predictive modelling helps identify preventive treatments, avoid medication misuse, find efficiencies, generate new revenue, and detect fraud (Raghupathi & Raghupathi, 2014).

Visualisation

Traditional data visualisation commonly includes standardised charts (such as bar, line, and pie charts) on dashboards. This approach is primarily analysis-oriented and it can be difficult to quickly grasp the intent of the display, limiting its communicative value (Zhang et al., 2022). In contrast, visual data storytelling employs a narrative-oriented process that emphasises clear, audience-specific communication with a goal of rapid understanding (Zhang et al., 2022).

Modern communication is highly visual, requiring an understanding of the audience to effectively convey messages (Zhang et al., 2022). Visual data storytelling presents information in graphic forms that the audience can easily understand (Zhang et al., 2022). This method may differ from traditional graphing rules, focusing on titles that convey clear messages and imagery that highlights key points and provides context. Simplicity is crucial for rapid understanding.

The first step in visual data storytelling involves identifying the message you want to convey, which is often quite complex. Often what needs to be conveyed relates to a problem that

requires solving and it is essential that the extent of the problem is fully understood. Problem definition frameworks can provide significant value. Conveying the solution also takes work. Both working out the problem and the solution is often best with teamwork and collaboration. Conveying a clear message requires data and critical thinking, often drawn from insights from others. (Zhang et al., 2022). Creating visualisations that effectively convey this message requires an understanding of the audience, how they think, and what drives them. The author then uses their data knowledge to craft key information into a compelling narrative (Zhang et al., 2022).

Courses on data visualisation and storytelling provide tools for understanding the audience, business drivers, problem definition, and using data to address business needs. They demonstrate how to effectively identify and communicate key points to the intended audience.

Data Visualisation: From Understanding to Deployment

The process of data visualisation follows a structured yet iterative path through five key phases. Each phase builds upon the previous one, though there is often movement back and forth as new insights emerge.

The process begins with two interconnected phases of understanding. The first focuses on business requirements and

problem definition, while the second examines available data sources. These phases work in tandem, with discoveries in one area often informing and reshaping understanding in the other. This dynamic interplay helps ensure that the final visualisation will effectively address the business need.

Data preparation follows as the third phase. This critical stage involves organising and cleansing the data, potentially merging multiple datasets, and formatting everything appropriately for analysis. Without thorough preparation, subsequent analysis may prove unreliable or misleading.

The modelling phase employs various analytical techniques, ranging from descriptive analytics that illuminate past events to predictive analytics that forecast future trends. Analysts might utilise familiar tools such as Excel and Power BI, or more specialised options like Python and R, depending on the complexity required. In healthcare settings, for instance, these tools might analyse clinician performance or predict hospital readmission rates.

During the evaluation phase, analysts apply critical thinking to assess their findings. This involves consulting with colleagues, reviewing previous research, and carefully considering any limitations or assumptions in their work. This reflective stage ensures the robustness of the analysis and identifies any additional factors that should be considered.

The final deployment phase transforms insights into compelling visualisations that tell a clear story. Whether feeding into other models or presenting to stakeholders, the

key objective is to make the information accessible and actionable.

Throughout this process, effective data visualisation serves as a crucial tool for understanding, analysing, and communicating findings at each stage. The success of the final visualisation often depends on how well each phase has been executed and how effectively the iterations between phases have been managed.

Activity

Visit the Information is Beautiful blog [opens in new tab] and note 3 helpful ways that data can be visualised.

The phases that are required for visualising data starting with understanding the problem or challenge at hand. The text boxes below show these phases.

Phase 1 Business Understanding and Data Understanding

During these phases, the focus is on the problem and requirements from a business perspective (Wirth et al., 1999). The business problem is clarified, and a hypothesis is formulated. Data that could support or refute the hypothesis is sought. This process involves a back-and-forth exchange between understanding the data and comprehending the business problem, which continues until all data requirements are identified. These steps are revisited as the understanding of the data and outcomes evolves.

Phase 2 Data Preparation

The data preparation phase is designed to ready the data for input into modelling tools (Wirth et al., 1999). This phase involves activities such as

data cleansing, data augmentation (combining with other datasets and reference data), and formatting the data for modelling tools (Wirth et al., 1999).

Phase 3 Modelling

During this phase, various modelling techniques are selected and tested to find the most accurate models. Often, multiple models are applied to address the same problem (Wirth et al., 1999). As results emerge, there's a continual exchange with other phases to refine outcomes and generate new hypotheses.

Common modelling types include descriptive analytics ("what happened"), diagnostic analytics ("why something happened"), predictive analytics ("what could happen"), and prescriptive analytics ("what should happen"). Other techniques include regression, cohort, cluster, time-series, and text analysis. Effective application of these techniques is crucial for successful analysis (Houser et al., 2023). Analysts use tools like Microsoft Excel, Power BI, Flourish,

Qlik, SAS, or Jupyter Notebook, along with languages such as SQL, R, Python, or DAX, for advanced queries and calculations (Houser et al., 2023). For health informatics (HI) professionals, these techniques and technologies have numerous applications in healthcare data. Descriptive analytics is often used for reporting, Qlik for physician performance analysis, and Power BI for predictive analytics, population health management, and hospital readmission analysis and prevention (Houser et al., 2023).

Phase 4 Evaluation

At this stage you leverage the outputs from the modelling phase and using critical thinking make your judgements as to its accuracy and application. You may likely consult with others and with previous research. Additionally reviewing previous steps to ensure you have thought of everything, understanding limitations and assumptions. A key objective in this stage is also to identify if there are other considerations that should be included (Wirth et al., 1999).

Phase 5 Deployment

Once knowledge has been gained it needs to be organised and presented in a way that it is useful, either for feeding back into other models, or for presenting to tell a story.

Key Implications for Practice

The effective management of health data relies on the '5 A's' framework: Availability, Accessibility, Accuracy, Analysis and Ability. For health information practice to succeed, data must not only exist and be stored accessibly, but systems must ensure its availability through robust backup procedures and redundancy measures. Additionally, proper access controls and security protocols must protect sensitive health information while still enabling authorised users to retrieve it efficiently.

Data quality is paramount to use of data in health care. Data quality requires rigorous attention to accuracy, completeness, reliability and timeliness throughout the data lifecycle. Health information practitioners must implement

strong data governance frameworks that clearly define roles, responsibilities and standards for data management. This includes establishing clear processes for data collection, storage, analysis and disposal, while ensuring compliance with privacy regulations and maintaining data integrity across jurisdictions.

The human element is always crucial – successful health information practice around data and data use requires both technical competency and data literacy among practitioners. This encompasses analytical and critical thinking skills, domain knowledge of healthcare, and the ability to effectively visualise and communicate insights from data. As healthcare generates increasingly vast amounts of data through electronic health records, imaging, genomics and wearable devices, practitioners must be able to leverage modern analytical tools and techniques while maintaining ethical standards and patient privacy. Ongoing training and education in data literacy should be prioritised to build these essential capabilities across the healthcare workforce.

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Image descriptions

Figure 1: An infographic titled "Expanding role of data and AI in clinical practice." It features a horizontal blue arrow, labeled "Data and AI," pointing to the right.

Four key sections border the arrow:

1. Clinical practice: Data to inform diagnosis, treatment and ongoing management; Patient survey and safety/ quality metrics applied to improve care.
2. Predictive and prescriptive analytics: Data for risk prediction, disease diagnosis; Treatment recommendations.
3. Evidence based medicine: Data and information to inform practice, identify best practice treatments and guidelines; Research and genomics.
4. Personalised medicine: Tailored treatments for individuals; Disease management for individuals and populations; Patient engagement with treatment; Mental health support with Large Language Models; Enhanced patient and community education.

[Return to Figure 1]

Figure 2: The image is a horizontal infographic composed of five stacked, colourful bars, each representing a factor affecting data utilisation in healthcare. Each bar features a heading and a brief explanation.

1. The topmost bar is labeled “Availability,” and states that if data doesn’t exist or isn’t stored, it won’t be available for analysis.
2. The second bar is “Accessibility,” noting that low accessibility leads to its lack of use.
3. The third bar, titled “Architecture,” explains that poorly

structured data hinders the combination of data sets for analysis.

4. The fourth bar is labeled "Ability," indicating that poor data literacy and analytical skills reduce the use of data.
5. The final bar is "Accuracy," emphasising that poor data quality reduces trust and the willingness to use data.

[Return to Figure 2]

Figure 3: The image is a circular diagram divided into four equal sections, each representing different aspects of data management.

Starting from the top left and moving clockwise, the sections are labeled as follows:

1. Dark blue section labeled "Efficiency" lists key points: "Reuse data," "Repeatable processes," and "Easy to use tools."
2. Navy section labeled "Safety" highlights: "Privacy," "Cyber," "Accuracy," and "Retention."
3. Purple section labeled "Trusted" includes: "Timeliness," "Data quality," and "Useful."
4. Green section labeled "Connectivity" contains: "Interoperability" and "Ease of access."

Each segment focuses on a crucial aspect of data management, identified by specific descriptors within each coloured quadrant.

[Return to Figure 3]

Figure 4: A diagram with five hexagons labeled “What,” “Where,” “How,” “If,” and “Can,” related to data management questions.

1. What data you have? Details of what the data contains
2. Where is it located?
3. How to get it? Does the data exist what tools can you use to access it?
4. If it’s accurate? Does it represent the hypothesis, is it true and is it leveraging good quality data?
5. Can you use it? Are you allowed to use it? Is it ethical or legal?

[Return to Figure 4]

Figure 5: The image is a circular diagram divided into six colored segments, each representing a different stage of the data lifecycle. At the centre is a smaller circle labeled “Data Governance Storage” surrounded with associated terms like “identity access management”, “standards”, “privacy”, “cyber” and “medical decision-making”. The cycle progresses in an anti-clockwise direction, beginning with the stage “Create, Collect and Capture” and leads into other stages in sequence: “Cleanse and Prepare”, “Analyse and Collaborate”, “Visualise and Evaluate”, “Share and Disseminate” and finally, “Archive and Retention”.

Each segment is associated with specific tasks and technologies.

Segment 1 – Create, Collect and Capture

- Patient administration systems
- Diagnostic systems
- Lab testing results
- Excel spreadsheets

Segment 2 – Cleanse and Prepare

- Data augmentation
- Format for modelling tools

Segment 3 – Analyse and Collaborate

- Version control
- Cross-industry standard process for data mining
- Artificial intelligence and machine learning
- SQL / R / Python / Dax
- Hypothesis driven

Segment 4 – Visualise and Evaluate

- Analysis oriented visualisation
- Audience awareness
- Narrative oriented visualisation
- Critical thinking

Segment 5 – Share and Disseminate

- Communication
- Storytelling
- Ethics
- Security conscious
- Interoperability and integrations

Segment 6 – Archive and Retention

- Retention schedules
- Legal requirements
- Retention policies
- Business requirements
- Needs per datatype

[Return to Figure 5]

Figure 6: A diagram divided into five vertical columns, each labeled at the top with a different data governance domain and containing text explaining the specific domain it represents.

- Domain 1: Labeled “Meta Data Management” refers to aligning the business glossary, data definitions and data lineage with business processes. Having clearly aligned decision making around these.
- Domain 2: Labeled “Data Quality Management” refers to enabling data owners to make decisions that will

enable the improvement of data quality in source systems. A practice of cleansing the data at source data quality rules management and AI driven data quality models.

- Domain 3: Labeled "Data Lifecycle Management" refers to ownership policies around data ingestion including authority to consume data, avoiding multiple versions of the same data multiple locations. Data retention and data disposal ownership and decision making.
- Domain 4: Labeled "Data Access" refers to principles of security and privacy are adhered to so that the right people are accessing the data and with the right permission to access it.
- Domain 5: Labeled "Data Principles" refers to appropriate standards in the data management lifecycle to enable interoperability and alignment. Data management teams standards to enable efficiency between teams preventing duplicate effort.

[Return to Figure 6]

BEYOND THE HEALTH RECORD

Alternative Sources of Healthcare Data

Maryann Wood

Learning Outcomes

Upon completing this chapter, you will be able to:

- Understand the sources of health information and data available beyond the health care record.
- Reflect on how the data sources can be used to inform decision making.

Introduction

The purpose of this chapter is to provide you with an understanding of the many data sources available in health aside from the healthcare record covered in the chapter Data The Heart of the Healthcare System. In particular, this chapter describes the sources of health information, including the

various data repositories held in hospitals, specialised health units and government agencies. A global context is provided for many of the sources, including examples, particularly in the Australian context. Data sources include population data such as the census and vital and civil registration statistics, disease surveillance systems, and surveys.

Understanding health data sources beyond the health care record discussed in the previous chapter is important for a number of reasons:

- Utilising data from multiple sources such as government agencies and specialised health units can provide a broader perspective and a more rounded picture of the health of a community or country.
- Data from these diverse data repositories such as population data, disease surveillance systems, and surveys offer insights not available in the healthcare record alone.
- Improved health outcomes can be achieved through the analysis of the data sources by identifying trends, tracking outbreaks, and planning public health interventions.

Population data

Census

A census is an essential tool that helps countries answer questions such as:

- How many people are there in a defined population?
- Who are the people in the defined population?
- Where do the people in the defined population live?

In essence, a census provides an opportunity to "count the nation" and gather a profile of the population based on characteristics such as age, gender, education, occupation, income, housing, access to water, and other facilities. For many nations, the census is the only chance to collect this crucial base data, which forms the foundation for evidence-based decision-making at various levels.

The United Nations (2017) produced an important reference manual Principles and Recommendations for Population and Housing Censuses, Revision 3 [PDF]. The manual is used for the planning and conducting of a census by national statistical offices and country census official. See the link to the Manual by the United Nations to review the manual in detail: Note that this is a large document and may require good bandwidth to access.

Traditionally, a census focuses on the population. The

United Nations (2017) identified two types of censuses: a population census and a housing census:

- A population census involves the complete process of collecting, compiling, evaluating, analysing, and disseminating demographic, economic, and social data at a specific time for all individuals in a country or a well-defined part of it.
- A housing census involves the complete process of collecting, compiling, evaluating, analysing, and disseminating statistical data at a specific time for all living quarters and their occupants in a country, or a well-defined part of it.

In most countries, these activities are combined into a Census of Population and Housing. For many countries, the census is the largest peacetime activity, requiring mapping of the entire country, mobilising a large team of enumerators, conducting public awareness campaigns, gathering data from individuals and households, and compiling, analysing, and disseminating the data.

Uses of Census Data

As the census provides a snapshot of a nation at a specific time, it allows decision makers to plan for essential public services like schools, healthcare and roads. It helps in understanding

the population's size, location, and needs regarding these services. By aiming to include everyone and asking uniform questions, the census offers a detailed view of the population, enabling comparisons, even within small areas like suburbs or postal regions. In the context of how hospitals can use census data, some examples include:

- **Resource Allocation:** Hospitals can use census data to determine the demand for various medical services and allocate resources accordingly. Understanding the demographic distribution of the catchment will aid with planning of services. Areas with a higher population of elderly individuals may require more geriatric care services. Likewise knowing the multicultural diversity of your population can assist in providing appropriate services. For those establishing new hospitals, understanding the Aboriginal and Torres Strait Islander percentage of the catchment population can assist with preparation and licensing requirements.
- **Infrastructure Planning:** Data on housing and population density can help hospitals plan for expansions or new facilities in areas of need.
- **Emergency Preparedness:** Understanding the demographic and socio-economic characteristics of a region can aid in developing targeted emergency response plans and health campaigns.
- **Public Health Initiatives:** Census data can be used to

identify health trends and disparities within different communities, allowing hospitals to tailor public health initiatives and outreach programs effectively. It also allows the hospital to ensure they have the right public health information in the right languages and contexts for diverse populations.

Other examples of census data use that may overlap with the health sector include:

- **Population:** Grant allocation and planning for services.
- **Health:** Allocation of health and social services based on data on the age and socio-economic make-up of the population.
- **Housing:** Measures of inadequate accommodation and the need for new housing.
- **Employment:** Planning of jobs and training policies.
- **Transport:** Information collected on travel to and from work and the availability of cars contributes to the understanding of pressures on transport systems and the planning of roads and public transport.
- **Ethnicity:** Identify the extent and nature of the ethnic groups. Measure the success of equal opportunities policies and plan programs to take account of minority groups.
- **Statistics and Research** Benchmarks for statistical compilation or frames for sample surveys, benchmark

for research and analysis. Availability of small area data allows for comparison of data at small area level, not just state, district or provincial level.

What is Collected in a Census?

A census is a unique chance to reach every household and collect essential data about the country. It is crucial that census content accurately reflects the nation's information needs. This means understanding the key questions the country wants to answer and identifying the relevant topics. The United Nations (2017) suggests that these topics should be chosen after considering:

- The needs of various data users in the country.
- Achieving a high level of international comparability, both regionally and globally.
- The public's willingness and ability to provide accurate information on these topics.
- The total national resources available for conducting the census.

When deciding on the topics to include, countries should consider whether there are alternative methods for gathering the data. For example, health-related questions might be better suited for a health survey. However, the census might be the only opportunity to gather statistics on mortality and

morbidity. In some countries, especially developing ones, you might find questions about infant deaths in the household over the past year, as well as environmental factors like access to water and food.

On the United Nations website, you can access copies of the questionnaires used by countries in the latest iteration of their census. To find the questionnaire used by your country, visit the United Nations website [opens in new tab]. You might like to review the questions asked of your country and compare them with other countries.

Alternatively, you might also find it useful to review the data from countries' census via Population Censuses' Datasets (1995 – Present) [opens in new tab].

Country Census Practices and Examples

The principles identified above provide recommendations for how a country should conduct a census, with a key recommendation of the United Nations (2017) being that a Census of Population and Housing should be conducted every

10 years, a recommendation followed by many countries such as the England, Wales, Scotland, the United States of American and India. Australia, Canada, Ireland, Japan, and New Zealand conduct their census every five years. A summary is provided below on the Australian census, and links and summaries of how other countries conduct their census are provided. Links to data are also provided. It is also important to note that the national statistics agencies of many countries share ideas, learnings, and innovations in conducting a census so that countries can provide the best experience and quality data for decision making.

Australia

As Australia's national statistical agency, the Australian Bureau of Statistics (ABS) conduct a five yearly Census of Population and Housing. The most recent census was conducted in August 2021 (ABS, n.d.). The deployment of the census in Australia is governed by the Census and Statistic Act 1905 (Cth, n.d.). The Act designates mandatory completion of the census form for all people and gives provision to direct people to provide the information (Cth, n.d.).

The scope of census includes everyone in Australia on census night, except for foreign diplomats and their families. Visitors to Australia are counted regardless of their duration of stay (ABS, 2022a). Australian residents who are abroad on census night are not included (ABS, 2022a). After the census, the ABS uses emigration and immigration data to adjust the

population figures, considering residents, citizens, and non-citizens. The data collected in the Australian Census of Population and Housing includes age, sex, address, marital status, religion, country of birth, indigenous status, ethnicity/ancestry, language spoken at home, educational background, occupation, income, household information, disability/carer status, children, fertility, and motor vehicles.

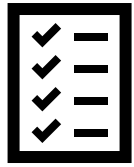
The ABS primarily conduct an online census, with 80% of people responding to the census via the online form, an increase from the 63% who completed the census online in 2016(ABS, 2022b). An increase in the response rate from 95.1% in 2016 to 96.1% of the population in 2021 completing the census was also noted (ABS, 2022b).

For the 2021 census, the ABS (2022c) had inclusivity strategies in place to ensure barriers for participation in the census were addressed. This included strategies for First Nations people, culturally and linguistically diverse populations, and homelessness.

The following table provides a listing of various countries, their frequency of census, links to how they conduct a census, and access to data from their most recent census.

Note: Each link opens in a new tab.

Table 1. Global census and data availability for various countries.

Country	Frequency	How Census is Conducted	Data availability
Australia	5 years		
Canada	5 years		
England and Wales	10 years		
Fiji	10 years		
India	10 years		

Country	Frequency	How Census is Conducted	Data availability
Ireland	5 years		
Japan	5 years		
New Zealand	5 years		
Papa New Guinea	10 years		
Scotland	10 years		

Country	Frequency	How Census is Conducted	Data availability
United States of America	10 years		

Activity

Review the list of countries above and identify your country. Access the relevant link in the data availability column to explore the data that is available. Consider the amount of data available to the public from the census for your country. You may then want to review the data availability for other countries and compare the level of detail that countries make available. Finally, consider how you can use this data in the management of your health service.

Civil Registration

Civil registration, also known as vital registration, involves the documentation of key life events such as births, deaths, and marriages within a country (United Nations, 2023). This process should be continuous and permanent, ideally supported by laws that mandate registration (United Nations, 2023).

The advantages of a civil registration system include:

- Protecting rights related to social status and benefits.
- Establishing identity, parental relationships, and citizenship.
- Providing eligibility for social benefits and age-related items like school entry, the right to work, and driver's licenses (United Nations, 2023).

A comprehensive civil registration system ensures these rights for the entire population. It also offers administrative benefits by monitoring causes of death and identifying individual needs, such as maternal and child healthcare. Additionally, it meets the need for data on small geographic areas. The statistical data from a complete civil registration system are free from sampling errors and can be cross-checked with other records, such as census data. These records serve as a foundation for more detailed studies. In some countries, the civil registration system is a primary source of health statistics.

Uses of Civil Registration Data

Civil registration data has uses for both the individual and from a research and policy perspective. In the context of the individual, it provides evidence of a person's birth, the facts related to the birth (such as date and location of birth) and provides evidence of the death. In the context of research and policy the administrative by product data can be applied:

- In public health programs in postnatal care of the mother and child or to identify populations at risk.
- For administering social services and social programs.
- In public health programs to control infectious diseases, programs for public safety, accident prevention, and crime eradication.
- In health research of maternal, infant, or fetal death, and preparing health indicators such as infant mortality rate, perinatal/neonatal mortality rates, and maternal mortality rates.
- For studies of mortality differentials by age, sex, and geographical location.
- In historical demography research involving long term trends.
- In the construction of life tables and population estimates.
- In public health programs in the absence of morbidity data or for health education.

- In maternal and child health services for planning an evaluation.

Confidentiality safeguards are essential for both the legal and administrative use of vital records, as well as for the statistical use of the data they provide. Protecting confidentiality helps maintain individual privacy, improves the completeness and accuracy of registration data, and strengthens research based on these data.

A country's robust civil registration system is built on a well-designed registration law that provides clear instructions on how the system should operate. While the law governing civil registration typically does not appear in the country's basic constitution, it must align with the principles and rights protected by that constitution. Unlike the vital statistics system, which is often included under a general statistics law, the civil registration system requires a specific law to ensure its continuity, permanence, and mandatory nature.

Example of Country Civil Registration

In Australia, the responsibility for registering births, deaths (including fetal deaths and causes of death), and marriages lies with the individual state and territory governments (ABS, 2018a), (ABS, 2018b). Each state and territory have legislation governing the registration of these vital events and the establishment of agencies to manage this information (ABS,

2018a), (ABS, 2018b). The legislation also outlines the roles and responsibilities of the Registrars of Births, Deaths, and Marriages (RBDM).

The primary purpose of registering vital events is administrative, ensuring a person's legal status in life (through birth registration) or in death (through death registration, including the cause). For each birth, a birth registration statement must be completed and signed by at least one parent of the child (ABS, 2018a). Once registered, the family can apply for a birth certificate.

Several forms are required to register a death, and different individuals are responsible for providing the necessary information (ABS, 2018b). All forms must be completed before the RBDM finalises the registration. These forms include death notification form (completed by the funeral director) and medical certificate of cause of death (completed by a doctor who attended the patient before death and forwarded to the RBDM). In cases of suspicious or unnatural deaths, a coroner completes the medical certificate of cause of death after investigations (an interim certificate may be issued for complex cases), and certificate of burial or cremation (completed by the funeral director and submitted to the RBDM).

To process administrative data into useful statistical data, data on births and deaths is provided monthly to the ABS in electronic format ABS, 2018a), (ABS, 2018b). The processing involves system edits, data cleaning, and aggregate data quality

checks. The processing of cause of death data is more complex, as evidenced by the diagram:

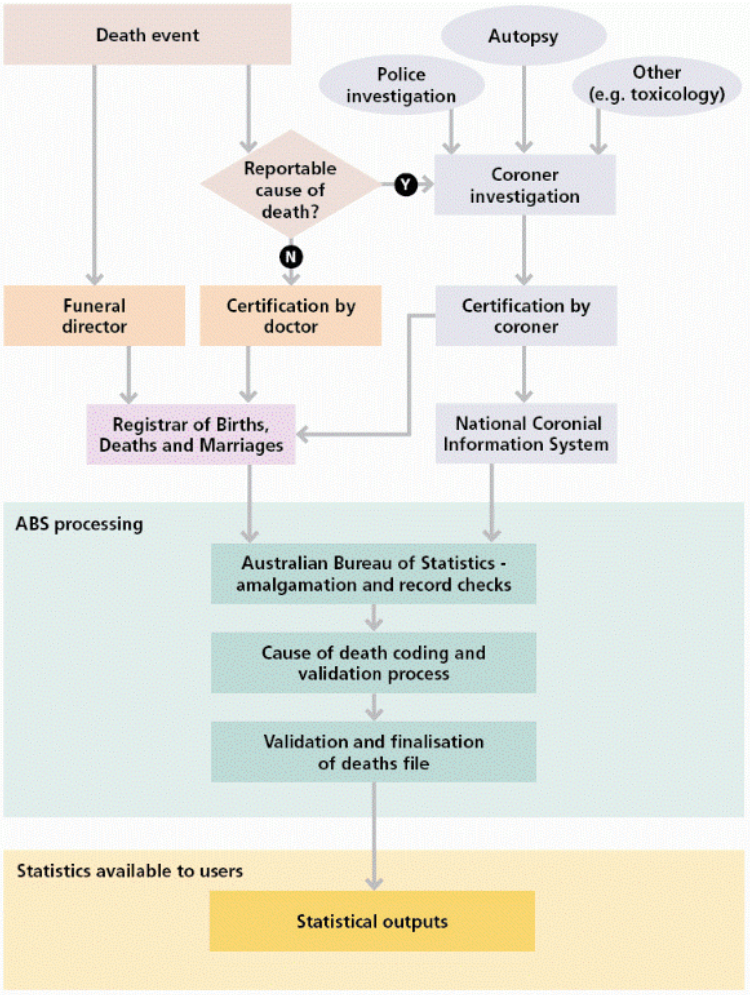


Figure 1. "Australian causes of death statistics system" by Australian Bureau of Statistics, in Causes of Death, Australia methodology is licensed under CC BY 4.0. [Go to image description]

Data are made available annually via the ABS website on each

of the above collections. For those interested, data can be accessed via the following links.

Note: Each link opens in a new tab.

- Cause of death
- Deaths
- Births

Activity

Take time to explore the above links and identify which data sources you would utilise in your role as health professionals to inform decision making.

In recognition of the need for more timely data needing to be available during the COVID-19 pandemic, the ABS introduced the publication of Provisional Mortality Statistics [opens in new tab] in June 2020, which provided an early indication of patterns of mortality (ABS, 2024) and they have continued to provide this data post-pandemic.

Disease Surveillance Systems

Disease surveillance systems enable the collection and analysis of data on specific diseases. These systems include registries for conditions such as cancer, AIDS, or injuries and trauma and in public health emergencies such as COVID 19 (World Health Organization, 2025a). Typically operated by government agencies, the data collection is usually mandated by law.

National Notifiable Disease Surveillance Systems (Australia)

The National Notifiable Diseases Surveillance System (NNDSS) oversees the monitoring of over 50 communicable diseases or disease groups, such as H1N1, HIV/AIDS, foodborne diseases like Hepatitis A, meningococcal and gonococcal diseases, vaccine-preventable diseases and childhood immunization coverage (e.g., mumps, whooping cough), rare paediatric communicable diseases, rotavirus, tuberculosis, and influenza (Department of Health, Disability and Ageing, 2025a). As new communicable diseases are identified, they are added to the collection system. For example, COVID-19 was included in the list of quarantinable diseases from 2020.

Notifications under this scheme are made through state or territory health authorities, in accordance with health legislation in each jurisdiction. Electronic files are provided to

the Department of Health, Disability and Ageing's NNDSS [opens in new tab] where de-identified files are collated, analysed, and updated data is published.

Data can be utilised to identify high-risk areas, design educational programs, and allocate resources to mitigate or eradicate disease outbreaks. This information is shared with public health officials, healthcare providers, researchers, and other key stakeholders, as well as the public, when appropriate.

Activity

Access the National Notifiable Diseases Surveillance System data visualisation tool [opens in new tab]. Explore the data available via this link, then access the "Notifications for all diseases" tab.

Consider the following:

- Are there any diseases of particular concern or with high (unexpected) numbers?
- Are there any diseases with zero cases noted in cells? Why do you think it is important to continue to report on these conditions?
- How will you use this data as a health

professional for informed decision making?

Disease Registries

A registry is a specialised form of disease surveillance designed to gather data on various health issues, such as cancer. It functions as a facility that collects, analyses, and reports data, serving as a mechanism for disease monitoring (Department of Health, n.d.). The data collection for registries is typically supported by legislation that enforces the provision of information.

There are three main types of registries:

Population-based registries focus on assessing the impact of a disease within a specific community or geographically defined population (Department of Health, n.d.). They collect data to monitor disease trends, current incidence, morbidity, and/or mortality. An example would be any of the cancer registries in each of the states and territories in Australia.

Hospital-based registries collect data about patients attending a particular hospital (Department of Health, n.d.). They provide information that can be used by hospital administration and medical staff to evaluate the effectiveness of diagnosis and treatment. These registries are established to assess disease processes, treatment, and survival relationships,

facilitate patient follow-up, assess prognostic indicators, gain statistical evidence related to disease epidemiology, and support retrospective and prospective clinical research.

Special purpose registries reflect local interest in specific diseases, such as tuberculosis or AIDS (Department of Health, n.d.). Due to their ad hoc nature, they are usually shorter-lived than hospital-based or population-based registries.

Activity

As a health information manager or public health professional, consider the following in terms of what would be required if you were asked to set up a disease registry:

- What type of data do you need to collect?
- Where would the data be sourced from?
- Who will have custodianship of the data?
- How will the data be kept secure?

You may wish to reflect on the Covid 19 experience as a guide when trying to answer these questions. Consider from your observations during the

pandemic where, when, and how data were collected.

Service and Resource Records

Service Records

Service records are crucial for providing health planners with information about the number and types of services delivered to clients within the health system. An integrated approach to collecting these records is essential to minimise the burden on those providing the data. The principle of "collect once, use many times" should be applied to service records (Health Metrics Network & World Health Organization, 2008). Consequently, much of the source data for service records is collected for other purposes, and the information is compiled as a by-product, often referred to as administrative by-product data. Examples of service records in the Australian context are hospital morbidity data, the Medicare Benefits Scheme, and Pharmaceutical Benefits Scheme.

Other Australian context examples of hospital morbidity data include the Private Hospital Data Bureau and Hospital Casemix Protocol data collections, which involve the submission of de-identified patient information from private

hospitals for policy development and funding calculations in Australia.

- **Private Hospital Data Bureau data collection:** Private hospitals submit data on admitted treatment episodes, including patient demographics, clinical information, and hospital charges. These data have been collected since 1997 and are used to inform the Medical Costs Finder app and calculate the national efficient price for hospital services (Department of Health, Disability and Ageing, 2022a).
- **Hospital Casemix Protocol data collection:** Under the *Private Health Insurance Act* 2007 (Cth, n.d.), both public and private hospitals submit HCP data for privately insured patients, covering clinical, demographic, and financial information. These data, collected since 1995, are also utilised for policy development and research purposes (Department of Health, Disability and Ageing, 2025b).

Resource Records

Resource records are divided into three categories: 1. infrastructure and health services, 2. human resources, and 3. financing and expenditure (Health Metrics Network & World Health Organization, 2008). These categories contain essential data sources that support the continuous planning and

maintenance of health information, health systems, and health resources.

Infrastructure records

From an infrastructure and health service perspective, it is important to continuously monitor the number and types of operational health care facilities at national, state, district, provincial, and local levels (Health Metrics Network & World Health Organization, 2008). For example, each jurisdiction in Australia has legislative requirements for licensing a facility with the State Health Authority before it can be established (Department of Health, Disability and Ageing, 2022b). This is particularly important, as it ensures ongoing compliance with health and safety regulations and reporting requirements.

Human resource records

Measuring human resources is essential for determining whether a health system has enough resources to meet both current and future needs. While a national database of human resources is ideal, it is not a feasible option in many countries and other data sources should be considered if such a database is unavailable (Health Metrics Network & World Health Organization, 2008). In the Australian context, the Australian Institute of Health and Welfare (AIHW) uses various data sources to gather information on the national health labour

workforce and make this information available via the AIHW website [opens in new tab].

Finance and expenditure

In order to evaluate the efficiency and effectiveness of a healthcare system, it is important to understand the sources of health care funding, how those resources are allocated, and how they are utilised. It is essential to have an awareness, not only of the expenditure, but also other factors that may influence how the funding is spent, including societal, political, and economic factors. In the Australian context, the AIHW compile statistics on health and welfare expenditure [opens in new tab] and make them available via their website.

A key organisation that plays a role in ensuring the consistency of the financial data that is collected in Australia is the Independent Health and Aged Care Pricing Authority (IHACPA). IHACPA are an independent government authority who help the Australian Government to allocate funds for hospital and aged care services more efficiently by offering evidence-based price determinations and pricing advice (IHACPA, 2025). IHACPA play a key role in providing the classification systems and underpinning guidelines that enable the financial data to be collected and ensuring financial consistency. To read further on classifications and casemix refer to the chapter on Healthcare Classifications and Terminologies.

Hospital data repositories (and the Health Information Manager role)

Much of the data mentioned in the service and resource records above originates in the individual hospitals and health services. Each of these services has a responsibility for collecting and managing the data before ensuring the data are transferred across to the relevant state and federal government authorities in the Australian context. The data may be located in a hospital wide data repository or located in a number of different data repositories in the hospital.

It is the responsibility of the health information managers in those facilities, as the data custodians, to identify all information assets within their organisation and to ensure the data is safe, secure, and accessible when required – but only to those who should have access. That is, the health information manager needs to ensure data management practices and policies are in place that incorporate concepts such as data cleansing, data quality, data maintenance, database administration, data warehousing, meta-data management, and data security. Health information managers are also responsible for ensuring the data within their hospital repositories are collected in alignment with state and national guidelines, as outlined in national minimum data sets and data dictionaries. In the Australian context, national minimum data sets and data dictionaries are available in the metadata repository Metadata Online Registry (METEOR) [opens in new tab]).

Consistent application of good data management practices allows for comparisons within a facility as well as across facilities, states, and also internationally. This allows for confidence in the data collection, and consequently, the data. This ensures that researchers, statisticians, and policy and planning people can use the data with confidence. Through their understanding of the collected data, health information managers are best placed to provide advice to data users on the best application of the data and how the data can be used to inform decision making.

Population Surveys

A survey systematically gathers information through various methods such as face-to-face interviews, self-completed questionnaires, telephone, postal service, or a combination of these approaches (ABS, 2023a). The representativeness of the surveyed population determines the generalisability of the results. Surveys can provide insights into the health status of a population, their use of health services, and health-related lifestyle aspects.

The objectives of a health survey include obtaining national benchmark information on various health issues, monitoring health trends over time, and providing data on health indicators for national health priority areas and significant subgroups of the population (ABS, 2023b) (ICF International, 2012). Health surveys may collect data on

health status indicators, injuries, health-related actions, and health risk factors such as smoking, alcohol consumption, diet, exercise, body mass, sun protection, breastfeeding, and immunisation rates. Examples of specific data collected include women's health items such as breast and cervical cancer screening practices, contraceptive behaviours, hormone replacement therapy, breastfeeding history, and demographic and socio-economic characteristics.

Examples of International Health Surveys

Demographic and Health Survey (DHS)

The DHS offers a detailed summary of population health, focusing specifically on child, maternal, and sexual health. Countries that have previously participated in these surveys are typically those that have received support from aid organizations like USAID, the World Bank, and UNICEF (Croft et al., 2023). The survey targets a sample population and is usually conducted in countries lacking adequate information from administrative or other routine data collections. Historically, the questionnaire is divided into three sections (Croft et al., 2023):

1. A household questionnaire that gathers demographic information such as age and gender of all household

members, as well as environmental factors like access to clean water

2. A women's questionnaire for all women aged 15 to 49 in the household, covering topics like reproductive behaviour, contraceptive knowledge and use, and issues related to children and women
3. A men's questionnaire for all men aged 15 to 59 in the household, focusing on contraceptive knowledge and behaviours.

A biomarker questionnaire and a fieldworker questionnaire have been introduced in more recent iterations (Croft et al., 2023).

World Health Organization (WHO) – World Health Survey and World Health Survey Plus (WHS+)

The World Health Organization (WHO) has created and implemented a survey program called the World Health Survey (WHS). This program gathers comprehensive baseline data on population health, the outcomes of health system investments, and the current functioning of health systems. It also monitors inputs, functions, and outcomes.

WHO (2025b) recognised the importance of countries having effective data systems that integrate various sources such as household surveys, surveillance systems, health facility assessments, administrative data, civil registration, and vital

statistics. These systems are crucial for monitoring progress towards Sustainable Development Goals (SDGs) (WHO, 2025b). To support this, WHO (2025b) developed WHS+, which helps countries systematically collect, analyse, and interpret health-related data essential for public health planning, implementation, and evaluation. WHS+ is adaptable to country-specific needs due to its design features, addressing various public health topics, using innovative technology, and having a flexible methodology. It can be integrated into ongoing surveys or conducted as a standalone survey.

Australian examples

The ABS run the National Health Survey, which involves key stakeholder consultation, including agencies like AIHW and the Department of Health, to gather essential information. The survey aims to collect national data on Australians' health status, their use of health services and facilities, and health-related lifestyle aspects (ABS, 2022d). The data, which cover both urban and rural areas across all states and includes residents of private and non-private dwellings, can be used to monitor health trends over time (ABS, 2022d).

The survey provides information on long-term conditions, risk factors, and health-related conditions. It also includes details on self-management of conditions, such as consultations with health professionals about healthy lifestyles, GP check-ups, and tests for cholesterol, blood

pressure, and bone density (ABS, 2022d). Additionally, it covers occupational exercise, sitting time, and physical measurements of individuals aged five years and over, including height, weight, and waist and hip circumference (ABS, 2022d). If you are interested you can access data from the National Health Survey [opens in new tab].

The AIHW (2025) also run population surveys on areas of interest in the health sector. For example, the National Drug Strategy Survey is conducted every three years and respondents are about their use and opinions of licit and illicit drugs, including alcohol, tobacco, cannabis, e-cigarettes and vapes (AIHW, 2025). The survey acknowledges that drug use effects not just the individual, but families, and communities (AIHW, 2025). You can access the Australian Institute of Health and Welfare's [opens in new tab] publications on this topic. The AIHW also analyse data collected via survey by other organisations (such as the ABS) to produce publications and articles on health areas of interest such as disability, chronic conditions, veterans and young people.

Summary

This chapter was developed to provide you with an understanding of the data available beyond the health care record. Data sources identified in this chapter will assist you as a health information management professional in informing

your decision making for policy and planning of your health service or your state, province or district. Many additional sources are available to you in both the Australian and international contexts. The purpose of this chapter was to identify some of those sources so that you can then further explore other sources and consider how you can use them for informed decision making for the questions that need to be answered to provide better health and better outcomes for the health sector. To help that exploration at the national and international level, a summary table is provided below to key Australian and International agencies who provide data for informed decision making.

It is suggested that you explore the data in the links provided in this chapter and the table below as a first step. Exploring the data and attempting the activities will broaden your understanding of how you can use these data. You should also identify the people in the organisations discussed in this chapter who can assist you in understanding how you can use the data for informed decision making. This includes the health information managers in the organisations and those responsible for the data as data custodians or who have collected the data. They are the people who understand the data best and know how best it should be applied for to assist you in answering your questions – for better health and better health outcomes.

Activity

Explore the data in the links provided below to understand the type of data available other than that found in healthcare records and consider how data sources can be used.

Note: Each link opens in a new tab.

ORGANISATION

- Australian Bureau of Statistics
- Australian Institute of Health
- United Nations Statistics Division
- World Health Organisation, Global Health Observatory

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Image descriptions

Figure 1: The flow chart begins with a death event. A death event has two options, a funeral director or reportable cause of death. Funeral director registers the death with the registrar of births deaths and marriages. A reportable death has two options, yes or no. No, a Not reportable death, will be certified by a doctor then registered with the registrar of births deaths

and marriages. Yes, a reportable death, goes to a coroner investigation. Coroner investigation contains three fields, police investigation, autopsy, and other (e.g. toxicology). Coroner investigation goes to certification by coroner. There are two options from certification by coroner, registrar of births deaths and marriages and National Coronial Information System. The next section of the flow chart is called ABS processing. The flow chart continues from registrar of births deaths and marriages and National Coronial Information System to Australian Bureau of Statistics amalgamation and record checks. This flows to cause of death coding and validation process. This then flows to validation and finalisation of deaths file. The flow chart ends at the next section called statistics available to users at the statistical outputs option.

[Return to Figure 1]

HEALTHCARE CLASSIFICATION AND TERMINOLOGIES

Vickie Bennett; Filippa Pretty; and Brooke McPherson

Learning Outcomes

In this chapter you will gain knowledge of:

- Classifications and terminologies and how to derive value from data for both.
- How classifications impact funding models in Australia.
- Mappings, what they are and what they are used for.
- Considerations when choosing and implementing a classification or terminology.
- Understand the World Health Organization's (WHO) Family of International Classifications.

We will also delve into the many uses of classifications – locally, nationally, and internationally.

Introduction

Healthcare classifications and terminologies serve as fundamental tools in health information management, providing standardised frameworks for organising and analysing healthcare data. The World Health Organization's Family of International Classifications (WHO-FIC), which includes the International Classification of Diseases (ICD), is foundational for global health data standardisation. In Australia, these classifications directly impact healthcare funding through systems like Activity Based Funding (ABF), where clinical coding using ICD-10-AM. a derivative of the ICD, is used to group cases into clinically meaningful and resource homogenous groups and is used for the allocation of funding for healthcare services. Mappings play a crucial role in this ecosystem by creating relationships between different classification systems and terminologies, enabling data interoperability and comparison across various healthcare settings and systems. The effective use of these classification, terminology and grouping systems allows healthcare organisations to derive insights from their data, supporting clinical decision-making, research, epidemiological studies, and health policy development while ensuring consistent communication across the healthcare continuum. In this chapter we explore health classifications, terminologies, the ICD family of classifications and important issues relating to the use and application of these systems.

What are Health Classifications and Terminologies?

Health Classifications

Health classifications are a system of categories to which morbid or interventional entities are assigned according to established criteria (WHO [PDF]). They organise large quantities of clinical and other detailed information on diseases, related health conditions, and other concepts (such as drugs and external causes of injury) into meaningful categories (WHO [PDF]). These categories are hierarchical (e.g. acute through to chronic, mild to severe), exhaustive, and mutually exclusive. Health classifications usually have an index that assists a user to the correct code assignment, which can also be determined using rules and standards. Health classifications are used for statistical reporting, epidemiology, auditing, planning, financial billing, and other use cases where comparable data are required (WHO [PDF]). The most well-known and widely used health classification is the World Health Organization's (WHO) International Classification of Diseases (ICD). This classification system, or adaptations is used widely across the globe to collect statistical and other data about patients and populations.

Clinical Terminologies

A terminology is a structured vocabulary of terms and concepts arranged according to relationships and definitions that provide context. A clinical terminology uses medical vocabulary to describe and capture diseases, interventions, clinical findings, treatments, and medicines (National Library of Medicine, n.d.). It enables comprehensive and detailed capture of care and treatment provided during clinical care (Australian Digital Health Agency, 2020; Commonwealth Scientific and Industrial Research Organisation, 2023). Terminology tools systematically codify clinical information entered into an electronic health record, and allow for standardised information exchange between clinicians, thus facilitating patient care across multiple healthcare providers (Australian Digital Health Agency).

Why Are They Important?

With increased investments into digital systems and changes in the delivery of clinical practice towards more integrated and person-centred care, the adoption of standardised classifications and terminologies is critical for establishing clarity and consistency when encoding, documenting, and exchanging information on health-related events (Pretty et al., 2023).

Classifications and terminologies provide a **common**

language to describe the care and treatment of patients using standardised terms (Harrison, 2021; CSIRO, 2024). The use of fit-for-purpose and freely available classifications and terminologies is important for representing information in a consistent manner, enabling the storage, retrieval, and meaningful analysis of health information and exchange of information between clinicians (Harrison et al., 2021).

Using clinical terminologies and classifications together for their intended primary purposes (clinical inputs and communication, and statistical outputs and reporting, respectively), enhances and strengthens clinical and patient information use, decision-making, and outcomes (Harrison, 2021).

What Health Classifications and Terminologies are Used Internationally and in Australia?

International Classifications

The WHO develops and maintains a 'family' of classifications that capture and describe the health spectrum (WHO, n.d.). They are:

- the International Classification of Diseases and Related Health Problems (ICD)
- the International Classification of Functioning, Disability and Health (ICF)
- the International Classification of Health Interventions (ICHI) (WHO, n.d.).

The WHO Family of International Classifications (WHO-FIC) aims to provide a conceptual framework of information dimensions related to health and health management. They establish a common language to improve communication and permit comparisons of data across countries' health-care disciplines, services, and time (see Figure 1).

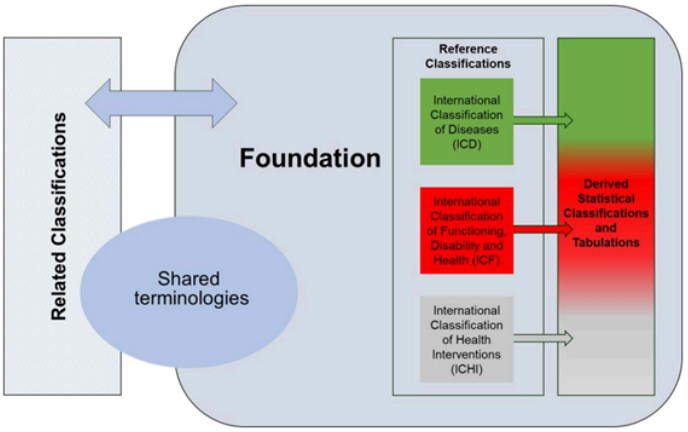


Figure 1. "Relationships between the WHO Family of International Classifications (WHO-FIC) and Related Classifications, the Foundation Component, and shared terms", International Classification of Diseases, Eleventh Revision (ICD-11), World Health Organization is licensed under CC BY-ND 3.0 IGO [Go to image description]

The WHO-FIC Reference Classifications have a core structure called the *foundation*, which is a multidimensional collection of all health entities, including diseases, injuries, external causes, anatomy, medications, functioning and disability concepts, as well as health interventions. The classifications are drawn from this foundation, known as linearisations (what were previously known as tabular lists) (Fung et al, 2020, Fung et al, 2023). Foundation entities may be included in a linearisation as a code, category or searchable (index) term (Fung et al, 2020, Fung et al 2023). Each entity in the foundation has a unique identifier, called a uniform resource

identifier (URI) or "foundation URI". This URI enables the same entity to be linked across the reference classifications to identify the same concept even if the classifications gives it a different code in each different classification system (Fung et al, 2020, Fung et al, 2023). The URI can also be used to track data entry at point of care to understand what terminology is in current use to ensure the terms are searchable entities (i.e., index terms) (WHO, n.d.).

International Classification of Diseases

The International Classification of Diseases and Related Health Problems (ICD) is the WHO classification for recording, reporting, and grouping conditions and factors that influence health. It contains categories for diseases and disorders, health related conditions, external causes of disease or death, anatomy, sites, activities, medicines, vaccines, and more. The ICD facilitates systematic recording, analysis, interpretation and comparison of mortality and morbidity data and has been the basis for comparable statistics within countries and internationally over time (Harrison et al, 2021).

The latest version, the 11th Revision (ICD-11), was endorsed in 2019 and came into effect in 2022 for potential implementations across multiple use cases.

Activity

Watch this video, by the WHO that introduces ICD-11 and note key changes.

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://oercollective.caul.edu.au/health-information-management/?p=84#oembed-1

ICD-11 uses an **ontology**-based design. This **ontology-based design** of ICD-11 and the migration of its sibling classifications (ICF and ICHI) into the same ontological infrastructure has enabled the full integration of terminology and classification in a common platform (World Health Organization, 2021).

ICD-11 has been designed to enable **semantic interoperability** of individual data, reusability of recorded

data for use cases other than health statistics, including decision support, resource allocation, reimbursement, guidelines, and more (World Health Organization, 2021).

The ICD-11 contains up-to-date scientific knowledge and mechanisms that allow for health information to be used in:

- the improvement of health outcomes;
- patient safety and quality analysis;
- meaningful population health reporting;
- integrated care; and
- strategic planning and delivery of health care services (WHO, 2021).

The ICD-11 has a Reference Guide [opens in new tab] that provides comprehensive detail, including historical background material, instructions, and guidelines for use. ICD chapters have been revised for ICD-11. There are now 26 chapters and two supplementary sections in the classification. Chapters/sections not previously in the ICD-10 include:

- Chapter 04 *Diseases of the immune system* (previously in Chapter 03)
- Chapter 07 *Sleep-wake disorders*
- Chapter 17 *Conditions related to sexual health*
- Chapter 26 *Supplementary chapter Traditional Medicine Conditions*
- Section V *Supplementary section for functioning*

assessment

- Section X *Extension codes* (World Health Organization, 2021)

International Classification of Functioning, Disability and Health

The International Classification of Functioning, Disability and Health is the WHO classification for measuring health and disability at individual and population levels. It also includes environmental factors (World Health Organization, 2001). ICF was endorsed as the international standard to describe and measure health and disability in 2001 (World Health Organization, 2001).

The ICF was developed to provide a scientific basis and common language for describing health and health-related states, to facilitate communication between different users, such as health care workers, policy makers, quality assurance evaluators, and the public, including people with disabilities, about health and health related states, outcomes and determinants in both positive and negative terms (World Health Organization, 2001).

The ICF has two parts:

1. Part One – functioning and disability, which captures body functions and structures, and activities and participation

2. Part Two – contextual environmental and personal factors (World Health Organization, 2001).

The ICF can be used as:

- A statistical tool – in the collection and recording of data via population studies or in an information management system
- A research tool – to measure outcomes, quality of life, or environmental factors
- A clinical tool – in needs assessments, vocational assessments, or rehabilitation and outcome evaluations (World Health Organization, 2001).

As the ICF is a health and health-related classification, it is also used internationally in other sectors, such as insurance, social security, labour, education, social policy, and environmental modification (World Health Organization, 2001). It can be used in conjunction with the ICD to provide information on diagnoses as well as functioning capacity to give a broader and more meaningful picture of the health of people or populations. It can also be used in conjunction with the ICHI to provide information on interventions undertaken for assessment and management/treatment of functioning and disabilities, and the outcomes (World Health Organization, 2001).

International Classification of Health Interventions

The ICHI is a newly developed WHO classification for reporting and analysing **health interventions** for clinical and statistical purposes (World Health Organization, 2025c). A health intervention is defined as "an act performed for, with or on behalf of a person on a population whose purpose is to assess, improve, maintain, promote or modify health, functioning or health conditions" (World Health Organization, 2025c). Examples of health interventions include surgical procedures and public health interventions such as immunisation.

Historically, the International Classification of Procedures in Medicine was published by WHO in 1976 and included diagnostic, medical, and surgical interventions (Gersenovic, 1995 cited in Fung et al, 2022). While the 10th Revision of ICD was being developed, the Heads of WHO Collaborating Centres for Classification of Diseases "recognized that the process of consultation that had to be followed before finalization and publication was inappropriate in such a wide and rapidly advancing field". Therefore, it was decided that there should be no revision of the International Classification of Procedures in Medicine for ICD-10 (Fung et al, 2022).

However, over time, comparisons of hospital interventions across Member States could not be undertaken due to the large number of interventions classifications used across Member

State countries. As a as result, from 2007, the ICHI has been developed by a wide range of people drawn from WHO-FIC Collaborating Centres in all WHO regions, as well as a number of WHO staff (World Health Organization, 2025c). The ICHI includes a broad range of interventions performed in medical, surgical, mental health, primary care, allied health, functioning, rehabilitation, and health promotion, as well as interventions used in community and public health. It does not include information about the provider of an intervention or the setting. The reasons for and outcomes of the intervention are also not included; these can be captured using the ICD and/or ICF (World Health Organization, 2025c). The ICHI is grouped into the following four sections:

- Interventions on Body Systems and Functions
- Interventions on Activities and Participation Domains
- Interventions on the Environment
- Interventions on Health-related Behaviours (World Health Organization, 2025c).

Health Classifications Used in Australia

In Australia, the Australian Bureau of Statistics (2025) classifies cause of death using the ICD-10 via an automated coding system known as Iris. The coded data generated are

compiled in the National Mortality dataset and then used for statistical reporting as well as mandatory reporting to WHO (Australian Bureau of Statistics, 2025). For morbidity, the Independent Health and Aged Care Pricing Authority reviews and updates existing classifications and is also responsible for introducing new classifications for health service categories without an existing classification. Overtime, new classifications have been created, for example to better describe sub and non-acute care patients who are treated in Australian hospitals. Table 1 below shows the classifications used across each of the patient service categories. For further information on each classification please open the hyperlinks.

Note: Each link opens in a new tab.

Table 1. List of classifications applicable to use cases in Australian morbidity health sector. Reproduced with permission from the Independent Health and Aged Care Pricing Authority (2025a).

Service category	Classification
Admitted care	International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM), Australian Classification of Health Interventions (ACHI), Australian Coding Standards (ACS)
Admitted acute care	Australian Refined Diagnosis Related Groups classification (AR-DRGs)
Subacute and non-acute care	Australian National Subacute and Non-Acute Patient classification (AN-SNAP)
Emergency care	Emergency Care ICD-10-AM Principal Diagnosis Short List (EPD Short List) Australian Emergency Care Classification (AECC) Urgency Disposition Groups (UDG)
Non-admitted care	Tier 2 Non-Admitted Services Classification (Tier 2)
Mental health care	Australian Mental Health Care Classification (AMHCC)
Teaching, training and research	Australian Teaching and Training Classification (ATTC)

International Terminologies

Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT) is a comprehensive, multilingual clinical healthcare terminology with scientifically validated clinical content enabling consistent representation of clinical content in electronic health records (SNOMED International, 2025). SNOMED CT contains concepts for diagnosis, clinical findings like signs and symptoms, surgical, therapeutic and diagnostic procedures as well as observables (for example heart rate), and concepts representing body structures, organisms, substances, pharmaceutical products, physical objects, physical forces, specimens and many other types of information that may need to be recorded (SNOMED International, 2025). Every concept represents a unique clinical meaning, referenced using a unique, numeric and machine-readable identifier. The identifier provides a unique reference to each concept and does not have any human interpretable meaning (SNOMED International, 2025). Logical Observation Identifiers Names and Codes (LOINC, 2025) is a terminology developed in 1994 for laboratory and clinical observations to send clinical data electronically from laboratories and other data producers to hospitals, clinicians offices, and payers who use the data for clinical care and management purposes. It contains a rich catalogue of measurements, including laboratory tests, clinical measures like vital signs and

anthropometric measures, standardized survey instruments, and more. LOINC also contains codes for collections of these items, such as panels, forms, and documents (LOINC, 2025). International terminologies such as SNOMED CT and LOINC are also used in the Australian context.

Activity

Watch this short video on SNOMED CT and consider why it is an important foundational terminology.

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://oercollective.caul.edu.au/health-information-management/?p=84#oembed-2

Other Terminologies

Medical Dictionary for Regulatory Activities [opens in new tab] is an international medical terminology with an emphasis on use for data entry, retrieval, analysis, and display. It applies to all phases of drug development, and to the health effects and malfunction of devices. An appendix includes concept descriptions which describe how a medical concept is interpreted, used, and classified. The concept descriptions are intended to aid the consistent and accurate use of Medical Dictionary for Regulatory Activities in structured capture, retrieval, and analysis. This Dictionary is used by Australia's Therapeutic Goods Administration [opens in new tab]. The Mondo Disease Ontology [opens in new tab] aims to harmonise disease definitions across the world. It is a semi-automatically constructed ontology that merges in multiple disease resources to yield a coherent merged ontology (Mondo, n.d).

Australian Terminologies

SNOMED CT Australian Release (SNOMED CT-AU) is the Australian extension to SNOMED CT created under licence with SNOMED International (CSIRO, 2025). SNOMED CT-AU provides local variations and customisation of terms relevant to the Australian healthcare system. It includes the international resources along with all Australian developed

terminology, including the Australian Medicines Terminology for use in Australian clinical IT systems (Australian Digital Health Agency, 2025b). The Australian Government has identified SNOMED CT-AU as the preferred national terminology for Australia, and this has been endorsed by all Australian state and territory governments (CSIRO, 2025).

The National Clinical Terminology Service is critical to support of SNOMED CT-AU [opens in new tab]. SNOMED CT-AU has been available for use in Australia since 1 July 2006 and is updated monthly. Australia's National Clinical Terminology Service was launched in 2016 and is underpinned by the CSIRO's Ontoserver Fast Healthcare Interoperability Resources Terminology server which is hosted on behalf of the Australian Digital Health Agency. Ontoserver licences are available for free for end use in Australia from the Australian Digital Health Agency [opens in new tab]. Since it launched, the National Clinical Terminology Service has facilitated standard terminologies in Australia's digital health systems and enabled standard-based interoperability in data exchange (CSIRO, 2025).

LOINC terms are also used in Australia, particularly in pathology systems, and a subset of LOINC terms are now also included in the NCTS (Australian Digital Health Agency, 2025).

Implementing Classification

or Terminology-based Systems

When a new data collection is required, several items should be considered before selecting a classification or terminology. For example, if you want very detailed information for research purposes the ICD may be sufficient, for clinical care a more granular system may be required, such as SNOMED CT.

What is the Purpose of the Data Collection?

The use case should determine which classification or terminology would be most appropriate to use, so this must be carefully considered. For example, the ICD would not be used in a data collection about interventions; a classification for interventions would be more suitable, such as ICHI or ACHI or a terminology that contains interventional concepts.

What Outputs Would be Required?

The following questions are useful to consider:

- What type and level of data aggregation do you

intend this data collection to produce?
- What type of reporting do you intend to produce?

Figure 2 demonstrates the granularity required for specific use cases.

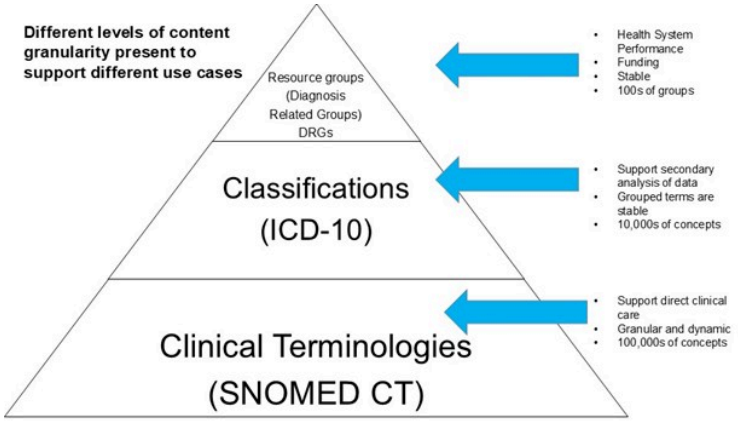


Figure 2. Specific Use Cases and Level of Detail Required for Information Capture.
Source: Adapted from Slide 9 in Australian Digital Health Agency (2020). [Go to image description]

Uses of Classification Data – Local, National and International

Coded data, abstracted from health records can have many uses across all levels of healthcare. This includes turning coded

data into other forms through classification systems. Examples of uses include:

- Casemix, DRGs – provide information for the assignment of patients into the appropriate diagnosis related group to be used for the funding of the hospital.
- Research – having diseases and interventions with allocated codes enables an easy way to sort, retrieve, and review data for clinical research.
- National and jurisdictional level statistics – enables stakeholders to monitor health information at population levels, to influence policy direction, public health planning, and funding.
- Health service planning and evaluation – an institution or an area health service can use the data to assess the uses of their facilities and allocate funding and equipment.
- Quality assurance activities –people can use coded data to examine the outcome of diseases and interventions and assess quality of coding and analyse clinical indicators. See the chapter on Patient Safety and Sustainable Development Goals Through the Lens of Health Information Management .
- Epidemiology – coded data are used to both track and project disease patterns and frequency of the population.

Figure 3 provides an overview of the value of health care data capture, transfer, and use.

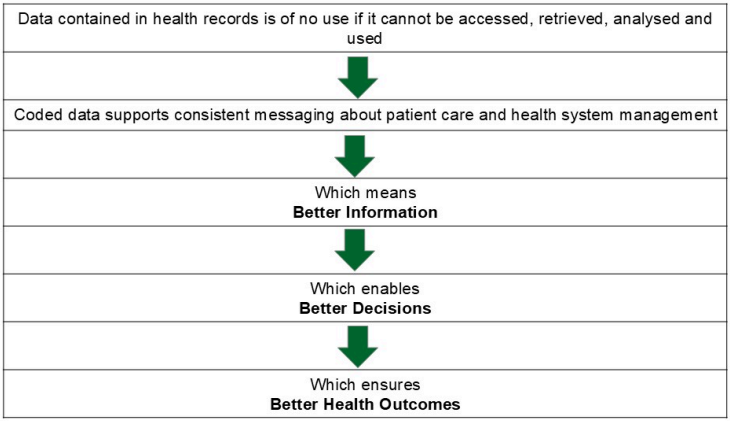


Figure 3. Benefits of Coded Health Information. [Go to image description]

The Path of Admitted Care Morbidity Data – Local, National and International

The most common coded data in Australia are morbidity data collected for hospital admitted patients. These data are generated by health information managers and clinical coders in every hospital in Australia, who code each separation of admitted patients using ICD-10-AM/ACHI/ACS (2025b). Hospitals submit coded data to their respective state or territory health department, usually after the end of a specific

reporting period (often monthly). These data then undergo rigorous quality assurance at the jurisdictional level, and hospitals can address data issues before the data collection closes each year. State and territory health departments then forward on their data to repositories held at the national level. The frequency for this can vary depending on which repository the data are being submitted to.

One repository is the National Hospitals Data Collection [opens in new tab], held by the Australian Institute of Health and Welfare (AIHW). Data are submitted to this repository on an annual basis. This repository encompasses the major national hospital databases including the National Hospital Morbidity Database and the National Non-Admitted Patient Emergency Department Care Database.

These data are then used for health statistics reporting via publications such as:

- Australia's health [opens in new tab]: a biannual publication outlining health information about the Australian population
- MyHospitals [opens in new tab]: containing hospital level information on admissions, presentations to emergency departments and waiting times for elective surgery.
- Health and Wellbeing of First Nations people [opens in new tab]
- Australian Burden of Disease Study [opens in new tab]

The morbidity data is also available to download from:

- Principal diagnosis data cubes [opens in new tab]
- Procedures data cubes [opens in new tab]

Australia has an obligation to supply health and health-related data to the WHO, who then publish this data in the WHO Global Health Observatory [opens in new tab] and the AIHW is often involved in the data supply. Australia benefits from this in that it allows for international comparisons of health, which helps to identify opportunities for preventative action and health system improvement (AIHW, 2025).

Australia also provides coded morbidity data to the Organisation for Economic Co-operation and Development (OECD), which is published in an online database, *OECD Health* Statistics (AIHW, 2025). This is the most comprehensive source of comparable statistics on health and health systems across OECD and partner countries. The database contains information on health status, health care services and health care spending for member countries. Information from OECD Health Statistics facilitates international comparative reporting, supports policy planning and decision making, and enables health-related research and analysis.

Mappings

With the increasing adoption of electronic health records, the amount of coded data being collected is increasing exponentially. Today these data are encoded in a multitude of health care classifications and terminologies for different purposes. Classification and terminology mapping are used to transform such data so that they can be used for additional purposes, aggregated with data from other sources, or exchanged between systems (World Health Organization, 2024a).

Another reason for terminology mapping is the dynamic nature of health care. As scientific understanding of disease processes improves and new interventions become available, classifications and terminologies need to evolve. During a mapping process, the differences in the intended purpose (use case), structure, and constraints of the different classifications and terminologies may mean that maps between them may be approximate and dependent on the subjective judgement of map developers and users. Limitations in the development of maps may also mean that transformation of data based on these maps may involve information loss. Whether such information loss is acceptable or can be mitigated depends on the intended usage of the data. For example, where a category's specificity is reduced it may affect the ability to report on individual conditions.

Classification and Funding

Activity based funding (ABF) in the Australian healthcare sector is the way of funding hospitals based on the number and mix of patients they treat. If a hospital treats more patients, it may receive more funding. ABF also takes into account that some patients are more complicated to treat than others. for example a hospital episode of care for a simple appendicectomy is less complicated and less costly than an episode of care for an organ transplant (Independent Health and Aged Care Pricing Authority, 2025b). The **Australian Refined Diagnosis Related Group**s (AR-DRG) classification provides a clinically meaningful way to relate or group the number and type of patients treated in admitted acute episodes of care to the resources required in treatment (Independent Health and Aged Care Pricing Authority, 2023e).

ABF should support timely access to quality health services, improve the value of the public investment in hospital care and ensure a sustainable and efficient network of public hospital services. ABF payments should be fair and equitable, including being based on the same price for the same service across public, private or not for profit providers of public hospital services (Independent Health and Aged Care Pricing Authority, 2025b).

The Pricing Framework for Australian Public Hospital Services [opens in new tab] is used to allocate funding and is updated annually. It outlines the principles, scope and

methodology adopted by Independent Health and Aged Care Pricing Authority to determine the national efficient price and the national efficient cost for Australian public hospital services for the specific financial year (Independent Health and Aged Care Pricing Authority, 2025b).

How Does it All Work?

ICD-10-AM and ACHI codes are an integral part of the Australian Refined Diagnosis Related Groups (AR-DRGs) (Independent Health and Aged Care Pricing Authority, 2023e).

> ***"The Australian Refined Diagnosis Related Groups (AR-DRG) classification provides a clinically meaningful way to group together treatments and services provided for admitted acute episodes of care to enable hospitals to be funded for these services using activity based funding" (Independent Health and Aged Care Pricing Authority)***

To assign an AR-DRGs each episode is 'grouped' into clinically homogeneous groups – thereby reflecting resources required (usually by specialty) and complexity. Grouping logic is very complex, this is commonly performed by software programs, and only one AR-DRG is produced for each admitted patient episode of care (Independent Health and Aged Care Pricing Authority, 2023e).

Figure 4 demonstrates AR-DRG assignment flow.

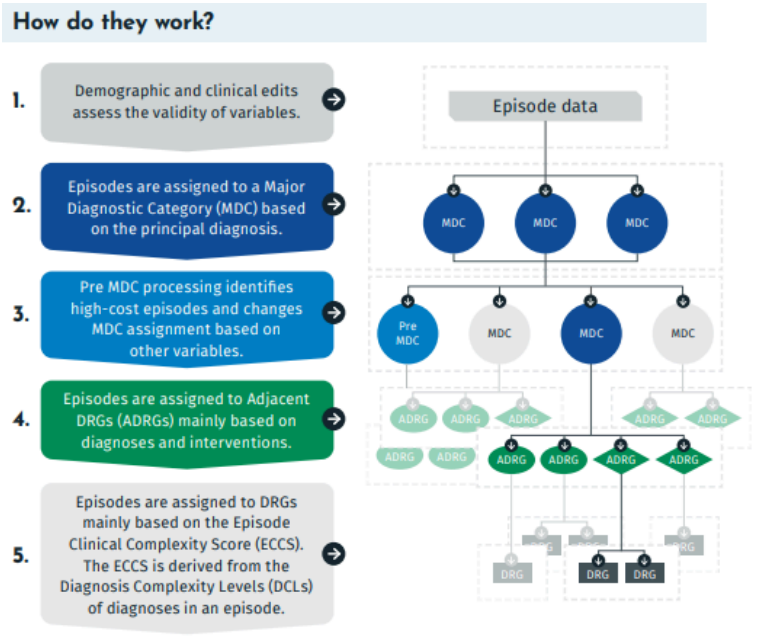


Figure 4. An Overview of the AR-DRG Assignment Flow. Reproduced with permission from the Independent Health and Aged Care Pricing Authority. [Go to image description]

What Does an AR-DRG Look Like?

The AR-DRG classification was developed using a hierarchy of structures with various types of DRGs. There are special DRGs to cater for high cost episodes of care for example patients who have been on extended ventilation for long periods. There are DRGs where there is no splits, or further

differentiation based on complexity. The vast majority of DRGs have splits to cater for complexity and also where other variables, such as transfer status and length of stay are used to categories episodes of care.

	DRGs in Version 11.0	Description	Example
Pre MDC	9 DRGs	High-cost episodes	**A13A** Ventilation >= 336 Hours, Major Complexity
No splits	83 DRGs	DRG is assigned without the use of complexity score	**L61Z** Haemodialysis
Split on complexity	700 DRGs	DRG is assigned using a complexity score	**G02B** Major Small and Large Bowel Interventions, Intermediate Complexity
Split on other variables	9 DRGs	DRGs using other variables such as transfer status and length of stay	**B70D** Stroke and Other Cerebrovascular Disorders, Transferred < 5 Days

Figure 5. AR-DRG Complexity Splits, Version 11.0. Reproduced with permission from the Independent Health and Aged Care Pricing Authority. [Go to image description]

Terms Associated with AR-DRGS

In this section, major terms associated with Australian DRGs are explained. There is an abundance of material on the AR-DRGs [opens in new tab].

Major Diagnostic Category (MDC) – a split of cases based on the principal diagnosis. They correspond generally to the major organ systems of the body (AIHW, 2024a).

Table 2 demonstrates the number, names of MDCs for AR-DRGS (ADRGS), and the code that those DRGs begin with e.g., the letter A, B, C, etc. This helps users when examining a DRG. For example, if it commences with the letter B, the condition will belong to a disease and disorder of the nervous system.

Table 2. "Major Diagnostic Categories and the AR-DRG ranges covered by each" by Australian Institute of Health and Welfare is licensed under CC BY 4.0

MDC	MDC Description	AR-DRG beginning with
Pre-MDC	Major procedures where the principal diagnosis may be associated with any MDC	A
01.	Diseases and disorders of the nervous system	B
02.	Diseases and disorders of the eye	C
03.	Diseases and disorders of the ear, nose, mouth and throat	D
04.	Diseases and disorders of the respiratory system	E
05.	Diseases and disorders of the circulatory system	F
06.	Diseases and disorders of the digestive system	G
07.	Diseases and disorders of the hepatobiliary system and pancreas	H
08.	Diseases and disorders of the musculoskeletal system and connective tissue	I
09.	Diseases and disorders of the skin, subcutaneous tissue and breast	J
10.	Endocrine, nutritional and metabolic diseases and disorders	K

MDC	MDC Description	AR-DRG beginning with
11.	Diseases and disorders of the kidney and urinary tract	L
12.	Diseases and disorders of the male reproductive system	M
13.	Diseases and disorders of the female reproductive system	N
14.	Pregnancy, childbirth and the puerperium	O
15.	Newborns and other neonates	P
16.	Diseases and disorders of the blood and blood forming organs and immunological disorders	Q
17.	Neoplastic disorders (haematological and solid neoplasms)	R
18.	Infectious and parasitic diseases	T
19.	Mental diseases and disorders	U
20.	Alcohol/drug use and alcohol/ drug induced organic mental disorders	V
21A.	Injuries, Poisoning and Toxic Effects of Drugs: Multiple Trauma	W
21B.	Injuries, Poisoning and Toxic Effects of Drugs	X
22.	Burns	Y

MDC	MDC Description	AR-DRG beginning with
23.	Factors influencing health status and other contacts with health services	Z
GIs unrelated to principal diagnosis	General interventions unrelated to principal diagnosis	8
Error-DRGs	Error DRGs	9

Pre MDC processing – Episodes are assessed as to whether they meet pre MDC criteria that identifies very high-cost episodes and is driven by a specific intervention code that overrides the outcome of the principal diagnosis-based MDC assignment (Independent Health and Aged Care Pricing Authority, 2023f).

Adjacent DRGs (ADRG) – Episodes are assigned to an ADRG mostly according to diagnosis and intervention codes. All MDCs have a hierarchical structure that separates the ADRGs into either the intervention or medical partition (Independent Health and Aged Care Pricing Authority, 2023f).

Partitions – These partitions divide the ADRG to represent the broad category of service:

For AR-DRG version 9.0 onwards these are:

- Intervention: separations involving a general

intervention (operating room procedure) or at least one specific intervention (non-operating room procedure) significant to the MDC.

- Medical: separations not involving an operating room procedure or a locally significant non-operating room procedure. (Independent Health and Aged Care Pricing Authority, 2023f).

The Episode Clinical Complexity (ECC) Model was introduced in AR-DRG Version 8.0 and uses ICD-10-AM codes to determine the clinical complexity of an episode (Independent Health and Aged Care Pricing Authority, 2023f).The ECC model assigns an Episode Clinical Complexity Score to each episode that quantifies relative levels of resource utilisation within each ADRG and is used to split ADRGs into different DRG levels based on resource homogeneity.

The process of deriving an Episode Clinical Complexity Score for each episode begins by assigning a Diagnosis Complexity Level (DCL) value to each diagnosis reported for the episode. DCLs are integers that quantify the levels of resource utilisation associated with each diagnosis, relative to levels within the ADRG to which the episode belongs. DCL values are assigned to principal diagnosis and additional diagnosis codes and range between zero and five (Independent Health and Aged Care Pricing Authority, 2023f).

AR-DRG – the final DRG assigned when the ECC Model

is applied based on the assigned ICD-10-AM codes for the episode of care (Independent Health and Aged Care Pricing Authority, 2023f).

Note: the demographic and clinical edits undertaken at the start of DRG allocation (see Figure 4) include age, sex, separation mode, length of stay, newborn admission weight, hours of mechanical ventilation, and same-day status. The edits also validate all diagnosis (ICD-10-AM) and intervention (ACHI) codes, combined with a patient's age and sex. (Independent Health and Aged Care Pricing Authority, 2023f)

Potential issues in relation to the validity of the data may result in assignment to one of the three error DRGs:

- 960Z *Ungroupable*
- 961Z *Unacceptable Principal Diagnosis*
- 963Z *Neonatal Diagnosis Not Consistent with Age/ Weight.*

AR-DRG data can be explored using the AIHW's data cubes [opens in new tab].

Key Implications for Practice

- Health Information Managers (HIMs) must ensure robust coding practices using standardised classifications

(e.g., ICD-10-AM) as this directly impacts healthcare funding through Activity Based Funding and DRG assignment.

- Healthcare organisations need to implement effective data quality assurance processes at local levels before submission to jurisdictional and national bodies to maintain data integrity and accuracy.
- HIM professionals should maintain expertise in multiple classification and terminology systems to support various use cases (e.g., clinical care, research, statistics) and enable data interoperability.
- HIM professionals need to understand and adapt to evolving classification systems (like ICD-11) to ensure organisational readiness for future transitions.
- Regular monitoring and analysis of coded data is essential for supporting quality assurance, research, epidemiology, and health service planning activities.

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Image descriptions

Figure 1: A flowchart illustrating the relationships within the WHO Family of International Classifications (WHO-FIC) framework. On the left is a vertical, grey rectangle labeled “Related Classifications”. On the right is a large rectangle labeled “Foundation”. Between the two rectangles is a two-headed arrow, showing interaction in both directions. Overlapping between the Related Classifications and the

Foundation is an oval labeled "Shared terminologies", connecting or bridging those two elements. This indicates that Related Classifications share terms or vocabulary with the Foundation and its reference classifications. Inside the "Foundation" rectangle, there are two main sections: the "Reference Classifications" and "Derived Statistical Classifications and Tabulations."

The "Reference Classifications" section is divided into three green and red blocks representing different classifications:

1. "International Classification of Diseases (ICD)" in green.
2. "International Classification of Functioning, Disability and Health (ICF)" in red.
3. "International Classification of Health Interventions (ICHI)" in grey.

Each block has horizontal arrows pointing to the "Derived Statistical Classifications and Tabulations" in shades of red and green on the right side. The overall design uses color differentiation and arrows to depict the flow and relationship among various classification systems.

[Return to Figure 1]

Figure 2: A diagram illustrating different levels of content granularity needed to support various use cases in healthcare data classification and terminology systems. It consists of a pyramid divided into three levels, labeled from top to bottom.

At the top is a small triangular section labeled "Resource groups (Diagnosis Related Groups) DRGs," indicating hundreds of groups. This segment is associated with health system performance, funding, and stability.

The middle section of the pyramid is labeled "Classifications (ICD-10)" and indicates supporting secondary analysis of data with stable grouped terms, representing tens of thousands of concepts.

The bottom and largest section is labeled "Clinical Terminologies (SNOMED CT)." It illustrates support for direct clinical care and has granular and dynamic content, encompassing hundreds of thousands of concepts.

[Return to Figure 2]

Figure 3: A vertical flowchart illustrating the importance of coded healthcare data. It begins with a broad statement at the top, emphasising that data in health records is useless if inaccessible or unanalysed. Below this is a green downward arrow leading to text about how coded data supports consistent communications in patient care and health system management. Another downward arrow follows, pointing to text that states this results in better information. This is succeeded by another arrow, leading to text that states better information enables better decisions. The final arrow points to the concluding text, which asserts that better decisions ensure better health outcomes.

[Return to Figure 3]

Figure 4: A flowchart illustrating the AR-DRG (Australian

Refined Diagnosis Related Groups) assignment process. At the top, there is a section labeled "Episode data," which leads into a series of stages numbered 1 to 5 on the left with arrows pointing right, corresponding to various steps in the process on the right.

1. The first stage describes that demographic and clinical edits assess the validity of variables.
2. The second stage describes episodes being assigned to a Major Diagnostic Category (MDC) based on the principal diagnosis.
3. The third stage involves pre-MDC processing identifying high-cost episodes and changing MDC assignments based on other variables.
4. The fourth stage assigns episodes to Adjacent DRGs (ADRGs) based mainly on diagnoses and interventions.
5. The fifth stage assigns episodes to DRGs based mainly on the Episode Clinical Complexity Score (ECCS), derived from Diagnosis Complexity Levels (DCLs).

The flowchart has arrows indicating the flow from one step to the next, showing the processing pathway from episode data to the assignment of DRGs.

[Return to Figure 4]

Figure 5: A table outlining the Australian Refined Diagnosis-Related Groups (AR-DRGs) and their complexity splits in Version 11.0. The table is divided into four rows,

each with three columns labeled "DRGs in Version 11.0," "Description," and "Example."

- The first row, labeled "Pre MDC," includes "9 DRGs" with a description of "High-cost episodes" and has an example of "A13A Ventilation – 336 Hours, Major Complexity."
- The second row, "No splits," lists "83 DRGs" that are "assigned without the use of complexity score," exemplified by "L61Z Haemodialysis."
- The third row, "Split on complexity," states "700 DRGs" are "assigned using a complexity score," with an example of "G02B Major Small and Large Bowel Interventions, Intermediate Complexity."
- The fourth row, "Split on other variables," contains "9 DRGs" using variables such as "transfer status and length of stay," demonstrated by "B70D Stroke and Other Cerebrovascular Disorders, Transferred < 5 Days."

[Return to Figure 5]

PART 4 HEALTH INFORMATICS AND DIGITAL HEALTH

NAVIGATING THE FUTURE

The Impact of Health Informatics and Digital Technologies on Healthcare

Usman Iqbal; Amina Tariq; and Sandeep Reddy

Learning Outcomes

- Evaluate how digital health technologies, particularly Electronic Health and Medical Records (EHRs/EMRs) and Artificial Intelligence, transform healthcare delivery and patient outcomes, demonstrating critical understanding of their benefits and limitations.
- Apply principles of user-centered design and safety protocols in the development and implementation of health information systems, with consideration of interoperability requirements and industry standards.
- Analyse potential risks in health informatics systems and develop appropriate mitigation strategies, while maintaining compliance with information sharing protocols and governance frameworks.

Introduction

Overview of Health Informatics and Digital Health

Health informatics refers to the interdisciplinary field that leverages information technology and data science to improve healthcare delivery, decision-making, and management (Buntin et al., 2011). It combines computer science, healthcare, and information science to optimise the collection, storage, retrieval, and utilisation of health information. Digital health, a broad and evolving domain, encompasses all forms of technology used to improve health outcomes, including mobile health apps, wearable devices, telemedicine, artificial intelligence (AI), and electronic health records (EHRs) (Kellermann & Jones, 2013).

Technologies such as AI and big data analytics enable personalised care by using patient data to generate real-time insights and predictive models (Jiang et al., 2017). The integration of these tools enhances clinical decision-making and promotes efficient care delivery. The integration of AI in healthcare, particularly in diagnostic processes, can introduce challenges such as bias in algorithmic decisions and inequities in care, which require comprehensive risk management strategies (Iqbal et al., 2024 [opens in new tab]). Digital health has rapidly gained traction, driven by the need for healthcare

systems to address growing patient populations, chronic diseases, and administrative inefficiencies (Topol, 2019).

Importance of Effective Health Information Management in the Digital Context

Effective management of health information is crucial in the digital age to ensure the quality, safety, and efficiency of healthcare services. With the increasing reliance on digital tools like EHRs/EMRs (hereafter referred to as EHRs), cloud computing, and telemedicine, management and integration of health data across systems are more important than ever (Buntin et al., 2011). Proper data management enables healthcare providers to track patient history, make informed decisions, and reduce errors or misdiagnoses, as effective integration of AI tools can significantly enhance diagnostic performance and support clinical decision-making (Goh et al., 2024).

Digital health tools also empower patients by providing them with access to their health data, allowing them to monitor their conditions and actively engage in their healthcare. For example, patients with chronic diseases like diabetes can use mobile health apps to track blood sugar levels and communicate with their healthcare providers in real time,

improving treatment adherence and outcomes (Goel & Taneja, 2023).

Current and Emerging Applications

Electronic Health Record Systems

EHRs have become a fundamental component of modern healthcare systems globally, transforming how healthcare organisations collect, store, and use patient information (Nasserh et al., 2015). As healthcare continues to evolve in the digital era, the global adoption of EHR systems has gained substantial momentum, albeit with varying degrees of progress across different regions (Tsai et al., 2020). The adoption of EHR systems has been notably expeditious in developed countries, with nations such as the United States, United Kingdom, and Australia at the forefront (Morrison et al, 2011). In these countries, governmental initiatives and financial incentives have played a pivotal role in encouraging healthcare providers to transition from paper-based records to electronic systems. Conversely, numerous developing countries face challenges in implementing EHR systems due to limited resources, inadequate infrastructure, and a dearth of

trained personnel (Morrison et al, 2011). Nevertheless, there are promising initiatives in countries such as India and Brazil, where governments are investing in digital health infrastructure to enhance healthcare delivery and management (Barbalho et al., 2022; Pai et al., 2021). Read the chapter Electronic Medical and Health Records.

Benefits and Challenges

EHR systems have revolutionised healthcare delivery by offering significant improvements in clinical outcomes, including enhanced quality of care and reduced medical errors, while simultaneously increasing organisational efficiency (Ratwani, 2017). These systems provide comprehensive patient data access, facilitate improved clinical decision-making, and enable effective population health management. The implementation of EHRs has demonstrated considerable potential in transforming healthcare delivery by streamlining processes and improving patient care quality through integrated healthcare informatics tools (Ratwani, 2017).

Notwithstanding their potential advantages, healthcare organisations encounter numerous challenges in the adoption and implementation of EHRs (Menachemi & Collum,2011). A primary obstacle is interoperability, wherein inconsistent data formats and communication deficiencies between disparate systems impede seamless information exchange. Additional challenges comprise concerns regarding data

security, patient confidentiality, and the substantial costs associated with implementation and maintenance. While EHRs offer considerable promise for enhancing efficiency, quality, and safety, healthcare providers frequently encounter various implementation challenges that necessitate careful consideration to maximise the systems' potential benefits (Menachemi & Collum,2011).

Future Outlook

As healthcare continues to evolve, EHRs will play an increasingly pivotal role in delivering high-quality, patient-centred care (Tsai et al., 2020). By addressing the challenges associated with EHR implementation and leveraging their numerous benefits, healthcare organisations can harness the potential of digital technology to improve outcomes and enhance the patient experience (Menachemi & Collum,2011). While EHRs have significantly transformed healthcare globally by improving efficiency, patient safety, and care coordination, addressing challenges related to privacy, interoperability, and resource allocation remains essential to fully realise their potential. Electronic Health and Medical Records are covered in more detail in a separate chapter for those interested in learning more.

Artificial Intelligence (AI):

Applications in Diagnostics and Patient Management

The integration of AI into healthcare, particularly in diagnostics and patient management, is rapidly evolving, driven by advancements in machine learning, deep learning, and natural language processing. Current evidence suggests that AI has the potential to revolutionise healthcare delivery, leading to more accurate diagnoses, personalised treatments, and improved patient outcomes (Reddy et al, 2019 [opens in new tab]). This section delves into the theoretical underpinnings and models that form the basis of AI applications in healthcare, supported by empirical evidence from recent studies. The integration of AI in healthcare extends beyond diagnostics and patient management, encompassing areas such as drug discovery, medical imaging analysis, and predictive analytics for population health. Machine learning algorithms, particularly deep neural networks, have demonstrated remarkable capabilities in analysing complex medical data, including EHRs, genomic information, and medical images (Reddy et al., 2019 [opens in new tab]). These AI systems can identify patterns and correlations that may not be immediately apparent to human clinicians, potentially leading to earlier disease detection and more targeted interventions (Wang. 2023). For example, studies have shown that AI-powered image analysis can detect subtle abnormalities in radiological scans with accuracy

comparable to, or sometimes exceeding, that of experienced radiologists (Kato et al. 2022). The figure below reflects the need to balance the benefits that AI can bring to challenges in healthcare.

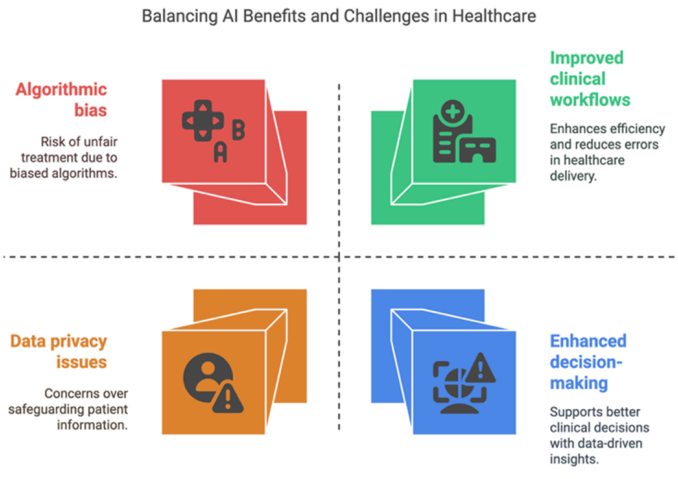


Figure 1. Balancing AI Benefits and Challenges in Healthcare.

The theoretical framework underlying AI in healthcare is rooted in computational models that simulate human cognitive processes, such as pattern recognition and decision-making. These models are trained on vast datasets of medical information, allowing them to learn and improve their performance over time (Haken et al. 1996). However, the implementation of AI in clinical settings raises important ethical and practical considerations (Reddy & Shaikh, 2025

[opens in new tab]). Issues such as data privacy, algorithmic bias, and the interpretability of AI-generated recommendations need to be carefully addressed to ensure the responsible and equitable deployment of these technologies. As AI continues to evolve, its integration into healthcare systems promises to enhance clinical workflows, reduce medical errors, and ultimately improve the quality and accessibility of healthcare services worldwide. In the next section we will discuss the theory, evidence and models related to AI application in healthcare.

Machine Learning in Diagnostic Imaging

One of the most prominent applications of AI in diagnostics is in the field of medical imaging. Machine learning algorithms, particularly deep learning models like convolutional neural networks (CNNs), have demonstrated remarkable accuracy in analysing images such as X-rays, CT scans, and MRIs.

- **Theory:** CNNs are inspired by the visual cortex of the brain and are designed to automatically learn hierarchical features from images. They excel at pattern recognition, making them ideal for identifying subtle anomalies in medical images that might be missed by human observers (Aishwarya et al.2025).
- **Evidence:** Esteva et al. (2017) developed a CNN that

could classify skin lesions with an accuracy comparable to that of board-certified dermatologists. The model was trained on a dataset of over 129,000 clinical images, demonstrating the potential of deep learning for skin cancer detection. Similarly, Rajpurkar et al. (2017) developed CheXNet, a 121-layer CNN that could detect pneumonia from chest X-rays exceeding the performance of practicing radiologists.

- **Model:** The typical model involves training a CNN on a large dataset of annotated medical images, where each image is labelled with the corresponding diagnosis. The trained model can then be used to analyse new, unseen images and provide diagnostic predictions (Aishwarya et al.2025).Natural Language Processing for Clinical Documentation and Decision Support

Natural Language Processing for Clinical Documentation and Decision Support

Natural language processing (NLP) algorithms are employed to extract valuable information from unstructured clinical text, such as EHRs, physician notes, and pathology reports.

- **Theory**: NLP techniques like tokenisation, part-of-speech tagging, and named entity recognition are used to analyse and understand the meaning of clinical text.

Machine learning models, such as recurrent neural networks and transformers are then trained to identify relevant information and patterns within the text (Cheruku et al. 2025).

- **Evidence:** Miotto et al. (2016) demonstrated the use of unsupervised deep learning on EHR data to derive patient representations that could predict future diagnoses with high accuracy. This approach leverages the vast amount of information contained within EHRs to improve disease prediction. In addition, Wang et al. (2019) implemented a real-time clinical decision support system based on NLP, leading to significant improvement in adherence to clinical practice guidelines and reducing potential medical errors. In the context of pulmonary hypertension (PH), AI algorithms have been designed to detect PH using EHRs, with results showing the model's capability to accurately retrospectively predict the diagnosis of PH up to 18 months prior to the clinical confirmation of PH (Averjanovaitė et al. 2023). This highlights the potential of AI tools to substantially reduce diagnostic delays in PH and thereby enhance patient outcomes.
- **Model:** This approach involves preprocessing clinical text, extracting relevant features using NLP techniques, and then training a machine learning model to perform tasks such as disease prediction, risk stratification, or generating clinical alerts.

AI-Powered Predictive Analytics for Patient Management

AI algorithms are increasingly being used to develop predictive models that can forecast patient outcomes, identify high-risk individuals, and personalise treatment plans.

- **Theory:** Predictive models leverage various machine learning algorithms, including regression, classification, and clustering, to analyse patient data (demographics, medical history, lab results, etc.) and predict future events, such as hospital readmissions, disease progression, or response to treatment (Raghul et al. 2025 and Gandra et al. 2024).
- **Evidence:** Futoma et al. (2015) developed a machine learning model that could predict sepsis onset in ICU patients' hours before clinical recognition, potentially allowing for earlier intervention and improved outcomes. Weng et al. (2017) conducted a large-scale study demonstrating that machine learning models could outperform traditional risk assessment tools in predicting cardiovascular events. AI has also found application in other areas of healthcare, such as genomics and drug discovery (Nardone et al., 2024). By exploiting AI algorithms, researchers and doctors can analyse large amounts of genomic data to identify genetic markers associated with certain diseases,

including cancer. This information can be used to develop targeted therapies and personalised treatment plans for patients. Clinical Decision Support Systems powered by AI can help healthcare professionals make more informed decisions by providing evidence-based recommendations and warnings (Liao et al. 2023).

- **Model:** These models are typically built by training machine learning algorithms on historical patient data, where the target variable is the outcome of interest (e.g., hospital readmission). The trained model can then be applied to new patient data to generate predictions and inform clinical decision-making (Gandra et al. 2024).

Robotic Process Automation for Administrative Tasks

AI-driven automation, specifically robotic process automation (RPA), is gaining traction for streamlining administrative tasks, freeing up clinicians' time, and reducing operational costs. AI has the potential to enhance productivity and improve the quality of care in two main ways: information synthesis, as the amount and complexity of data (e.g., patient data from electronic health records, gene sequencing, or medical literature) is overwhelming for a human operator to handle alone; and enhancement of human performance, by helping healthcare providers track and analyse all available information (Radaelli et al. 2024).

- **Theory:** RPA involves using software robots to automate repetitive, rule-based tasks, such as appointment scheduling, billing, and claims processing. These robots mimic human actions by interacting with existing software systems without requiring deep integration (Choubey, 2024).
- **Evidence:** A study by McKinsey Global Institute (2018) estimated that RPA can automate up to 45% of work activities in healthcare, leading to significant cost savings. Healthcare institutions can potentially attain positive results after implementing RPA for tasks like prior authorisation processing and patient registration (Jain & Bhatnagar, 2019).
- **Model:** The RPA model typically involves identifying suitable tasks for automation, designing workflows for the software robots, and deploying the robots to perform the tasks automatically (Agarwal et al. 2024).

Designing Health Information Systems

Usability: User-centred Design Principles

Usability in digital health applications ensures tools are

effective, intuitive, and capable of fostering meaningful health outcomes. Poor usability often leads to low adoption rates, as seen in applications requiring excessive manual data entry, which users may find burdensome (Buis & Huh-Yoo, 2020). A recent cross-sectional survey study conducted across 112 U.S. hospitals explored the relationship between EHR usability and safety performance (Classen et al. 2023). The findings revealed a significant association between higher EHR usability and improved safety outcomes, suggesting that enhancing usability can directly benefit patient safety (Classen et al., 2023).

User-centred design in healthcare focuses on involving end users—patients, clinicians, and other stakeholders—throughout the design process to ensure digital health tools are intuitive, effective, and aligned with user needs (Bhattacharyya et al., 2019). Its importance lies in enhancing usability, fostering adoption, and ultimately improving health outcomes by tailoring solutions to real-world contexts (Johnson et al. 2005, Duffy et al., 2022). Some critical evidence-based principles when designing digital health technologies include:

1. **Understanding User Context**: Designing for diverse populations means recognising context specific challenges. For example, elderly users often struggle with app navigation due to limited digital literacy. By integrating large buttons, voice navigation, and simplified interfaces, developers can address these needs

(Azimi et al., 2017).

2. **Iterative Testing and Feedback**: Successful examples include the iterative development of "Learn to Quit," a smoking cessation app tailored for individuals with serious mental illness. Each design iteration incorporated user feedback, significantly improving usability and engagement (Vilardaga et al., 2018).
3. **Multistakeholder Collaboration**: A collaborative approach was exemplified in the development of a rheumatoid arthritis intervention. Clinicians, patients, and developers co-designed a tool that integrated patient-reported outcomes into routine care, improving both usability and clinical applicability (Ragouzeos et al., 2019).
4. **Minimise User Burden**: The "MyFitnessPal" app initially struggled with user retention due to tedious manual entry. Introducing barcode scanning for food items simplified the process, reducing user burden and boosting engagement (Harte et al., 2017).
5. **Adapt to Clinical Contexts**: Digital health tools often fail when they disrupt clinical workflows. An example is the adaptation of a tablet-based tool for primary care that prioritised patient discussion topics during visits, seamlessly fitting into clinicians' routines (Lyles et al., 2016).
6. **Prioritise Accessibility and Inclusivity**: Accessibility features in diabetes management apps, such as screen

readers and high-contrast modes, have made these tools usable for individuals with visual impairments, expanding their impact (Duffy et al., 2022).

Activity

Learners will identify the User Centred Design principles applied in hypothetical digital health implementation scenarios. In this activity, more than one UCD principle may apply to a single scenario, testing students' deeper understanding of user-centered design in real-world contexts.

Case 1: A wearable health monitoring device was designed for users with mobility issues. During development, the team conducted multiple testing and feedback sessions with users and healthcare providers to ensure that the interface is intuitive and accessible. The final product includes voice commands and large, easy-to-read displays. **Which UCD principles does this represent? Select all that apply.**

- Iterative Testing and Feedback

- Multistakeholder Collaboration
- Understanding User Context
- Accessibility and Inclusivity
- Minimise User Burden
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Case 2: A telehealth platform was developed with input from nurses, physicians, patients, and IT expertshowever patients were not included. The system was tested iteratively, with improvements made after each testing phase to better fit clinical workflows and patient needs. **Which UCD principles does this represent? Select all that apply.**

-
  Accessibility and Inclusivity
- Multistakeholder Collaboration
-
  Iterative Testing and Feedback

- Minimise User Burden

- Understanding User Context
-
-
-
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Case 3: A fitness app initially required users to log every workout manually. Based on feedback when tested by users the logging process was found to be very time-consuming, the developers introduced automated workout detection using wearable sensors. They also ensured the app was compatible with accessibility features like screen readers.

Which UCD principles does this represent? Select all that apply.

- Iterative Testing and Feedback

- Understanding User Context
- Multistakeholder Collaboration

- Minimise User Burden
- Accessibility and Inclusivity
-
-
-
-
-

Case 4: A mobile app for managing chronic diseases was designed specifically for elderly users and those with low digital literacy. The developers minimised user burden by simplifying the navigation, while also incorporating feedback from healthcare professionals to ensure clinical accuracy. **Which UCD principles does this represent? Select all that apply.**

- Iterative Testing and Feedback
- Understanding User Context
- Minimise User Burden
- Multistakeholder Collaboration
- Accessibility and Inclusivity
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Case 5: A real-time patient monitoring system was developed in collaboration with hospital staff. The developers prioritised iterative feedback and ensured the system was accessible to both tech-savvy and non-tech-savvy users by providing multiple interface options (touchscreen and voice control). **Which UCD principles does this represent? Select all that apply.**

- Accessibility and Inclusivity
- Understanding User Context
- Minimise User Burden
- Iterative Testing and Feedback
- Multistakeholder Collaboration
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The interactive version of this H5P content is available at:
https://oercollective.caul.edu.au/health-information-management/?p=88#h5p-26

Safety: Minimising Errors and Enhancing Patient Safety

There is growing evidence regarding how digital health technologies can have a positive impact on patient safety, particularly in reducing errors related to medication management. Westbrook et al. (2022) demonstrated the impact of an electronic medication management system in paediatric hospitals. Over one year, the study found a 36% reduction in overall prescribing errors and a 33% decrease in high-risk medication errors compared to paper-based systems. However, in the first 70 days of implementation, potential adverse drug events increased by 62%, highlighting the need for robust support during the transition. Automated barcode medication administration systems further ensure correct drug delivery to the right patient, reducing administration errors by up to 50% (Poon et al., 2010). Beyond medication safety, telemedicine interventions, such as those reviewed by Grygorian et al. (2024), have improved patient safety in abdominal surgery by reducing hospital readmissions by 33%

and emergency visits through enhanced postoperative monitoring and early detection of complications. Additionally, AI is emerging as a possible transformative technology in enhancing patient safety. AI applications such as early warning systems, predictive analytics, process automation, and personalised treatment have been associated with cost savings through reduced adverse events and improved operational efficiency in hospital settings (Epelde, 2024). Recent evidence underscores AI's potential in refining cancer detection and supporting clinical decision-making in oncology. For example, Mota et al. (2023) investigated the effectiveness of an AI system in delineating prostate cancer boundaries to enhance diagnostic precision. The study compared the AI's performance to that of expert radiologists, assessing accuracy and agreement with pathology results. The results showed that the AI system significantly improved detection and delineation of prostate cancer, providing reliable support for clinical decision-making and treatment planning. These evidence-based examples emphasise the critical role of digital health technologies in minimising errors and promoting safer, more coordinated healthcare practices.

Interoperability and Information Sharing

Seamless information exchange is essential for improving

patient outcomes, reducing healthcare costs, and ensuring continuity of care by enabling timely access to accurate and comprehensive patient information (Bates & Samal, 2018). This is enabled by enabling interoperability across the digital ecosystem in healthcare services.

Interoperability, Information Standards and Protocols: Ensuring Seamless Information Exchange

Interoperability in healthcare refers to the ability of different information systems, devices, and applications to access, exchange, and cooperatively use data in a coordinated manner across organisational, regional, and national boundaries (HIMSS, 2021). Interoperability can be categorised into foundational, structural, and semantic types. Foundational interoperability allows basic data exchange without requiring interpretation, structural interoperability ensures data exchange is organised and preserved, and semantic interoperability enables systems to interpret and use the exchanged data meaningfully (Hughes & Karla, 2023).

Standards and protocols play a crucial role in enabling this seamless exchange of information. The International Organization for Standardization (ISO) and the European Committee for Standardization (CEN) have also been

instrumental in setting guidelines for global health data exchange. For example, ISO/TS 13940:2015 provides principles and definitions to harmonize healthcare information (ISO, 2015). The adoption of coding systems like SNOMED CT and ICD-10 further ensures consistent representation of clinical data, enhancing its usability across systems (Chang & Mostafa, 2021). The global push for interoperability is underscored by initiatives like the Global Digital Health Partnership, which fosters international collaboration to improve health outcomes through standardised data exchange (Rucker et al., 2020). Regulatory frameworks such as the General Data Protection Regulation in the European Union (Voigt & Bussche, 2017) and the Health Insurance Portability and Accountability Act in the United States (Edemekong et al., 2024) also emphasise secure, standardised data sharing practices.

The adoption of universal standards ensures that healthcare data is comprehensible and usable, regardless of the system or technology used. Key standards like Health Level Seven (HL7), Fast Healthcare Interoperability Resources (FHIR), and Digital Imaging and Communications in Medicine are widely recognised for enabling interoperability (HL7 International, 2023; Vorisek et al. 2022, Graham et al. 2005). HL7 and FHIR provide frameworks for structuring and exchanging health information (HL7 International, 2023; Mandl et al., 2016). While HL7 has been foundational in the development of healthcare communication standards, FHIR,

introduced more recently, leverages modern web technologies such as RESTful APIs to facilitate real-time data sharing and interoperability (Mandel et al., 2016; HL7 International, 2023).

Challenges: Addressing Barriers to Effective Information Sharing

Despite advancements in health information exchange, significant challenges impede effective interoperability. Key barriers include technological fragmentation, data privacy concerns, and organisational resistance (Abell et al. 2023). These issues collectively hinder the realisation of integrated, patient-centric care.

Technological fragmentation: This arises from disparate healthcare systems and platforms, which often use proprietary data formats. As noted by Peiris et al. (2024), the lack of uniform standards across vendors leads to data silos, where critical patient information is trapped within specific systems. Legacy systems in many healthcare facilities also cannot easily integrate with modern technologies, necessitating costly upgrades or replacements (Tariq et al., 2014; Walker et al. 2005).

Data privacy and security: Cybersecurity threats, including data breaches and ransomware attacks, compromise patient trust and deter organisations from fully embracing interoperability (Kruse et al., 2017). Regulations like General

Data Protection Regulation and the Health Insurance Portability and Accountability Act aim to mitigate these risks but often create additional complexities, particularly for multinational organisations navigating diverse compliance requirements (Voigt & Bussche, 2017). An explanation of European and United States compliance requirements can be found here **GDPR** and **HIPAA**.

Organisational and cultural barriers: Resistance to change, whether due to financial constraints, lack of technical expertise, or perceived threats to competitive advantage, often slows down the adoption of interoperable systems (Fernando et al., 2024). Financial disincentives, such as the cost of implementation and maintenance, are also among the top reasons for delayed interoperability projects (Holmgren et al. 2017).

Data ownership and governance: Ethical concerns regarding data ownership and consent further complicate information sharing. While patients own their health data in principle, inconsistencies in laws and policies across regions create ambiguity in data access rights. For example, a review by Khatri and Assefa (2023) highlighted significant disparities in patient data governance frameworks, which undermine international data exchange efforts.

Limitations in standards adoption: Variability in information standards adoption, especially across low and middle-income countries (LMICs), creates disparities in health data exchange capabilities (Borges et al. 2023). Harmonisation

between older legacy systems and modern platforms also remains a significant hurdle.

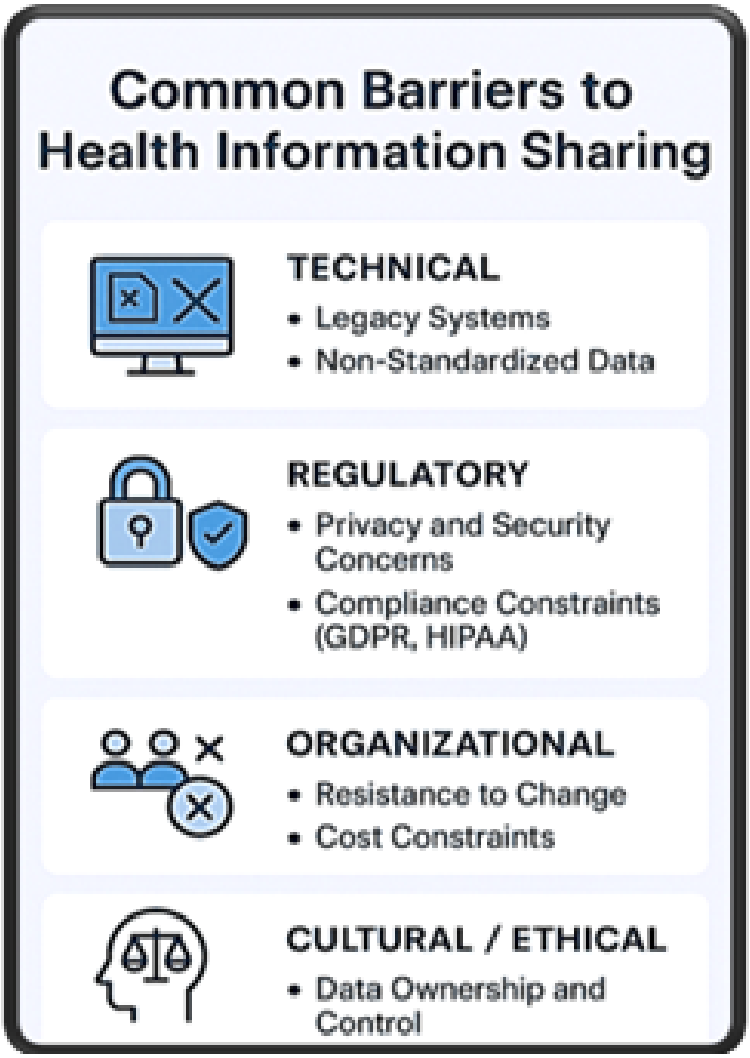


Figure 2. Common Barriers to Health Information Sharing.

Addressing these barriers requires a multifaceted approach. Investments in standardised, interoperable systems must be complemented by robust policies that prioritise data security and patient consent (Khatri et al., 2023). Capacity-building initiatives, particularly in LMICs, are essential to equip healthcare providers with the skills and resources needed to implement interoperable technologies. Collaborative efforts, such as those by the World Health Organization (2021) aim to bridge these gaps by promoting universal health coverage through digital health technologies.

Risk Management

Identifying Risks: Potential Issues in Health Informatics

While digital health and health informatics offer substantial benefits, they also come with several risks that need to be managed effectively. One major concern is data security and patient privacy. Healthcare data is highly sensitive, and breaches can lead to significant consequences, including identity theft, financial loss, and loss of trust in healthcare systems (Rindfleisch, 1997). Cybersecurity threats such as ransomware attacks on healthcare organisations highlight the vulnerabilities within health IT systems (Ewoh & Vartiainen,

2024). Further reading on Cybersecurity and Cyber Risk Management is provided in other chapters in this text.

Another risk is the lack of interoperability between different digital health systems. Many healthcare systems use diverse platforms and technologies for managing patient data, which can create silos that hinder information exchange. This lack of interoperability can lead to incomplete or inaccurate patient records, impacting the quality of care (Li et al., 2022).

The integration of AI and machine learning in healthcare also presents challenges, particularly regarding algorithmic bias and the potential for inequities in care. AI models are trained on data that may not represent all demographic groups equally, which can result in biased outcomes, particularly for minority or underserved populations (Obermeyer et al., 2019). To ensure AI tools contribute positively to healthcare, it is crucial to design collaborative human-AI systems and address ethical, legal, and social frameworks that govern their integration (Iqbal et al., 2020).

Mitigation Strategies: Approaches to Managing and Reducing Risks

Addressing the risks associated with digital health requires a multi-pronged approach, including robust cybersecurity measures, standardisation of health data systems, and careful

oversight of AI tools. To mitigate cybersecurity risks, healthcare organisations should adopt end-to-end encryption, regularly conduct security audits, and comply with data protection laws like that from the United States, **HIPAA** (Buntin et al., 2011). The use of secure cloud storage and identity authentication protocols can further enhance the security of health data.

To tackle interoperability issues, it is essential to adopt standardised frameworks for health data exchange, such as the Fast Healthcare Interoperability Resources standard, which enables seamless sharing of patient information between different health systems (Lambrecht et al., 2019). Promoting the adoption of integrated IT platforms that combine EHRs, telemedicine, and patient portals into a single system can also improve data flow and reduce errors.

In the case of AI and machine learning, healthcare organisations must ensure transparency and accountability in algorithm development. Regular audits should be conducted to assess the fairness and performance of AI tools, and algorithms should be trained on diverse, representative datasets to avoid biases (Obermeyer et al., 2019). Moreover, AI should be used as a decision-support tool, with final decisions always remaining in the hands of qualified healthcare professionals. AI has significant potential in revolutionising healthcare by enabling personalised treatment plans and earlier interventions, through predictive models and big data analytics (Iqbal et al., 2024).

Summary

Health informatics and digital health are playing a transformative role in modern healthcare, offering solutions to longstanding issues such as inefficiencies in care delivery, disparities in healthcare access, and the management of chronic diseases. However, the adoption of these technologies is not without its challenges. Data privacy and security, interoperability, and the ethical use of AI are key risks that must be addressed through comprehensive risk management strategies (Cuff, 2023 and Rashid et al. 2025).

Implementing strong cybersecurity practices, promoting data standardisation, and ensuring that AI tools are equitable and transparent will enable healthcare organisations to harness the potential of digital health while minimising the associated risks. The future of healthcare lies in the effective integration of digital health technologies, with the goal of improving patient outcomes, optimising healthcare delivery, and ensuring that these innovations are accessible to all. The integration of AI tools requires a balanced approach to minimise risks while maximising benefits (Iqbal et al., 2020).

Future Directions in Health Informatics and Digital Health

Looking ahead, several key trends are likely to shape the future

of health informatics and digital health. One of the most promising areas is the use of **precision medicine**, which tailors medical treatment to individual genetic profiles, lifestyle factors, and other unique characteristics (Collins & Varmus, 2015). Advancements in genomics, combined with big data analytics and AI, will make it increasingly possible to provide personalised care that is more effective and cost-efficient.

The **growth of telehealth, telemedicine and remote patient monitoring** will continue to expand, particularly as healthcare systems around the world work to increase access to care, especially in rural and underserved regions. The ongoing development of **5G networks** and improved mobile technologies will support real-time communication between healthcare providers and patients, enabling faster diagnosis and treatment.

Current evidence strongly supports the potential of AI to transform diagnostics and patient management (Wang, 2023). Machine learning, deep learning, and NLP are driving innovations in image analysis, clinical documentation, predictive analytics, and automation. While challenges remain in terms of data availability, model interpretability, and regulatory approval, ongoing research and development efforts are paving the way for wider adoption of AI in healthcare (Reddy & Shaikh, 2025). As these technologies mature, we can expect to see even more sophisticated AI models that will further enhance the accuracy, efficiency, and personalisation of healthcare delivery. However, it is crucial to address the

ethical, privacy, and regulatory challenges associated with AI implementation to ensure its responsible and equitable adoption across the healthcare sector.

Moreover, **blockchain technology** holds promise for enhancing data security and patient consent management. By providing decentralised, tamper-proof records of health data transactions, blockchain can increase transparency, improve data privacy, and facilitate secure data sharing across multiple stakeholders (Agbo et al., 2019).

As digital health technologies continue to evolve, it is critical to ensure that these innovations are implemented equitably, providing benefits to all populations, regardless of socioeconomic status or geographic location. Addressing both the opportunities and risks associated with health informatics will enable healthcare systems to create a more efficient, secure, and patient-centred future.

Activity Reflection

Identify three challenges in health and consider:

- How might a digital solution contribute to addressing the problem or challenge?

- Consider emerging technologies and the role they could play in addressing the problem or challenge?

Possible challenges and solutions

Healthcare access in remote areas continues to affect healthcare systems globally. Through telehealth, telemedicine and remote patient monitoring, we're seeing changes in care delivery. Patients in remote locations can connect with healthcare providers through video consultations, while wearable devices and IoT sensors, powered by 5G technology, enable continuous health monitoring. This digital connection is removing geographical barriers and bringing healthcare to underserved communities.

Mental health service delivery, can be supported through digital platforms. AI-powered chatbots can provide 24/7 support, while virtual therapy sessions make mental health care more accessible. These solutions, enhanced by machine learning and natural language processing, can detect early warning signs and provide timely interventions. Virtual Reality applications offer new approaches to exposure therapy and treatment.

Chronic disease management, can be improved through integrated care management platforms. These systems combine personal health apps, digital health records, and automated monitoring to create a comprehensive care system. Emerging technologies like predictive analytics and blockchain are enabling early intervention and secure data sharing. Smart devices for automated medication dispensing are improving treatment adherence, while coordinated care platforms ensure healthcare providers have access to patient information.

These digital solutions are creating a more connected and efficient healthcare system. By using emerging technologies, we can address current challenges while developing a framework for future healthcare improvements that support better outcomes and more accessible care.

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ELECTRONIC MEDICAL AND HEALTH RECORDS

Willy Chan; Sheree Lloyd; and Helen Almond

Learning Outcomes

- Understand the health information management considerations for electronic medical records (EMRs)/electronic health records (EHRs) at various levels and their impact on healthcare delivery, consumers, and data management.
- Evaluate the factors in choosing an EMR solution, including functionality, usability, interoperability standards, and resources to make decisions and introduce solutions to enhance healthcare operations.
- Identify the success factors and challenges in the implementation and maturation of EMR/EHR systems.
- Propose solutions to address challenges to EMR/EHR implementation, maximising their value and effectiveness.

Introduction

Electronic medical records (EMRs) and electronic health records (EHRs) represent a significant advancement in the management of health information. Digital records are designed to streamline the collection, storage, retrieval, and sharing of health information, ultimately improving the quality of care. Digital records capture structured and unstructured data and can be analysed to understand health service utilisation, disease, and treatment patterns. This chapter explores the considerations for managing health information through EMRs and EHRs, examining their distinctions, implementation, and impact.

Background and Context

EMRs are foundational to a digitally enabled healthcare system. Organisational EMRs collect vast volumes of data at a very granular level. Countries such as Singapore and Australia have implemented longitudinal health summary records often referred to as EHRs providing vital information across jurisdictions and compiling a lifelong health repository. In Europe, the United Kingdom, and other countries, the term *electronic health record* refers to clinical records maintained by hospitals, primary care, and aged care providers. In Australia, *electronic medical record* is used to describe detailed records

held by healthcare providers, while *electronic health records* are a longitudinal digital record accessible by healthcare providers and users.

Healthcare systems that are responsive to health care user needs and preferences can lead to better health outcomes and a more efficient healthcare system (Havana et al., 2023). Digital health solutions such as electronic health and medical records are vital to support the delivery of care at the right time, in the right place and by the appropriate provider. EMRs and EHRs are implemented to support clinicians and healthcare providers to provide seamless and integrated care, and support health care users to achieve improved health outcomes Owens et al cited in (Almond & Mather, 2023). Person-centred service delivery can empower individuals to manage their health, disease, and treatment (Havana et al., 2023). Real-time access to health information enhances decision-making, personalised care, and fosters collaboration between users and providers.

Achieving the United Nations' Sustainable Development Goals (SDGs), particularly Goal 3: Good Health and Well-Being, requires innovative approaches to improve healthcare delivery, equity, and outcomes on a global scale (United Nations, 2023). Health information systems, particularly EMRs and EHRs, play a central role in supporting these objectives by providing a foundation for data-driven decision-making and resource allocation (Stephen et al., 2024; Vos et al., 2020). These digital tools can facilitate the collection, management, and analysis of health user information,

enhancing healthcare operations while tracking progress toward SDG health targets (United Nations, 2023). The chapter on Patient Safety and Sustainable Development Goals Through the Lens of Health Information Management also describes this integral role.

Data from EMRs/EHRs can drive healthcare improvement and performance. Predictive analytics using routinely collected data can enhance healthcare outcomes by identifying trends, optimising resources, and supporting preventive health measures (Canfell, Chan, et al., 2024; Kumar & Suthar, 2024; Obermeyer et al., 2019).

This chapter explores the importance of longitudinal records and data linkage, and the critical factors for successful EMR implementation. The functionality and usability of EMRs, adoption of interoperability standards, and maturity and value of EMR systems are also examined. The goal is to highlight how EMRs can transform healthcare delivery into a more efficient, effective, and person-focused system.

Difference Between EMR and EHR

The introduction touched on the difference between EMRs and EHRs. This differentiation is important. Essentially, EMRs are digital counterparts to traditional paper charts, primarily used to document a person's diagnosis and

treatment history within a single healthcare setting, such as a hospital, community health centre, aged care home, or general practice. EMRs have the potential to streamline clinical workflows, improve record-keeping, and enhance patient care within that specific organisation. In contrast, EHRs are designed to transcend individual care settings by enabling the secure sharing of health information across multiple providers, organisations, and even with healthcare users themselves (McGinn et al., 2012). EHRs serve as a comprehensive, **longitudinal health record**, capturing data from "cradle to grave" to provide a holistic view of an individual's health journey over their lifetime. This fundamental distinction highlights the broader, integrative role of EHRs in supporting coordinated care, enhancing healthcare user outcomes, and driving population health initiatives; whereas EMRs remain important for managing care at a local organisational level. Understanding these differences is critical to appreciating their respective contributions to modern healthcare systems and achieving data-driven improvements in care delivery.

Activity Watch and Reflect

This video explains the difference between EMRs

and EHRs. Reflect on the benefits of digitised health information. Consider the challenges and barriers of adopting an organisational or national health record.



One or more interactive elements has been excluded from this version of the text. You can view them online here: https://oercollective.caul.edu.au/health-information-management/?p=90#oembed-1

Health Information Management Considerations for EMRs/EHRs

EMR/EHR systems provide significant benefits for data management, healthcare providers, and consumers. By consolidating healthcare user data, including demographics, medical history, treatments, and outcomes, these systems ensure standardised, real-time data availability for clinical decision-making, resource allocation, and health policy development (Serbanati, 2020). At an institutional level, they

can enhance operational efficiency by avoiding repeat diagnostics and medication interactions and improving workflows. For consumers, EMR/EHR systems enable better access to personal health information, fostering greater healthcare user engagement and autonomy in care management (Serbanati, 2020). However, successful implementation requires leadership, change and project management, resource allocation (Abdelhak & Hanken, 2016; Arabi et al., 2022), data security, privacy, governance, and interoperability to maximise their impact across the health ecosystem (Tertulino et al., 2024).

Selecting an appropriate EMR solution is a critical step in enhancing healthcare. This section outlines the key factors that decision-makers must evaluate to ensure the chosen system meets the needs of their healthcare environment.

> **"People need reasons to change. A case for change is a concise collection of evidence that can be easily communicated to demonstrate the reasons for change and the risks of not changing. Taking the time to develop a convincing case for change is a worthwhile investment as it will help stakeholders clearly understand what, why and how of your project (NSW Agency for Clinical Innovation, 2024)"**

Leadership and project and change management are vital for EMR adoption. Effective leadership involves developing a clear vision with realistic goals to gain commitment to the project. Successful EMR implementation requires a leadership team

that includes practicing clinicians from all professional streams (Scott et al., 2019), reflecting users' key role in adoption. Training and support are essential components of implementation. Conducting well-timed training sessions tailored to address the specific needs of staff ensures that all users are adequately prepared to utilise the new system. Continuous technical support provides a safety net as staff adapt to the technology. Workflow redesign is essential to assess and improve existing workflows to integrate the EMR system into daily operations (Scott et al., 2019). This ensures that the new system enhances, rather than disrupts, the efficiency of healthcare delivery (Arabi et al., 2022).

Change management is often neglected during EMR implementation and is key to success. Project management helps to ensure EMR projects are achieved and completed within budget and time frames. Planning for risks and risk management is integral to successful EMR projects.

Financial considerations, such as understanding and managing costs and potential benefits are important in EMR projects. This involves developing a clear business case prior to implementation and careful budgeting and planning to ensure that the implementation is economically viable (Arabi et al., 2022). Resourcing for clinical and other staff to redesign workflows, and deliver training and support to users must be included in project budgets. When adopting EMRs, it is important to allocate additional resources and dedicate time to lead and manage change and complete the tasks required

for implementation (Greenhalgh & Abimbola, 2019). The availability of technical infrastructure, funding, and skilled personnel is crucial for the EMR implementation. Without adequate resources, even an advanced EMR system may fail to deliver its full potential (Bostan et al., 2024).

EMR implementation presents opportunities and challenges. Success relies on strong change management strategies, comprehensive training programs, and ongoing stakeholder engagement (Arabi et al., 2022; Scott et al., 2019). Critical challenges include resistance to change, high initial costs, technical barriers, and ensuring data privacy and cybersecurity. Achieving interoperability across fragmented healthcare systems remains a significant hurdle (Kosteniuk et al., 2024).

To successfully implement electronic medical and health records, it is crucial to invest in scalable solutions, particularly in resource-limited settings. This ensures systems can grow with operational demands (Rigby & Ammenwerth, 2016; World Health Organization, 2021). Selecting vendors that promote interoperability is important. Adherence to national and global data exchange standards and encouraging cross-platform integration can create unified health information systems that facilitate seamless data sharing and collaboration (Australian Digital Health Agency, 2023; Kuo & Lee, 2018; Palma, 2022).

Prioritising usability and training is essential to ensuring these systems are user-friendly, and clinicians can be supported

to do their work (Lloyd et al., 2021; Lloyd et al., 2024). Through iterative design processes and targeted training programs, healthcare providers can be empowered to use the systems effectively and improve overall efficiency and patient care (Carayon et al., 2021; Tao et al., 2020). Addressing data privacy is also essential. Implementing robust cybersecurity measures, governance frameworks, and legal compliance safeguards against breaches and misuse (Murdoch, 2021; Office of the Australian Information Commissioner, 2023; Ruotsalainen & Blobel, 2020).

Consideration of human factors is essential in the implementation of EMRs. A human factors design focus on the interaction between humans and technology. This consideration ensures that the systems are user-friendly, efficient, and safe. Through understanding human factors, EMR implementation can improve user satisfaction, reduce errors, and enhance overall system performance (Dubé et al., 2025; Kushniruk et al., 2014; Vasquez et al., 2024). Engaging users early in EMR implementation assists in developing solutions that meet healthcare providers and patients' needs.

Private Sector Considerations

The private health sector faces unique challenges during EMR procurement and implementation processes; for example, private providers lack the size of public health care organisations, which can limit an organisation's ability to

leverage economies of scale during the procurement process. Funding drivers for these projects will differ in the private sector, as the funding will need to be generated from existing revenue streams. The drivers for implementing EMRs can differ for private providers, with a focus on the following:

- Improvements in quality of care. By providing comprehensive and up-to-date patient information, EMRs enable healthcare providers to make more informed and timely decisions (Cahill et al., 2025). Standardised data collection templates (Rowlands et al., 2022) and clinical pathways within EMRs help reduce inconsistencies in patient care, and contribute to safer health care (Australian Commission on Safety and Quality in Healthcare, 2021; Neame et al., 2019). EMRs can alert providers to issues such as drug interactions or allergies, thereby reducing the risk of preventable harm. With access to detailed patient histories and evidence-based guidelines, healthcare providers can tailor treatments to each patient's specific needs, enhancing the appropriateness of care. EMRs can facilitate better communication between patients and providers, allowing for personalised and consumer-centred care. Data collected through EMRs can be used to monitor patient outcomes and identify areas for quality improvement, leading to continuous enhancements in healthcare delivery (Keasberry et al., 2017; Shaw et al.,

2018; Woods et al., 2023).

- Compliance with the *Standards for Safety and Quality* and to gain accreditation, including the ability to capture clinical indicators and quality data (Australian Commission on Safety and Quality in Healthcare, 2021). Capturing real-time data in the EMR removes the need for workarounds, reducing manual data collection and collation in spreadsheets and other tools. This creates efficiencies and removes the potential for error. Timely data also enable real-time responses.
- Health insurance fund requirements for data on diagnosis, treatment, and costs that could influence contract negotiations and reporting.
- Integrated care models that require healthcare records that encompass the patient journey from inpatient services to in-home and outpatient care post discharge.

The size of private health care organisations may impact the availability of staff to support large scale implementation. Without the scale of public hospitals, a lack of expertise within organisations will influence procurement and implementation processes and increase the need for external support. The lean staffing models that private providers use increase initial implementation costs because external resources will be required to support the process.

Organisations will often seek partnerships with EMR vendors to reduce the initial outlay and leverage vendors'

expert knowledge. The cost of the EMR and the limited funding streams in private hospitals will influence the choice between best of breed, with modules from multiple vendors versus integrated solution from a single vendor. Integrated solutions often require higher initial expenditure as opposed to spreading the expense over time as each module is implemented. The risk of fragmented systems and the requirements for multi-vendor systems integration is often traded for lower cost products.

Addressing these considerations and challenges, EMR/EHR systems can play a transformative role in achieving SDG health-related targets. Through their ability to provide foundational health data, enhance care delivery, and drive policy interventions, these systems contribute to a more sustainable, equitable, and data-driven healthcare future.

Health Information Management at Various Levels

Health information management (HIM) professionals play a pivotal role in leading EMR adoption, ensuring that systems meet user requirements, comply with privacy regulations, and advocate for interoperability at various levels of healthcare delivery. From individual providers to nationwide health

systems, each level presents unique challenges and opportunities for HIM practices.

Provider Level

At the provider level, EMRs are used to manage health information within a single setting. EMRs have been implemented in community health centres, primary care practitioner's offices (GPs, allied health practitioners), and aged and acute care settings. At the provider level, the EMR is the electronic version of the paper chart. Advantages of the EMR are that it can be viewed by more than one healthcare provider at a time in real-time and data can be analysed to understand health trends and patterns of utilisation within the setting. Provider EMRs offer various functionalities, including scheduling, clinical documentation, and prescription and medication management. In the United States, where many EMR vendors have originated, these systems have also been implemented to maximise billing and reimbursement. Provider EMRs have been identified to improve efficiency, reduce errors, and enhance care by providing quick access to health information (Canfell, Woods, et al., 2024; Woods et al., 2023). However, downsides have been identified in the literature, including burnout, data burden, note bloat, and usability (Hettinger et al., 2021; Kaipio et al., 2019; Kushniruk et al., 2014; Lloyd et al., 2021; Lloyd et al., 2024; Melnick et al., 2021; Thomas Craig et al., 2021; Tyllinen et al., 2018).

Case Study and Reflection – Technology in General Practice – Enhancing Patient Care

Background

Dr. Emily Chen is a GP operating a busy clinic. Like many modern healthcare providers, she faces challenges in managing her patients' records, appointments, and the increasing demand for telehealth consultations. To address these, Dr. Chen has implemented a comprehensive practice management software system.

Problem

Before adopting the software, Dr. Chen's clinic struggled with:

- Managing paper-based records, leading to inefficiencies and errors.
- High rates of missed appointments due to lack of reminders.
- Complex billing processes requiring manual

Medicare claims submissions.
- Difficulty in tracking patient progress for chronic diseases.

Solution

Dr. Chen chose a popular practice management software, to streamline her clinic's operations. The system offered key functionalities:

- **Electronic medical records:** Securely store patient data, including medical history, medications, and test results. The solution also seamlessly interfaces external systems (My Health Record, Australia's EHR for example).
- **Appointment scheduling:** Enable online booking and send automated reminders.
- **Billing integration:** Simplify invoicing with Medicare and Worker's Compensation claims for patients.
- **Pathology and imaging integration:** Allow seamless ordering and viewing of results.
- **Telehealth support:** Facilitate virtual consultations with secure video conferencing.

Outcomes

Since implementing practice management software, Dr. Chen's clinic has seen significant improvements:

1. Efficiency gains: Reduced paperwork and faster access to patient information.
2. Fewer missed appointments: Automated reminders lowered no-show rates by 25%.
3. Improved patient care: Alerts for medication interactions and streamlined test result management enhanced clinical decision-making.
4. Revenue management: Integrated billing reduced claim rejections and saved administrative time.
5. Better chronic disease management: Data analytics helped track and improve care for patients with long-term conditions.

Key Learning Points

- Software selection: Choosing the right practice management software is critical to meeting specific clinic needs.

- Staff training: Ensuring all staff are well-trained in using the software maximises its potential.
- Integration: Effective integration with Medicare, pathology, and telehealth services enhances both efficiency and patient outcomes.
- Adaptation: Adopting technology helps GPs adapt to the increasing demand for digital healthcare solutions.

Reflection Questions

- How could practice management software improve patient care in other healthcare settings?
- What challenges might clinics face when transitioning to digital systems?
- How can GPs ensure patient data remain secure with electronic health records?

Network Level

At the network level, the summary EHR can facilitate the

sharing of health information across multiple providers, improving coordination of care. In New South Wales (NSW), Australia, hospitals within each local health district utilise a unified instance of the EMR (eHealth NSW, 2025). This approach enables seamless sharing of patient information across facilities within the same district.

Regional Level

Regional health information systems share health information across different healthcare providers within a region, enhancing public health monitoring and response. Different approaches have been adopted to address this, with some Australian states moving to a single digital patient record (eHealth NSW, 2025). Tasmania aspires to an EMR that integrates pre-hospital and hospital records (Tasmanian Department of Health, 2022)

Hong Kong Hospital Authority's EMR, the Clinical Management System serves as a unified platform for managing patient records across all public hospitals (Hong Kong Government, 2020). Complementing this, the Electronic Health Record Sharing System facilitates data sharing between public and private health providers, enabling a patient-centric approach to care (Hong Kong Government, 2020).

National Level

At a national level, summary EHRs support large-scale health information exchanges, enabling comprehensive data analysis for policymaking and research. In a country such as Australia, this means that valuable summary health information can be accessed outside of the consumer's state of residence and be available when travelling in the event of ill health (Australian Digital Health Agency, 2024).

In the 2021 survey conducted by the Organisation for Economic Co-operation and Development (OCED), several countries reported they had implemented nationwide EHRs including Estonia, Finland, Hungary, and Iceland (Slawomirski et al., 2023).

Longitudinal Records and Data Linkage

Longitudinal records support data collection and the ability to track information over time, providing a comprehensive view of an individual or population's health. Data linkage involves connecting different data sources to create longitudinal records.

Singapore's National Electronic Health Record system is designed to create a unified health record for each patient, known as the "One Patient, One Health Record" initiative

(Ministry of Health Singapore, 2025). This system allows healthcare providers across the country to access a patient's summary health record securely and efficiently, ensuring coordinated and patient-centric care (Ministry of Health Singapore, 2025; synapxe). The National Electronic Health Record includes key health information, such as patient demographics, admission and visit history, discharge summaries, lab test results, radiology results, medication history, and records of surgeries or procedures. This centralised repository helps reduce duplicate tests, minimise medical errors, and improve the overall quality of care (Ministry of Health Singapore, 2025; synapxe).

Australia has made large investments in the My Health Record system over many years and is available to all citizens (Australian Digital Health Agency, 2024). The My Health Record is a secure online summary of health information, allowing consumers and their healthcare providers to access and share health information for better coordinated care. It includes personal health summaries, Medicare information, and emergency contacts, with personal control over managing access (Australian Digital Health Agency, 2024).

Activity – Shared Healthcare Records

Web Exploration of Shared Healthcare Records

- Visit Singapore's digital health platform HealthHub [opens in new tab] and the My Health Record website [opens in new tab]. Navigate these websites to understand how each system works. Look for features such as viewing medical records, managing appointments, and accessing lab results.
- While exploring the websites, take notes on the following:
    - Key features of each health record system.
    - How patients can access and manage their health information.
    - Security measures in place to protect patient data.

Key Features of Each Health Record System

Singapore's HealthHub

- Appointment management: View, book, reschedule, and cancel medical appointments.
- Lab results: Access lab test results, health screenings, and immunisation records.
- Medication management: Request medication refills or renew prescriptions digitally.
- Family health management: Access and manage health records of loved ones after adding their profiles (Ministry of Health Singapore, 2025).

Australia's My Health Record

- Shared health summary: Contains an overview of the patient's health status, including medical history, medications, and allergies.
- Pathology and diagnostic imaging results: Laboratories and imaging providers can upload results directly to the record.
- Specialist letters: Correspondence between

specialists and GPs is available.
- Advance care planning: Store advance care directives and other legal documents related to care.
- Medicare and Pharmaceutical Benefit Scheme claims history: Includes claims history for easier review of medications (Australian Digital Health Agency, 2024).

How Patients Can Access and Manage Their Health Information

Singapore's HealthHub

- Patients can access their health information through the HealthHub website or mobile app.
- They can view their NEHR records, including medications, drug allergies, and laboratory results.
- The app allows patients to see which healthcare institutions have accessed their records and receive notifications when their records are accessed (Ministry of Health Singapore, 2025).

Australia's My Health Record

- Patients can access their health information online through the My Health Record website or mobile app.
- They can view their medical records, including allergies, medications, immunisations, hospital discharge summaries, and test results.
- Patients can control who views their information by setting access controls and receiving notifications when their record is accessed (Australian Digital Health Agency, 2024).

Security Measures in Place to Protect Patient Data

Singapore's HealthHub

- Access control: Implementing access control measures to ensure only authorised personnel can access data.
- Data encryption: Encrypting data to protect it from unauthorised access.
- Audit logs: Keeping audit logs to track access to records.

- Regular security updates: Installing software updates promptly to protect against vulnerabilities (Ministry of Health Singapore, 2023).

Australia's My Health Record

- Firewalls: Using firewalls to block unauthorised access.
- Audit logs: Maintaining audit logs to track access to records.
- Anti-virus scanning: Conducting initial and regular anti-virus scanning of documents uploaded to records.
- System monitoring: Monitoring the system to detect suspicious activity (Australian Digital Health Agency, 2025).

Implementation and Health Information Management Practice

Introducing an EMR system involves key considerations for HIM practice. HIM professionals work to ensure that effective

governance of record systems is in place (Kemp et al., 2021). Health information professionals are involved in all phases of EMR acquisition from inception, to development of the business case, to selection of products, and finally, implementation.

Ensuring interoperability and integration with existing systems is critical to avoid data duplication. Establishing reference files for demographic details, disease classification, provider codes, and other key data items ensures consistency and accuracy. Standardised codes and terminologies help avoid errors and discrepancies enabling effective data analytics and reporting. Structured and standardised data formats support trend analysis, performance measurement, audit, data quality assessment, and service improvement. (Abdelhak & Hanken, 2016; Hardy, 2024; Owen et al., 2023).

The figure below shows the reference architecture for a health information system and would be tailored to meet reporting and stakeholder requirements (Tummers et al., 2021). This figure provides an example of where reference files may be necessary. Hospitals and general practices should collect data in standardised formats to ensure that the information is comparable and can be aggregated for national health statistics and research. Reference files and data dictionaries are critical requirements for the Australian Institute of Health and Welfare (2025), as they provide standardised terms and protocols for data collection, and maintain consistency across health, community services, and

housing sectors, supporting reliable national data collection and reporting, which is essential for informed decision-making and policy development.

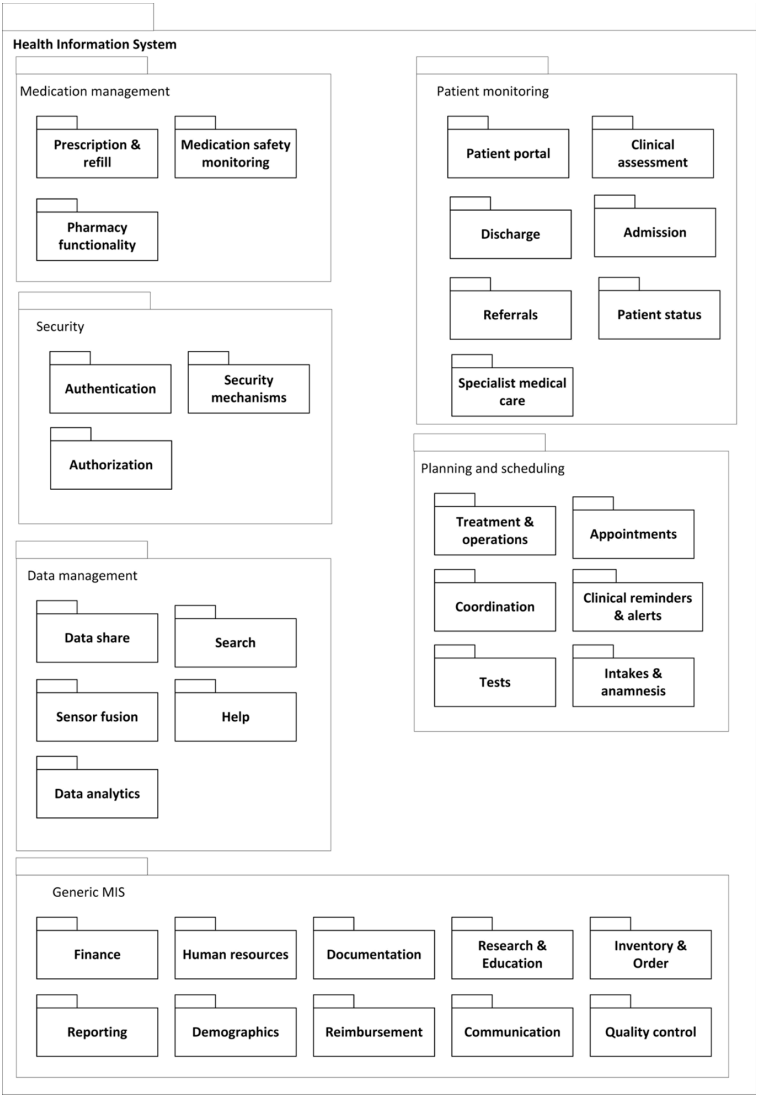


Figure 1. "The reference decomposition view of the HIS" by Joep Tummers, Hilde Tobi, Cagatay Catal, and Bedir Tekinerdogan, in Designing a reference architecture for health information systems is licensed under CC BY 4.0 [Go to image description]

HIM professionals are central to data integrity, quality, and accuracy in EMR systems. When entering information into an EMR system, it is important to consider the methods used for data capture and ways to reduce the data collection burden for staff (Sittig et al., 2025). This can be achieved by interfaces between EMR systems and monitoring devices, voice capture, templates, scanning, and the use of bar-codes. Data quality measures help avoid "garbage in, garbage out", where inaccurate data leads to unreliable and contested outputs.

Protecting consumer and patient information is an essential concern for health information managers and in any EMR or information system implementation. Robust security measures, such as encryption, access controls, and regular security assessments are essential to prevent unauthorised access and data breaches (Boonstra et al., 2014; Sittig et al., 2025). The EMR system and complementary systems like medical imaging and pathology must be able to communicate and exchange data seamlessly with other healthcare systems and providers; while a commitment to standards and their adoption is essential to support continuity of care and comprehensive patient records (Boonstra et al., 2014; Sittig et al., 2025).

Adequate and fit for purpose training and support are vital for effective EMR use, particularly in the highly mobile healthcare workforce (Ting et al., 2021). Continuous education ensures staff and clinicians can leverage new system features and software upgrades. HIM professionals often lead

upskilling efforts for professional, administrative, and coding staff.

Compliance with relevant laws and regulations, such as Australia's *Privacy Act* and *Freedom of Information Act* is another critical aspect of EMR implementation (Office of the Australian Information Commissioner, 1982, 1988). HIM professionals ensure proper reporting and adherence to legal requirements. Workflow redesign and effective change management strategies are essential to a smooth transition and to address any resistance from staff during EMR implementation (Boonstra et al., 2014).

Functionality and Usability of EMRs

EMRs are designed to enhance healthcare delivery by digitising information and streamlining workflows. The EMR system's functionality must support core clinical operations, including healthcare user documentation, decision support, and reporting capabilities. These functionalities are essential for maintaining comprehensive, contemporaneous and accurate clinical records, crucial for effective and safe patient care (Australian Commission on Safety and Quality in Healthcare, 2021; Bhati et al., 2023; Sittig et al., 2025). The table below shows the EMR functionalities that should be considered when purchasing solutions.

Table 1. Core functionality for EMR systems.

Functionality	Description
Clinical Documentation	To capture medical histories and progress notes in a structured searchable format. Supporting unstructured data such as clinical notes (Abdelhak & Hanken, 2016). AI scribes are now being trialled and integrated into EMR systems used in primary and acute sectors (Scott et al., 2021; Scott et al., 2024). To improve legibility of records (Koh & Ahmed, 2021).
Order Entry and Referral	To enable clinicians to electronically prescribe medications, order tests, and request referrals (Abdelhak & Hanken, 2016). To prevent medication errors (Cahill et al., 2025)
Decision Support	To support leader and manager decision making, safety and quality. Integrated clinical decision support systems provide real-time alerts, reminders and guidance. Real-time data for bed management, discharge planning and operational decision making can be reported to support leaders and managers (Abdelhak & Hanken, 2016).

Functionality	Description
Standards compliance for data sharing	To provide support for sharing of data from and with laboratory, radiology, and imaging systems, allowing results to interface directly into the health record for easy review. To assist data sharing and exchange within and across healthcare settings, supporting continuity of care and collaborative decision-making (Abdelhak & Hanken, 2016; Owen et al., 2023).
Patient Portals and Digital Front Door	To enable individuals to access their health records, view test results and communicate with providers (Bärkås et al., 2023; Shaw et al., 2018). EMRs can support patient portals through applications that interface to organisational health records and allow individuals to book appointments and schedule telehealth consultations enabling patient empowerment and control.

Useability Considerations

According to ISO/IEC 9241-11, usability is the degree to which a product or service can be used by specific users to achieve specific goals with effectiveness, efficiency, and satisfaction in a given context of use (International Standards Organisation, 2010). The EMR system must be intuitive and user-friendly to minimise the burden on clinicians and

optimise adoption (Lloyd et al., 2021; Lloyd et al., 2024). A system that is difficult to navigate can lead to frustration and decreased efficiency, whereas a user-friendly interface can enhance productivity and satisfaction among healthcare providers (Franks et al., 2024). Interfaces should be learnable and intuitive, enabling users to locate and input information quickly, ensuring ease of navigation. As overloading users with alerts and excessive information can lead to "alert fatigue" (Henry, 2023; Lloyd et al., 2024; Thomas Craig et al., 2021), cognitive load reduction is essential. EMRs must align with clinical workflows, supporting rather than hindering tasks to ensure seamless integration with workflows (Donohue-Ryan et al., 2023; Lloyd et al., 2024). Features such as error-checking algorithms and clear visual layouts help minimise errors and reduce the risk of data entry mistakes. Systems should be accessible across devices, such as desktops, tablets, and mobiles, enabling clinicians to work efficiently from any location.

Usability principles can be applied to improve user experience through appropriately designed user interfaces (Nielsen, 2024). Nielsen's (2024) usability heuristics are practical rules of thumb when evaluating EMR systems.

Activity Usability Heuristics

Explore Neilsen's (2024) Usability Heuristics [opens in new tab]

Reflect on the features that should be included in the design of an EMR system to improve user experience in EMR.

Items you might consider include:

The application of Nielsen's (2024) Usability Heuristics in the design of EMR systems can enhance user experience. These heuristics provide a framework for evaluating and improving the usability of EMR interfaces, which is essential given the complexity and critical nature of healthcare data management.

1. **Visibility of system status**: EMR systems must keep users informed about the status of their actions, such as data entry or retrieval processes. Clear feedback mechanisms, like progress indicators, help reduce uncertainty and enhance user confidence.
2. **Correlation between the system and the real world**: Using familiar medical terminology and conventions in EMR interfaces ensures that healthcare

professionals can easily understand and navigate the system. This alignment with real-world practices minimises the learning curve and potential errors.

3. **User control and freedom**: EMR systems should allow users to easily undo or redo actions, providing flexibility and reducing the risk of irreversible errors. This is particularly important in medical settings, where mistakes can have serious consequences.
4. **Consistency and standards**: Consistent design and adherence to established standards across different modules of the EMR system help users predict and understand system behaviour, thereby improving usability and reducing cognitive load.
5. **Error prevention**: Implementing proactive measures to prevent errors, such as validation checks and confirmation dialogues, is vital in EMR systems to ensure data accuracy and patient safety.
6. **Recognition rather than recall**: EMR interfaces should facilitate recognition over recall by providing visible options and actions,

reducing the need for users to remember information from one part of the system to another.

7. **Flexibility and efficiency of use**: EMR systems should cater to both novice and expert users by offering shortcuts and customisable workflows, enhancing efficiency and user satisfaction.
8. **Aesthetic and minimalist design**: A clean and uncluttered interface helps users focus on essential tasks without being overwhelmed by unnecessary information, which is critical in high-pressure healthcare environments.
9. **Help users with errors**: Providing clear, actionable error messages and guidance helps users recover from mistakes quickly and effectively, maintaining the integrity of medical records.
10. **Help and documentation**: Comprehensive help resources and documentation should be readily accessible within the EMR system to assist users to resolve issues and understand functionalities.

A positive user experience is essential for widespread user

adoption and satisfaction. Responsiveness to user inputs and the ability to customise the EMR to meet specific needs (templates, dashboards) can improve documentation quality (Rowlands et al., 2022; Smelcer et al., 2009). Features to support team-based care and documentation, and flexible documentation methods that complement clinician workflow and reduce documentation burden by reducing duplication have been identified as important (Rowlands et al., 2022). Excessive copying and pasting of text can lead to lengthy, cluttered notes, referred to as "note bloat" (Lloyd et al., 2024). EMRs should encourage concise, meaningful documentation while providing sufficient context (Strudwick et al., 2022) and enhance the patient experience by facilitating communication and transparency. Features like patient portals and shared decision-making tools help achieve this goal (Warren et al., 2019). Incorporating user feedback into system updates ensures that the EMR evolves to meet the changing needs of its users.

Case Study EMR Usability and Nursing Perspectives

Read the paper and reflect on key themes.

An interactive H5P element has been excluded from this version of the text. You can view it online here: https://oercollective.caul.edu.au/health-information-management/?p=90#h5p-19

Health information practitioners' involvement in procurement can contribute to the selection of systems that effectively meet end users' needs in the following ways:

- Including well-defined usability requirements in tendering provides a tangible basis for comparative evaluation (Hettinger et al., 2021; Lloyd et al., 2024; Saari et al., 2024).
- Acknowledging only linear and easily definable use cases may lead to a lack of understanding about the usability of complex systems, such as EMRs.
- Recognising the relevant complexity of each case helps identify and focus on the most significant use cases when determining requirements and constructing usability evaluations for the procurement process.
- Usability practitioners should consider existing IT

architecture and appropriate methods for using evaluation tools when defining usability evaluation criteria for the procurement of complex systems (Tyllinen et al., 2018).

Provider Adoption of Standards for Interoperability

Interoperability in health information systems enables the seamless exchange of health data across different systems and organisations and supports healthcare providers to access complete and accurate patient information. This capability also supports public health monitoring and response by facilitating the aggregation and analysis of health data from diverse sources (Kuo & Lee, 2018; Owen et al., 2023).

Interoperability is critical for the effective use of EHRs. Standards such as Health Level 7 (HL7) [opens in new tab]), Fast Healthcare Interoperability Resources (FHIR) [opens in new tab], and Digital Imaging and Communications in Medicine ensure that different systems can communicate and share information seamlessly (Abdelhak & Hanken, 2016). HL7 is a set of international standards for the exchange, integration, sharing, and retrieval of electronic health information (Owen et al., 2023). These standards define how information is packaged and communicated from one party to another, ensuring that different healthcare systems can work together seamlessly (International Standards Organization).

FHIR is a standard developed by HL7 and designed to be flexible and easy to implement, using web technologies such as RESTful APIs (REpresentational State Transfer Application Programming Interfaces) , JSON (JavaScript Object Notation), and XML (**eXtensible Markup Language)** (Gazzarata et al., 2024; International Standards Organization, 2023; Owen et al., 2023). FHIR aims to simplify the implementation process without sacrificing information integrity, making it easier for different healthcare systems to share data and improve patient care (International Standards Organization, 2023).

Several foundational elements are necessary to achieve interoperability. Standardised data formats, such as HL7 and FHIR ensure consistent interpretation and use of data across systems (Gazzarata et al., 2024). Semantic interoperability, which involves using common data models and coding systems like SNOMED CT and ICD, preserves the meaning of data when exchanged between systems (Owen et al., 2023). Additionally, robust technical infrastructure, including Application Programming Interfaces (APIs) and secure data exchange protocols, is essential for facilitating data transfer(Owen et al., 2023).

Strong data governance and security measures are also critical to protect patient privacy and ensure compliance with legislation and regulations (Smallwood, 2018). Organisational commitment and supportive policies are required to promote data sharing and collaboration among stakeholders. By

establishing these foundations, healthcare systems can achieve high levels of interoperability, leading to improved patient care, operational efficiency, and public health outcomes (Owen et al., 2023).

Adoption of Electronic Medical Records

Implementing an EMR system should be approached like any project. This means that the EMR project should have clear objectives, budgets, timeframes, and deliverables. EMR and other digital solutions and deployment of technology can be challenging, although significant improvement has been noted in recent times due to "out of the box" or "off the shelf" and "ready to go" software solutions. The days of end-user product fit requiring significant development are diminishing in the name of cost savings. Digital product suppliers are also offering more refined solutions where end-user needs are included and considered within their product development. Most organisations investing in large solutions, like EMR systems, will take a "best of breed" and "off the shelf" approach to purchase, which allows the user to contract with a software vendor to provide a fully functional product. The user knows the functionality offered by the product and exactly what is being purchased. They are often able to see these systems operating in other healthcare organisations. This is the

simplest and safest (least risky) option. However, it should be recognised that these systems are not always innovative or leading-edge solutions. Any system that has been developed and implemented in several organisations will, by the nature of the fast evolution of computer systems, be old technology.

Choosing an EMR Solution

When choosing an EMR solution, health providers must evaluate a range of criteria to ensure the system aligns with clinical, operational, and strategic goals. Important considerations are shown in the table below.

Consideration	Description
Functionality	Core capabilities are robust and relevant (e.g. clinical support, and alerts (Hardy, 2024). Ease of data entry 2024; Owen et al., 2023). Functionality to support us
Interoperability	Exchange of information with other clinical informat (Owen et al., 2023; Williams et al., 2019).This ensure
Usability	A user-friendly interface that supports workflows of be beneficial (Dymek et al., 2020; Vainiomäki et al., 2
Cost	Assessment of initial setup costs, such as hardware, so hardware upgrades and ongoing training will be requ

Consideration	Description
Security	Adherence to legislation, for example, in Australia, ea Agreements (Australian Government, 2020). Evidenc
Scalability	Ability to grow with the health provider's needs, acco
Customisation	Reports should be able to be customised to suit front data capture in digital data capture (Rowlands et al.,

Vendor relationships are an important consideration. There should be a good fit between the organisation acquiring the EMR and the vendor (Hardy, 2024). Understanding the vendor's process for making changes, and the availability for technical support, training, and updates should be front of mind (Hardy, 2024). Speaking with other organisations that have purchased systems from vendors will provide insights into and validate the information provided by vendors. When purchasing an EMR, organisations are likely to have a relationship with vendors across many years. Effective relationships will be based upon open and professional

communication and clear processes for dispute resolution (usually built into contracts) and establishing communication channels and information flow between IT, clinicians and the vendor can lead to reduced costs and better service (Hardy, 2024).

To promote a sustainable health and social care system, the impact on the environment should be considered and factored into purchasing decisions.(Paul et al., 2023). It involves energy efficiency, reducing electronic waste, responsible disposal practices and adopting other eco-friendly practices to mitigate the environmental footprint of IT infrastructure and operations (Paul et al., 2023). By optimising energy consumption and reducing electronic waste, health and social care organisations can lower their carbon footprint and operational expenses. Incorporating sustainability approaches not only creates value but also demonstrates corporate social responsibility. Investments in energy-saving technologies and cloud-based services also provide scalability and flexibility. Green computing in healthcare includes digitising records and imaging and reducing paper. The use of cloud-based services consolidates servers, reducing energy consumption and costs (Paul et al., 2023)

Case Study – Kenya's national roll-out of EMR to monitor HIV response

In Kenya, the Ministry of Health recognised the need for a standardised approach to adopting EMR systems as part of the national strategy to enhance HIV care and public health (Kang'a et al., 2017). The Ministry of Health developed standards and guidelines for EMRs and conducted a comprehensive review of existing systems to identify those suitable for nationwide rollout.

The checklist and scoring tool developed for evaluating EMR solutions was a critical component of the selection process. The tool included seven domains, each representing a critical aspect of EMR functionality:

- clinical decision support,
- order entry and results management,
- health information reporting,
- interoperability,
- data security and privacy,
- usability and interface design, and
- system reliability and scalability (Kang'a et al., 2017)

Evaluation of Different EMR

Solutions

Evaluating EMR solutions requires a structured approach to compare features, costs, and vendor performances (Abdelhak & Hanken, 2016). The evaluation team should reflect the breadth of users with the ability to assess the product across the functional and technical requirements identified in the tender/procurement process. The steps to perform a robust evaluation include:

1. Needs Assessment

Identify the clinical and administrative needs for the solution. Prioritise those "must have" features (deal breakers) and those that would be nice to have. From initial discussions, stakeholders such as clinicians, IT technicians, and health administrators should be involved. The adoption of an EMR system should align with the organisation's key strategic priorities (Hardy, 2024). The project should be identified as an organisational priority (Hardy, 2024).

2. Research

Investigate available EMR solutions in use by similar organisations. Talk to users and leaders in organisations using the EMR about various products' strengths and weaknesses. Focus on vendors with experience in similar settings.

Conducting a scan of emerging and new technologies can be helpful in determining how solutions may be impacted by technological trends.

3. Request for Proposal

Issue requests for proposal to vendors, specifying desired features, timeframes, technical requirements, and support needs (Abdelhak & Hanken, 2016; Hardy, 2024).

4. Demonstrations and Testing

Organise solution demonstrations to assess usability and functionality. Conduct testing in simulated healthcare settings to evaluate performance, relevancy, and gather user feedback.

5. Scoring and Analysis

Use weighted scoring systems to compare solutions based on criteria (e.g. functionality, cost and user satisfaction).

Cost and Support

EMR system costs includes initial setup, training, and ongoing maintenance. Providers should also consider the level of vendor support, including technical assistance and updates.

1. Initial Costs

- Hardware and infrastructure: Servers, networking, and user devices.
- Software licensing: Purchase or subscription fees for the EMR software.
- Training and change management: Expenses for onboarding staff and adapting workflows.
- Implementation: System configuration, integration with existing clinical information systems and data migration (Hardy, 2024).

2. Ongoing Costs

- Maintenance: Fees for software updates, patches and hardware upkeep.
- Hardware and equipment upgrades: Desktops, printers and other equipment need to upgraded to meet changing needs and asset retirement.
- Licensing renewals: Annual or periodic fees for continued software use.
- Support: Vendor provided help desk services and troubleshooting (Hardy, 2024).

Success Factors for Implementation

Successful implementation of EMR systems depends on factors such as stakeholder engagement, comprehensive training, and continuous support. Addressing common challenges, such as resistance to change and data migration issues is crucial for a smooth transition from paper to digital. Some factors that support successful EMR implementations are described below.

1. **Importance of planning**: Successful digital health implementation requires thorough planning to align with strategic goals and minimise disruptions (Abdelhak & Hanken, 2016).
2. **Leadership support**: Leaders should create an environment conducive to innovation and change (Lloyd et al., 2018)
3. **Change management:** Implementing an EMR will involve operational, strategic, cultural, and political changes. To manage change effectively, applying models such as Lewin's 3-Step Model, ADKAR, and Kotter's 8-Step Change Model is essential.
4. **Engaging with stakeholders:** Involving stakeholders early in the process will build trust and support. Identifying stakeholders and understanding their needs

is crucial for assessing the project's impact and addressing any concerns. Maintaining transparency and open communication helps manage expectations and gain stakeholder buy-in by keeping everyone informed and fostering trust.

5. **Implementation foundations:** Alignment of people, processes, technology, and governance is key to execution:

    - People: Engage and train staff, address resistance, and ensure digital literacy.
    - Processes: Align new systems with existing workflows or utilise the change to redesign processes for efficiency.
    - Technology: Select appropriate technology tools and ensure integration with existing systems.
    - Governance: Establish clear roles, responsibilities, and decision-making processes (Abdelhak & Hanken, 2016).

6. **Evaluation and sustainability:** Conduct evaluations to assess progress and outcomes through formative and summative evaluation. Track and measure the benefits of digital health implementation. Plan for long-term sustainability by addressing potential barriers and enablers. Assess and improve digital maturity to enhance the effectiveness of health information systems

Successful digital health implementation is dependent upon comprehensive planning, effective change management, stakeholder engagement, and continuous evaluation. By addressing these areas, health organisations can achieve sustainable and impactful digital transformations.

Activity Success Factors for EMR Implementation

Objective

To identify and understand the key success factors for implementing EMRs in hospitals.

Instructions

Read this paper on the factors for EMR implementation and digital transformation. Identify key learnings from this paper and apply them to a case study through analysis.

Going digital: A checklist in preparing for hospital-wide electronic medical record implementation and digital transformation [opens in new tab]

Case Study

Scenario: A mid-sized hospital is planning to implement an EMR system. The hospital has faced resistance from some staff members concerned about the changes. The IT infrastructure is outdated, and there is a lack of clear communication about the implementation process.

- What organisational considerations should the hospital address first?
- How can the hospital ensure technical readiness for the EMR implementation?
- What training and support strategies would be most effective?
- How can the hospital address cultural resistance to change?
- What steps should be taken post-implementation to ensure continuous improvement?

The Non-adoption, Abandonment, Scale-up, Spread, and Sustainability (NASSS) framework [opens in new tab] provides a comprehensive approach to understanding the complexities of adopting and sustaining health technologies

such as EMR (Greenhalgh & Abimbola, 2019; Greenhalgh et al., 2010; Greenhalgh et al., 2018; Greenhalgh et al., 2017). The framework, shown in the diagram below, confirms the importance of the technology's properties, its usability, and how well it integrates with existing systems. Clinical and cost-effectiveness, and how these benefits are distributed among stakeholders is emphasised. The framework considers the individuals and groups who will use the technology, such as patients, healthcare professionals, and caregivers, and reinforces the need to understand their readiness and capacity to adopt the technology (Greenhalgh & Abimbola, 2019; Greenhalgh et al., 2010; Greenhalgh et al., 2018; Greenhalgh et al., 2017). Understanding the organisational context and capacity to implement the technology, and how well the technology aligns with organisational goals is included. The framework examines the wider system, including regulatory, policy, and market factors that can influence the adoption and sustainability of the technology. Finally, the NASSS framework looks at how the technology and its use evolve over time (Greenhalgh & Abimbola, 2019; Greenhalgh et al., 2010; Greenhalgh et al., 2018; Greenhalgh et al., 2017). This includes the processes of adaptation and the technology's sustainability over the long term. When implementing EMRs, using a framework such as NASSS that analyses the complexity of health care systems can help identify potential barriers and facilitators to the successful implementation and long-term use of health technologies (Greenhalgh & Abimbola, 2019;

Greenhalgh et al., 2010; Greenhalgh et al., 2018; Greenhalgh et al., 2017).

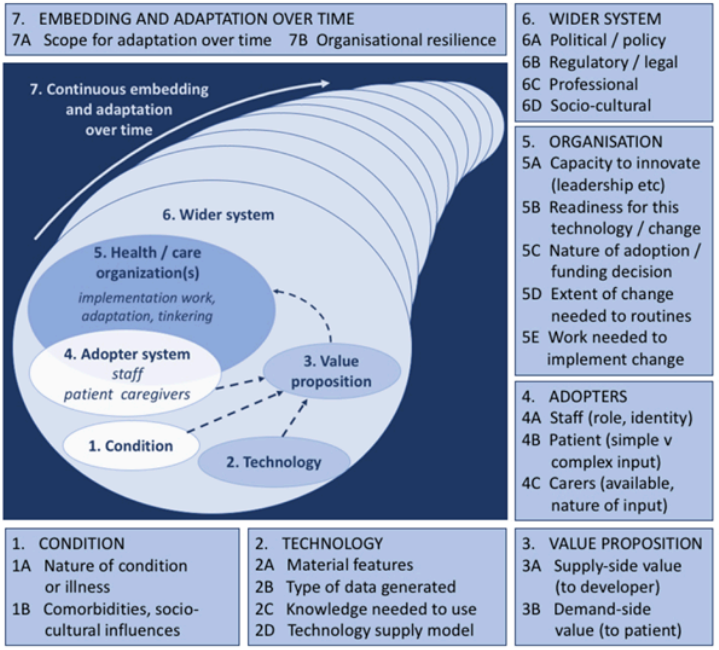


Figure 2. "The NASSS framework for considering influences on the adoption, nonadoption, abandonment, spread, scale-up, and sustainability of patient-facing health and care technologies" by Trisha Greenhalgh, Joseph Wherton, Chrysanthi Papoutsi, Jennifer Lynch, Gemma Hughes, Christine A'Court, Susan Hinder, Nick Fahy, Rob Procter, and Sara Shaw, in Beyond Adoption: A New Framework for Theorizing and Evaluating Nonadoption, Abandonment, and Challenges to the Scale-Up, Spread, and Sustainability of Health and Care is licensed under CC BY 4.0

Maturity of EMR Systems and

Value

Digital health maturity refers to the extent to which healthcare organisations have integrated digital tools and technologies into their operations to enhance patient care, improve population health outcomes, reduce healthcare costs, and improve the work life of healthcare providers. It encompasses the development and implementation of digital health infrastructure, such as electronic health records, telehealth services, and mobile health applications, as well as the training and education of healthcare staff to effectively use these technologies (Woods et al., 2023; Woods et al., 2022). Higher levels of digital health maturity are associated with better patient experiences, more efficient healthcare delivery, and improved health outcomes (Woods et al., 2023; Woods et al., 2022).

The maturity of EMR systems can be assessed through stages such as initial adoption, optimisation, and full integration (HIMSS, 2025). Measuring the value of EMR systems involves evaluating their impact on outcomes, operational efficiency, and overall healthcare quality. Future trends include the integration of artificial intelligence and advanced analytics to further enhance the capabilities of EMR systems (Woods et al., 2022).

The Electronic Medical Record Adoption Model (EMRAM) [opens in new tab] is a framework developed by the Healthcare Information and Management Systems Society

(HIMSS) (2025) to assess the maturity and effectiveness of EMR systems within healthcare organisations (HIMSS, 2025; Woods et al., 2022). EMRAM consists of eight stages, ranging from Stage 0, where no EMR systems are in place, to Stage 7, where the EMR system is fully integrated and optimised across the organisation (HIMSS, 2025). Each stage represents a higher level of sophistication and integration, with specific criteria that must be met to advance to the next stage. The model helps healthcare organisations identify their current level of EMR adoption, set goals for improvement, and benchmark their progress against other organisations (HIMSS, 2025).

Achieving higher stages of EMRAM is associated with benefits, including improved patient safety, enhanced clinical outcomes, and increased operational efficiency (HIMSS, 2025). For example, at Stage 3, healthcare organisations have implemented clinical documentation and decision support systems, which can reduce medical errors and improve the quality of care. By Stage 6, organisations have achieved advanced levels of data analytics and interoperability, enabling them to leverage health information for population health management and predictive analytics. Ultimately, reaching Stage 7 signifies that an organisation has fully integrated EMR systems that support seamless care delivery, real-time data access, and continuous quality improvement. This level of maturity not only enhances patient care, but also positions

healthcare organisations to meet regulatory requirements and adapt to future technological advancements (HIMSS, 2025).

Activity Test Your Knowledge

Answer this short set of questions to test your knowledge.

Which elements must leaders invest in for **successful** digital health implementation?

- Processes
- Technology
- People and processes
- People, processes, technologies, and change management
- People, processes and technologies
- Staff training
-
-
-
-

Pick the most correct response. A risk in implementing digital health solutions is:

- Excessive funding availability
- Patient involvement
- Data security and privacy concerns
- Leadership involvement
- Too many trained professionals
-
-
-
-

What is the most effective way to evaluate the success of a newly implemented EMR or EHR system?

- Multiple metrics including clinical outcomes, user feedback, and system performance
- Speed of implementation
- User satisfaction surveys
- Cost analysis
-
-
-
-

Which of the following best describes a primary limitation of an organisational Electronic Medical or Health Record (EHR) System?

- Increased storage capacity for patient data
- Potential for system downtime affecting access to critical information
- Enhanced documentation accuracy
- Improved communication between healthcare providers
-
-
-
-



The interactive version of this H5P content is available at:
https://oercollective.caul.edu.au/health-information-management/?p=90#h5p-25

Future Trends in EMR/EHR

openEHR (2024) is a technology comprising open specifications, clinical models, and software. The various components of openEHR are produced by the openEHR community and managed by openEHR International, a non-profit organisation established in 2003 and previously overseen by the openEHR Foundation. The openEHR initiative offers numerous benefits, by enhancing the interoperability and accessibility of health data. openEHR aims to provide a standardised architecture for EHRs and seamless data exchange across different healthcare systems and platforms. openEHR is designed to support the creation of longitudinal, consumer-centred health records (Open EHR, 2024). openEHR [opens in new tab] includes valuable information on this initiative.

openEHR's vendor-neutral approach enhances interoperability, reduces vendor lock-in. and promotes innovation by enabling the integration of best-of-breed solutions. openEHR's use of detailed clinical models, developed by and for healthcare professionals, ensures the system meets user needs. Additionally low-code application tools support rapid customisation and deployment tailored diverse healthcare settings (Open EHR, 2024).

Personally Held Records

As global mobility increases personally held healthcare records (PHRs) offer significant benefits. They enable individuals to share their health information with multiple healthcare providers, reducing communication gaps, errors, and duplicate tests (Archer et al., 2011; Ford et al., 2016; Tang et al., 2006). PHRs support people to actively participate in their own healthcare management, track health over time, and make informed decisions critical for managing chronic conditions and reducing healthcare expenditure (Ford et al., 2016).

PHR enablers include advancements in technology and supportive government policies. For example, the Australian Government's investment in the My Health Record system has provided a secure online summary of health information accessible to consumers and healthcare providers (Australian Digital Health Agency, 2024). My Health Record allows people to upload health information and includes Medicare data, medication details and emergency contacts, giving individuals control over who can access their records (Australian Digital Health Agency, 2024).

Many PHR systems allow secure messaging between patients and providers, making it easier to communicate and address health concerns directly and can lead to earlier interventions and improved health outcomes. PHRs that can streamline administrative processes by providing easy access to electronic prescription refills and appointment scheduling

are convenient for consumers (Archer et al., 2011; Ford et al., 2016; Tang et al., 2006).

The European Commission (2024) has recommended an EHR exchange format that promotes cross-border EHR interoperability. This initiative enables EU citizens to securely access and exchange their health data across the EU , improving care quality and reducing costs by avoiding duplication of medical tests and procedures (European Commission, 2024; Raab et al., 2023). Many European countries have already launched ambitious PHR projects to advance digital health solutions (European Commission, 2024). Health information exchange facilitates the secure sharing of health information among healthcare providers to improve the quality and continuity of care (Simon et al., 2009; Slawomirski et al., 2023).

In the United Kingdom, patient record access has developed significantly, particularly in the context of GP records, due to widespread computerisation. The National Health System (NHS) app allows patients to manage their personal health records, enabling them to view their GP health records, order prescriptions, and communicate with their healthcare providers (NHS, 2024). This system aims to enhance patient engagement and improve the coordination of care (NHS, 2024).

In Ireland, access to medical records is governed by data protection laws and the Freedom of Information Act (Citizens Information Board, 2025). Patients can access their health

records by writing to the Health Service Executive or through data protection requests (Citizens Information Board, 2025). There is also recognition that supporting the use of EHRs and investing in digital health can improve healthcare delivery (McDonald, 2024). This approach aligns with Europe's goal to make health records more accessible and compatible across borders (European Commission, 2024).

Health data in EMR and EHRs have transformative potential, but often remain siloed within institutions and jurisdictions. For example, Australia's My Health Record is limited to domestic use. However, platforms like PatientsLikeMe, Open Humans, and Health Record Banks challenge traditional models by enabling personal data sharing, self-health management, research, and clinical care (Kariotis et al., 2020). These models shift data stewardship and explore emerging data governance models, posing challenges for traditional health services and raising policy questions about the use of public good data (Kariotis et al., 2020).

Case Study Analysis and Solution Development

Evaluating and Implementing EMR/EHR Solutions for Sustainable Healthcare Goals

Objective

- Deepen your understanding of EMR/EHR considerations for health information management, decision-making, and implementation.
- Apply knowledge to analyse challenges and propose solutions to enhance EMR/EHR systems.
- Relate EMR/EHR implementation to achieving Sustainable Development Goals (SDG) (United Nations, 2023), especially Goal 3.

Activity Description

The activity centres on a **case study** of a healthcare system facing challenges in implementing an EMR/EHR solution. Readers will analyse the case, identify key problems, and develop practical solutions that address health information management, EMR

selection criteria, and implementation challenges, while aligning with SDG objectives.

Case Study

You are part of the leadership team at a regional hospital tasked with implementing an EMR system to improve healthcare delivery, data management, and patient outcomes.

- The hospital serves a diverse population, including underserved communities.
- Current challenges include fragmented patient records, low interoperability with other systems, clinician resistance to technology, and resource limitations.
- The hospital must ensure the EMR system meets SDG Goal 3 objectives, such as tracking vaccination coverage, disease prevalence, and access to care while supporting real-time decision-making.

Activity Tasks

a. **Health Information Management:**

- Identify the **types of data** the EMR

system should prioritise (e.g., patient outcomes, immunisation records, social determinants of health).
- Describe how these data will improve decision-making and contribute to SDG targets.

b. **Choosing an EMR Solution**

- Evaluate factors like **functionality, usability, interoperability, and resources** to recommend an EMR system.
- Explain how these features will improve healthcare delivery and patient outcomes.

c. **Challenges and Solutions**

- Identify 2–3 key challenges to implementing the EMR system (e.g., resistance to change, cost, lack of training).
- Propose practical solutions to overcome these challenges.

d. **Alignment with SDGs**

- Provide 1–2 examples of how the EMR system will align with SDG Goal 3 outcomes, such as reducing child mortality, improving maternal health, or ensuring equitable access to healthcare.

Reflection Questions

- How can EMR systems address healthcare inequities in resource-limited settings?
- What role does data interoperability play in achieving SDG health targets?
- How can predictive analytics from EMR data contribute to proactive healthcare interventions?

Expected Outcome

Readers will develop a solution-based understanding of EMR/EHR systems, addressing:

- Health data priorities and their alignment with SDGs.
- Decision-making for EMR system selection.
- Solutions to common implementation

challenges.

Key Implications for Practice

EMR and EHRs can contribute to effective health care practice. The key implications for practice highlight the importance of careful planning, stakeholder engagement, and evaluation in the successful implementation and use of EMRs and EHRs. When adopting EMRs, health information professionals' input into robust governance systems, interoperability standards, and user-friendly systems contribute to maximising the benefits of digital health solutions.

Health information management considerations: Effective governance for record systems is crucial. Health information professionals play a central role in ensuring data integrity, privacy, security, and interoperability. They are involved in all phases of EMR acquisition from inception to implementation

Choosing an EMR solution: Providers should consider factors such as cost, ease of use, interoperability, and vendor support. Evaluating different solutions through case studies and pilot programs can help in making informed decisions.

The business case for an EMR should justify the project by evaluating benefits, costs, and risks

Functionality and Usability of EMRs: Key functionalities include clinical documentation, order entry, and decision support. Usability considerations involve the system interface, ease of navigation, and the ability to integrate with other systems. Addressing usability challenges is essential for enhancing the efficiency and satisfaction of healthcare providers.

Provider Adoption of Standards for Interoperability: Interoperability is critical for effective use of EHRs. Standards such as HL7, FHIR, and DICOM ensure that different systems can communicate and share information seamlessly. This capability supports public health monitoring and response by facilitating the aggregation and analysis of health data from diverse sources

Success Factors for Implementation: Successful implementation depends on factors such as stakeholder engagement, comprehensive training, and continuous support. Addressing common challenges, such as resistance to change and data migration issues, is crucial for a smooth transition. Effective management strategies are required to ensure a smooth transition and to address any resistance from staff

Maturity of EMR Systems and Value: The maturity of EMR systems can be assessed through stages, such as initial adoption, optimisation, and full integration. Measuring the

value of EMR systems involves evaluating their impact on outcomes, operational efficiency, and overall healthcare quality. Future trends include the integration of artificial intelligence and advanced analytics to further enhance EMR systems' capabilities.

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Image descriptions

Figure 1: A diagram depicting the decomposition of a Health

Information System architecture into six main modules with 34 sub-modules. The layout is organised into boxes delineating the modules and their related sub-modules. The decomposition view helps to check for the presence of the required modules for all stakeholders.

1. The first module is Medication management, containing sub-modules related to medication handling, distribution, and safety monitoring.
2. The second module is Patient monitoring and contains sub-modules related to the assessment, admission, discharge, status, and referrals of patients, and is input for the electronic health record. The Patient monitoring module also contains a sub-module labeled Patient portal in which the patient can check his/her files.
3. The Security module with the sub-modules Authentication, Authorisation, and Security mechanisms must ensure the privacy and security of the Health Information System and its data.
4. Module number four is Planning and scheduling, with sub-modules used by various stakeholders to ensure proper care coordination.
5. The Generic MIS module is not healthcare specific. Its sub-modules are important to keep track of assets, such as staff and inventory, to provide means for organisation-wide communication, quality control, and financial affairs.

These five modules generate data, which needs management. This happens in the sixth module, Data management, which has sub-modules to ensure proper import, sharing, analysis, and data search. Generic MIS involves Finance, Human resources, Documentation, Research and Education, Inventory and Order, Reporting, Demographics, Reimbursement, Communication, and Quality control.

[Return to Figure 1]

Figure 2:

PART 5 HEALTH INFORMATION PRIVACY AND SECURITY

HEALTH INFORMATION LAW, PRIVACY AND ETHICS

Laura McVey and Joel Scanlan

Learning Outcomes

On completion of this chapter, learners will be able to:

- Understand the fundamental concepts of privacy as a human right, the key privacy terms, the different privacy legislation and privacy principles, and their implications for health information management.
- Describe the principles of informed consent, differentiate between written and verbal consent, and apply these concepts in various healthcare scenarios.
- Be able to identify the ethical dimensions of handling and responsible use of health information.
- Understand how to build a privacy culture within a healthcare organisation.

Introduction

Data breaches have become a frequent occurrence in modern life. From the MediSecure data breach affecting approximately 12.9 million Australians (Department of Home Affairs, 2024), to the highly publicised Optus (2022) and Latitude (2023) data breaches, most Australians' information has been part of a major data breach. The Office of the Australian Information Commissioner (OAIC) was notified of 595 data breaches from July to December 2024, with the health sector reporting more data breaches than any other sector (OAIC, 2025a). Similarly, in other countries data breaches are of ongoing concern.

Health data breaches have the potential to expose a vast amount of highly sensitive personal information. This includes a wide range of data that individuals may be reluctant to share with others, even those closest to them (Nass et al., 2009). The specific concerns and reasons for this reluctance are varied and complex, reflecting the diversity of individual preferences, cultural norms, and personal experiences.

However, the complexity of privacy within healthcare is more varied than the large-scale events we see in the media when events like the Medibank breach (Taylor, 2022) occur. Every day interactions between practitioners and patients and other stakeholders also require careful consideration with a privacy lens.

This chapter explores the concept of privacy, with particular attention to the Australian context. It also examines state and

territory privacy legislations and privacy principles. Patient consent and ethical data usage within an increasingly connected and digital healthcare industry are also considered. In this rapidly evolving context, understanding privacy is essential to safeguarding health information and patient confidentiality.

Part 1 – The Privacy Context in Australia

Privacy is a fundamental human right that enables individuals to "live a dignified, fulfilling, safe and autonomous life" (Australian Law Reform Commission, 2014, pp. Guiding Principles, Principle 1). There are three main ways to look at privacy: physical privacy, surveillance, and information privacy (OAIC, 2024e). This chapter focuses on information privacy; specifically, how individuals' personal information is handled or "promoting the protection of information that says who we are, what we do and what we believe" (OAIC, 2024e). In Australia, the National Safety and Quality Health Service Standards also require health services to adopt the Australian Charter of Healthcare Rights, which explicitly lists privacy as a fundamental right (Australian Commission on Safety and Quality in Health Care, 2020). The Charter of Aged Care Rights also explicitly lists personal privacy as a right (Aged Care Quality and Safety Commission, 2019).

Privacy Laws in Australia

In Australia, privacy laws vary depending on your workplace, with the federal *Privacy Act 1988* (Cth) regulating how personal information is handled, comprising 13 Australian Privacy Principles (APPs). The *Privacy Act 1988* (Cth) is regulated by the OAIC (2024c), and is applied to all Australian Government agencies, organisations with an annual turnover of more than $3 million, and other organisations, such as private sector health service providers.

Each state and territory has its own privacy legislation that public health organisations must adhere to. Some states have also enacted legislation specifically for health information. The map and table below offer a detailed overview of legislation by state and territory.


NORTHERN TERRITORY
QUEENSLAND
WESTERN AUSTRALIA
SOUTH AUSTRALIA
NEW SOUTH WALES
AUSTRALIAN CAPITAL TERRITORY
VICTORIA
TASMANIA





1

Northern Territory

The Office of the Information Commissioner Northern Territory oversees the privacy provisions of the Information Act 2002 (NT) and accepts complaints from consumers regarding the privacy of health information. The Health and Community Services Complaints Commission also accepts complaints about health, disability, and aged services in the Northern Territory.

2

Queensland

The Queensland Office of the Information Commissioner receives privacy complaints under the Information Privacy Act 2009 (Qld) and the *The Information Privacy and Other Legislation Amendment Bill (2023)*, which covers the Queensland public sector. Queensland's Health Ombudsman can also receive and investigate complaints about health services and health service providers.

3

Western Australia

The Office of the Information Commissioner (WA)

administers the Freedom of Information Act 1992 (WA) and the newly passed Privacy and Responsible Information Sharing Act (2024). The Health and Disability Services Complaints Office is an independent statutory authority that also handles complaints relating to health and disability services in Western Australia.

4

South Australia

The South Australian privacy committee handles privacy complaints related to state government agencies' compliance with a set of Information Privacy Principles The Health and Community Services Complaints Commissioner also receives complaints about government, private and non-government health and community services.

5

New South Wales

The NSW Information and Privacy Commission administers the Privacy and Personal Information Protection Act 1998 (NSW), which governs how NSW public sector agencies manage personal information. The Health Records and Information Privacy Act 2002 (NSW) deals with health information privacy in NSW and to both public and private sector health service providers.

6

Australian Capital Territory

The Information Privacy Act 2014 (ACT) regulates how Australian Capital Territory (ACT) public sector agencies handle personal information. The ACT Health Services Commissioner handles health record privacy complaints in alignment with the Health Records (Privacy and Access) Act 1997 (ACT). The Office of the Australian Information Commissioner exercises some of the functions of the Australian Capital Territory Information Privacy Commissioner.

7
Victoria

The Office of the Victorian Information Commissioner (OVIC) administers the Privacy and Data Protection Act 2014 (Vic). The Office of the Health Services Commissioner administers the Health Records Act 2001 (Vic) and conciliates complaints between consumers and health care providers.

8
Tasmania

The Tasmanian Ombudsman accepts complaints in relation to the Personal Information and Protection Act 2004 (Tas). This legislation covers the Tasmanian public sector, including public hospitals.



The interactive version of this H5P content is available at:
https://oercollective.caul.edu.au/health-information-management/?p=92#h5p-3

Table 1. A table comparing the l

Jurisdiction	Public Sector
Commonwealth	*Privacy Act 1988* (Cth)
Queensland	*Information Privacy Act 2009* (QLD) *The Information Privacy and Other Legislation Amendm*
Victoria	*Privacy and Data Protection Act 2014* (Vic) *Health Records Act 2001* (VIC)
New South Wales	*Privacy and Personal Information Protection Act 1998* (N *Health Records and Information Privacy Act 2002* (NSW
Tasmania	*Personal Information and Protection Act 2004* (TAS)
Western Australia	*Privacy and Responsible Information Sharing Act 2024* (V
Northern Territory	*Information Act 2002* (NT)
Australian Capital Territory	*Information Privacy Act 2014* (ACT) *Health Records (Privacy and Access) Act 1997* (ACT)
South Australia	Information Privacy Principles

What is Personal Information?

The definition of personal information differs across different legislations, but is defined in the *Privacy Act 1988* (Cth) as:

"Information or an opinion about an identified individual, or an individual who is reasonably identifiable:

1*whether the information or opinion is true or not; and*

2*whether the information or opinion is recorded in a material form or not."*

It is important to understand the definition of personal information for the jurisdiction in which you work. *Examples of personal information include:*

- Name, date of birth, home address, email address, phone number
- Sensitive information – including health and genetic information
- Credit information
- Photographs and video recordings
- Internet protocol (IP) addresses
- Facial or voice recognition (OAIC, 2024d).

What is Health Information?

Under the *Privacy Act 1988 (Cth)*, health information is

considered sensitive information and encompasses all personal information collected while delivering a health service (OAIC, 2019i). This encompasses all personal information collected before, during, or after a health service.

Privacy Key Terms

Regardless of which legislation you are following, there are key terms within privacy that all health information managers or those working with health information should understand.

Collection

Healthcare organisations can collect health information about a patient if it relates to the functions or activities of the healthcare service, such as delivering healthcare services, and whether the patient has given their consent (discussed in greater detail in Part 3 of this chapter). Health information should always be collected directly from the patient unless this is unreasonable or impractical; for example, in an emergency where the patient is unresponsive, where the patient is a child, or the patient is an adult who lacks capacity) (OAIC, 2019i). In this instance the next of kin or family member would provide information. Health information should never be collected "just in case".

Health information should also be collected in accordance with local laws (e.g., it should not breach any state, territory, or

Commonwealth laws) and through fair means (e.g., collecting the information without intimidation or deception). All jurisdictions regulate collection, so it is important to understand the principles of collection for your relevant jurisdiction (OAIC, 2019i). International laws will differ to those in Australia.

It is also important to recognise the collection of unsolicited health information and establish procedures to manage this information to ensure an individual's privacy is appropriately protected (OAIC, 2019i). For example, if a healthcare organisation receives health information they have not requested, it was not collected in relation to the functions or activities, and the patient did not consent (or an exception applies), the organisation needs to assess whether it should have collected the information. If it is deemed inappropriate and the healthcare organisation should not have collected the health information, it should be destroyed or de-identified (OAIC, 2019i).

It is also crucial to understand how health information is collected, as the collection of health information is expected to increase with the implementation of more digital health systems, tools, and services. Health information can be collected on paper registration and clinical forms, online forms, electronic medical records, clinical photos and videos, over the phone, via telehealth, via email or chats, via mobile health and applications, robotics and artificial intelligence or

by remote monitoring through either patient owned wearable technologies or supplied remote monitoring kits.

One of the most crucial safeguards for privacy is understanding what needs to be collected. Simply put, the less information collected, the less the healthcare organisation has to manage (OAIC, 2019b), reducing the risk for the organisation. Health information managers should work across the healthcare organisation to ensure that healthcare workers consider data minimisation when designing new collection processes or changing a process. Some aspects to consider include:

- What health information is necessary for the delivery of the function or activity?
- Is this information already being collected by the health care organisation and would you be collecting it again?
- Can the process be achieved without collecting the health information or would a smaller amount of health information meet the needs?
- Could the process be achieved using anonymous or de-identified data?

Use and Disclosure

Once health information has been collected, it will then be used or disclosed. The use of health information refers to the management of health information to perform the necessary

activities or functions, and it remains within the healthcare organisation's effective control (OAIC, 2018a). This includes searching for the patient in the patient master index, a clinician reviewing the electronic medical record before seeing a patient, or billing the patient for their outpatient visit. On the other hand, disclosure refers to health information being made accessible to others outside of the healthcare organisation, as subsequent handling of the health information is then outside the healthcare organisation's control (OAIC, 2019d). For example, a patient's medical record is provided to another healthcare provider for ongoing care, providing health information to a health insurer, or providing health information to law enforcement. Disclosure could also include accidentally providing health information to an unintended recipient, leading to a data breach, as discussed later in this chapter.

The use and disclosure of health information are regulated by privacy laws and this information should only be used or disclosed for the primary purpose for which it was collected or for a secondary purpose if an exception applies (OAIC, 2019i). This point emphasises why it is so important to understand what information is being collected and why, as this knowledge guides how health information can be used and shared. It is also essential that the healthcare organisation's privacy policy is up to date (touched on further later in this chapter).

Within the *Privacy Act 1988 (Cth)*, the following exceptions apply for a secondary purpose. This is referred to in further

detail in Chapter 6 of the *Act*: APP 6 Use or disclosure of personal information (OAIC, 2019d). The information in the box below was adapted from Chapter 6 of the *Act* for a health context.

- The patient has consented to a secondary use or disclosure.
- The patient would reasonably expect the healthcare organisation to use or disclose their health information for the secondary purpose, and that purpose is directly related to the primary purpose (e.g., the patient is referred to a specialist by a GP, as most patients would expect their health information to be disclosed in the referral. Similarly, if a specialist is writing a letter back to the GP about the patient's care, most patients would expect this). Patients are usually informed that these referrals and letters are going to occur by the GP or specialist, which further supports the patient's reasonable expectation of this occurring (OAIC, 2019i).
- The secondary use or disclosure is

required or authorised by or under an Australian law (e.g., mandatory reporting of child abuse under care and protection laws or mandatory notification of certain communicable diseases under public health laws (OAIC, 2019i) or a court/tribunal order such as receiving a subpoena for healthcare records).

- A permitted general situation exists in relation to secondary use or disclosure.
- Such as to lessen or prevent a serious threat to life, health or safety (e.g., receiving a request for information from a hospital about a patient who is unresponsive, seriously injured, and unable to consent. The information will ensure the hospital can provide safe and effective treatment. This disclosure is suitable as it is necessary to lessen a serious threat to the patient's life [OAIC, 2019e]).
- A permitted health situation exists in relation to the secondary use or disclosure.
- The use or disclosure is necessary for

conducting research or compiling or analysing statistics relevant to public health or public safety (Refer to Chapter 6 of the Act for additional details).

- The use or disclosure is necessary to prevent a serious threat to the life, health, or safety of a genetic relative of the patient.
- The disclosure is to a person responsible for the patient.
- The healthcare organisation reasonably believes that the secondary use or disclosure is reasonably necessary for one or more enforcement related activities conducted by or on behalf of an enforcement body.

If you are working as a health information manager or working with health information in another jurisdiction, it is best to refer to the relevant privacy legislation to understand uses and disclosures within that jurisdiction (defined in the table earlier in the chapter).

Cross-border Disclosure

Health information may need to be disclosed across state or territory border, or even overseas. Jurisdictions have key requirements that healthcare organisations need to meet to ensure that the cross-border disclosures are safe, and that legislation is not breached (OAIC, 2019f). It is essential that checks are implemented before disclosure occurs. This could include undertaking a contract agreement stipulating that the information is handled in accordance with the relevant privacy legislation, that health information is only disclosed to other states/territories or countries with substantially similar privacy legislation, or that the individual has consented (Information and Privacy Commission, 2019). Once again, the relevant legislation will provide greater insights into cross border disclosures and should be referred to for further detail.

Access and Corrections

From a patient-centred care perspective, it is vital to empower patients to actively participate in their care. If they are aware of the information stored about them, they can verify the accuracy of their records, identify potential errors, and ensure that decisions about their health are based on complete and correct information. Health providers and other entities holding this data must have clear, accessible processes for

individuals to request access and, importantly, to seek corrections if inaccuracies are found.

Privacy legislation across Australia (state, territory, and federal) allows patients to access the personal information healthcare organisations hold about them, noting there are some circumstances in which healthcare organisations can refuse. Patients (or their responsible person) may request access to this information for several reasons, including transferring their care to a new healthcare provider or reviewing what health information has been collected about them. Patients (or their responsible person) can also request corrections to the health information held about them if it is inaccurate. Each jurisdiction will include a provision in their laws that allows patients to access and correct information held about them, noting that what a patient can access or correct will be dependent on the request and the legislation. In some situations, a patient may be granted access to the health record in its entirety, while in other situations, it may be a subset.

Health service providers should have procedures for access requests. This process should include a form for patients to complete to request access indicating what health information they require; that is, the entire record or a specific part within the record (e.g., a date range or admission number). Before sharing any information with a patient, it is essential to verify their identity. Information can be provided to patients in a number of ways, including hardcopies, viewing the information on site, or providing a recording to watch onsite.

The type of information will dictate this, as described in APP 12 of the *Act* (OAIC, 2019h).

In certain circumstances, an individual (e.g., parent, guardian, or lawyer) may request information on a patient's behalf. Health information can be provided to these individuals; however, it is first necessary to understand and verify:

1. Whether the individual has the authority to act on the patient's behalf and for this type of request (e.g., parent of the child, asking for a power of attorney document, requesting consent from the patient if a lawyer is requesting the information on their behalf).
2. The identity of the individual before providing access to the health information.

Healthcare organisations may want to refuse access. However, if possible, the documentation should be provided, and exempt information should be blacked out. If an access request is refused, the patient or individual requesting access must be notified in writing. Each jurisdiction will have procedures to allow complaints or appeals about a refusal and must provide information about how to escalate concerns.

Patients may also want to correct health information held about them, and healthcare organisations should also have processes to enable this. Health information managers may develop different procedures for updating personal

information when a patient contacts the healthcare organisation (e.g., updating their address details within the patient master index or updating inaccuracies in a medical record, which may require additional input from clinicians).

My Health Record

My Health Record, Australia's national electronic health record, is another way patients can easily access their health information (myGov, 2025). My Health Record includes various clinical documents, including discharge summaries, pathology reports, diagnostic imaging reports, e-Referrals and event summaries to name a few. See the *Electronic Medical and Health Records* chapter for more information about My Health Record.

Health Information Security

Healthcare organisations need to protect the health information they manage. All privacy legislation clearly defines that healthcare organisations are responsible for protecting health information against loss or unauthorised access, use, disclosure, or modification (Health Records and Information Privacy Act 2002; OAIC, 2019g; OVIC, 2021). Organisations can protect health information in several ways, including the following security controls ranging from policy to technical countermeasures:

- Organisational wide policies and procedures,
- Providing mandatory in person or e-learning training,
- Building a privacy and security culture,
- Having access controls (e.g., passwords to access systems, two factor authentication),
- IT security controls (e.g. firewalls, encryption),
- Physical controls (e.g. swipe access to medical records), and
- Having clearly defined data breach response plans that have been tested.

These are discussed further in the *Cyber Risk Management* chapter.

Healthcare organisations must also ensure that health information is either destroyed or de-identified when no longer required for approved purposes, unless an exemption applies.

Retention and Disposal

Health information should not just be kept, as it can pose a risk to the organisation. Health information that has reached its retention period should be assessed to see if it can be destroyed or de-identified. Retention periods for health information vary across states and territories, and the relevant health record retention and disposal schedule should be consulted to determine how long the health information

should be retained. Retention periods are relevant to both electronic and paper records. Once an assessment on what records can be destroyed has been completed and approved, health information managers should work with the relevant teams to ensure that electronic records, including metadata, are securely deleted. Health information managers are also responsible for coordinating the safe disposal of paper records and ensuring they are securely disposed of once their minimum retention has been reached and they are no longer required.

Third parties should also be required to abide by the retention and disposal schedule by incorporating retention clauses into the contract. See the Data: the Heart of the Healthcare System chapter for more information about retention and disposal.

De-identification

De-identification is another important tool for enhancing privacy; however, this may not be suitable in all situations. De-identification of health information involves the removal of all identifying details to ensure that the information cannot be re-identified (OAIC, 2018a). When done correctly, this involves a two-step process:

1. The healthcare organisation removes the direct identifiers for patients

2. The healthcare organisation removes or alters other information that could be used to re-identify a patient and/or uses controls or safeguards to prevent re-identification.

Once health information is appropriately and thoroughly de-identified, it can be continuously utilised within the healthcare organisation; for example, for research, benchmarking, data analysis, or service planning. Health information managers should participate in the de-identification process. De-identification is not always the best method for managing health information that has reached its retention period, and in such cases, disposing of the health information may be more effective. The CSIRO has developed a De-identification Decision-Making Framework that provides helpful guidance (O'Keefe, 2017).

Anonymity and Pseudonyms

Healthcare organisations must establish procedures that allow individuals to engage with them anonymously or by using a pseudonym where it is lawful and practicable. To maintain anonymity, they must be able to interact with the healthcare organisation without disclosing any personal information or identifiers (e.g., they might call the healthcare organisation to ask about parking or visiting hours). Anonymity in healthcare is often not practicable, especially if an individual is seeking

healthcare. Similarly, using a pseudonym is not always practical. For someone to use a pseudonym, they would need to provide the health service with a name, term, or descriptor instead of using their real name. An example of this would be a username, screen name, a fictitious name, or email address that does not include the individual's actual name.

When evaluating a new service or modifying a service, it is important to consider whether individuals could engage with the healthcare organisation while remaining anonymous or by using a pseudonym to safeguard their privacy.

Data Quality

Data quality is another key aspect of privacy legislation and protecting individuals' privacy. This ensures that health information is accurate, complete, up to date, and not misleading. Good data quality practices ensure that the quality of the health information remains high, as decisions are made using this information. Healthcare organisations must embed processes into practice to confirm that health information is correct when it is collected, used, or disclosed. If the information is out of date, inaccurate, incomplete, or misleading, it should be revised accordingly. As discussed in the *Access and Correction* section, enabling patients to review their health information assists with ensuring data quality. Methods for ensuring data quality practices include asking for a Medicare card at each visit, asking the patient to provide

their address and phone number at their visit via open-ended question techniques, providing the patient with a demographics form to complete, and making fields mandatory before their first visit (e.g., through a patient portal).

Privacy Principles





1

Open and transparent management of personal information

Ensures that APP entities manage personal information in an open and transparent way. This includes having a clearly expressed and up to date APP privacy policy

2

Cross-border disclosure of personal information

Outlines the steps an APP entity must take to protect personal information before it is disclosed overseas.

3

Adoption, use or disclosure of government related identifiers

Outlines the limited circumstances when an organisation may adopt a government related identifier of an individual as its own identifier, or use or disclose a government related identifier of an individual.

4

Anonymity and pseudonymity

Requires APP entities to give individuals the option of not identifying themselves, or of using a pseudonym. Limited exceptions apply.

5

Collection of solicited personal information

Outlines when an APP entity can collect personal information that is solicited. It applies higher standards to the collection of sensitive information.

6

Quality of personal information

An APP entity must take reasonable steps to ensure the personal information it collects is accurate, up to date and

complete. An entity must also take reasonable steps to ensure the personal information it uses or discloses is accurate, up to date, complete and relevant, having regard to the purpose of the use or disclosure.

7

Dealing with unsolicited personal information

Outlines how APP entities must deal with unsolicited personal information.

8

Security of personal information

An APP entity must take reasonable steps to protect personal information it holds from misuse, interference and loss, and from unauthorised access, modification or disclosure. An entity has obligations to destroy or de-identify personal information in certain circumstances.

9

Notification of the collection of personal information

Outlines when and in what circumstances an APP entity that collects personal information must tell an individual about certain matters.

10

Access to personal information

Outlines an APP entity's obligations when an individual

requests to be given access to personal information held about them by the entity. This includes a requirement to provide access unless a specific exception applies.

11

Use or disclosure of personal information

Outlines the circumstances in which an APP entity may use or disclose personal information that it holds.

12

Correction of personal information

Outlines an APP entity's obligations in relation to correcting the personal information it holds about individuals.

13

Direct marketing

An organisation may only use or disclose personal information for direct marketing purposes if certain conditions are met.



The interactive version of this H5P content is available at: https://oercollective.caul.edu.au/health-information-management/?p=92#h5p-4

The key terms mentioned above form part of the privacy

principles for each jurisdiction. Breaching the privacy principles can result in regulatory action and penalties for healthcare organisations. Below is a summary of the privacy principles for each jurisdiction.

Note: Each link in Table 2 opens in a new tab.

Jurisdiction	Description
Australia	Core to the *Privacy Act 1988* (Cth) are the 13 Australian Pri including governance and accountability, collection, use, disc
Australian Capital Territory	Australian Capital Territory has 12 privacy principles govern private health services. For more information see: Health Re privacy principles covering the collection, use, disclosure, sto
New South Wales	New South Wales has 15 health privacy principles that are ke public sector agencies and privacy sector organisations. For m the collection, use, storage and disclosure of personal inform councils. For more information see: Information Protection
Northern Territory	The Northern Territory has 10 information privacy principl *Information Act 2002* (NT). For more information see: Ove
Queensland	Queensland has transitioned to having one set of privacy pri and 9 not being used or implemented. These principles form [PDF]
South Australia	South Australia is governed by information privacy principle form part of the information privacy principles instruction,

Jurisdiction	Description
Tasmania	Tasmania has 10 personal information protection principles authorities are governed by these principles, including public
Victoria	Within Victoria, the *Health Records Act 2001* (VIC) includes health.vic.gov.au Victoria also has 10 information privacy pri Victorian Information Commissioner
Western Australia	Western Australia has just introduced new legislation that in principles are applicable to all public entities, including publ

Part 2 – Privacy in Practice

Privacy legislation in each jurisdiction provides a robust framework for protecting health information. However, for privacy to be effective, organisations require more than legislation. Organisations must actively implement measures to translate these legal requirements into practice, which involves embedding privacy considerations into every stage of information handling, from collection and storage to use and disclosure. This involves not only adhering to the jurisdiction's

privacy legislation, but also anticipating and mitigating potential privacy risks. Two key concepts that can assist organisations in achieving this are "privacy by design" and "privacy impact assessments". These frameworks provide practical guidance for embedding privacy into the design and implementation of projects and systems, ensuring that the protection of personal information is prioritised from the outset.

Privacy by Design and the Five Safes

Privacy by design is a concept that embeds privacy considerations into the design and development of systems, products, and services. Rather than treating privacy as an afterthought, this proactive approach integrates privacy into the initial design and development phases.

Proposed by Ann Cavoukian (2011), privacy by design is based on seven foundational principles:

1. **Proactive not Reactive:** Anticipate and prevent privacy invasive events before they occur.
2. **Privacy as the Default:** Ensure personal data is automatically protected in any system or process.
3. **Privacy Embedded Into Design:** Incorporate privacy protections into the core functionality of systems and technologies.

4. **Full Functionality:** Avoid unnecessary trade-offs between privacy and other system functionalities.
5. **End-to-end Security:** Maintain secure handling of personal data throughout the entire lifecycle of a product or service.
6. **Visibility and Transparency:** Ensure that systems and practices are open and accountable to users.
7. **Respect for User Privacy:** Keep the interests and needs of individuals paramount in the design and operation of systems.

These principles emphasise a user-centric approach (7), aiming to proactively address privacy concerns (1, 2, 3), and throughout the entire lifecycle of a product or service (5). This framework seeks to balance functionality (4) with robust privacy protections, while ensuring accountability and transparency (6). Such principles can be implemented broadly within healthcare in relation to how data are handled, from both a technical perspective and in provider-consumer human interactions. Examples of considering (1, 2, 3, 7) can be seen in practical measures where data collected from a patient are minimised, duplicate collection of health information is avoided, or de-identification of data is implemented to ensure individuals cannot be readily identified.

A widely used practical framework that can enable privacy by design principles is the *Five Safes Framework* (Australian Institute of Health and Welfare, 2023), which has been used in

Australia and the UK across the last two decades. It provides a structured approach to assess and mitigate the risk of disclosing identifiable patient data, ensuring privacy is embedded throughout the data access lifecycle, while enabling crucial health research and analysis.

The framework requires considering five interdependent elements:

- **Safe People:** Ensuring only authorised, trained researchers or health analysts, bound by strict confidentiality agreements and ethical standards, can access patient data.
- **Safe Projects:** Confirming data use is restricted to specific, ethically approved health research or healthcare improvement projects with clear public benefit.
- **Safe Settings:** Guaranteeing access occurs within secure physical or digital environments with robust technical controls preventing unauthorised access or data leakage.
- **Safe Data:** Applying statistical disclosure controls, such as de-identification or aggregation, to patient records to minimise the risk of individuals being re-identified.
- **Safe Outputs:** Vetting all released statistics or research findings to prevent the disclosure of information attributable to individual patients (e.g., suppressing small cell counts) (Australian Institute of Health and Welfare, 2023).

By addressing these five areas, the framework enables privacy by design, balancing the use of valuable health data with the fundamental obligation to protect patient privacy (Australian Institute of Health and Welfare, 2023). Another key tool in achieving these goals in a verifiable way is through the completion of a privacy impact assessment.

Privacy Impact Assessment

In contrast to the overarching principles of privacy by design, which guide the entire development lifecycle, a privacy impact assessment (PIA) offers a more focused and granular approach to privacy. This is a structured process used to identify and evaluate the specific risks to personal information within a particular project or activity, which is particularly important when dealing with new technologies or sensitive data, including health information or data sharing initiatives. A privacy threshold assessment (PTA) is a helpful tool to ascertain whether a PIA is required. The PTA will assist organisations to determine whether the project or activity has a potential privacy impact and provide health information managers with an understanding of the privacy risk. A PTA is necessary if a project involves a new or changed method for handling personal information. If the project or activity is deemed high risk, then a PIA will be required.

A PIA is a detailed privacy risk assessment. It systematically examines how a project may impact an individual's privacy

by analysing the types of personal information involved, how it will be used, and where vulnerabilities might exist. This process helps organisations pinpoint potential privacy issues before they arise, allowing them to proactively implement safeguards.

The OAIC (2021) provides detailed guidance on conducting PIAs (including PTAs), emphasising the importance of stakeholder consultation and thorough documentation. This ensures that diverse perspectives are considered and that the PIA process is transparent and accountable. By undertaking this rigorous assessment, organisations can confidently demonstrate their commitment to privacy and build trust with individuals. Most jurisdictions have their own templates for completing a PIA that can be adapted for your organisation.

Privacy Policy

A privacy policy outlines how an organisation handles personal information (OAIC, 2024c). These are required for any organisation or agency subject to the *Privacy Act 1988* (Cth). Most state and territory agencies also require one, as per their applicable privacy legislation. A privacy policy includes details about:

- What kinds of personal information is collected and stored.

- How personal information is collected and stored.
- Why personal information needs to be collected.
- How the organisation will use and disclose personal information.
- If personal information will be disclosed outside Australia, including to which countries, if practical.
- How an individual can access their own personal information and correct it if required.
- How an individual can make a complaint, how it will be handled, and the organisation's name and contact details (OAIC, 2024c).

Privacy policies should be available to healthcare consumers and the public free of charge. It is generally expected that this information is available on an organisation or agency's website.

When creating or updating a privacy policy, it is important to understand how the healthcare organisation manages personal information, including its collection, use, and disclosure. It should also be written in plain English and avoid legal jargon.

Privacy Collection Notices

Privacy collection notices are different to privacy policies and cover the information handling practices for a specific purpose or activity (OAIC, 2019c; OVIC, 2019). These should be given to an individual either prior to or at the time of

collection. A privacy collection notice could be included on the bottom of a medical history form handed to a patient to complete, appear on an e-form, be a recording played to patients before information is collected, or be on a website where personal information is being collected. There may be times when a privacy collection notice is not reasonable or practical to provide to a patient at the time. If this occurs, the healthcare service should provide this notice as soon as possible. Healthcare organisations can also have privacy brochures that discuss the organisation's health information handling practices and display these in waiting areas, on the website, on a patient portal, or provide them to patients as part of their pre-admission documentation.

In accordance with Australian Privacy Principle 5 (OAIC, 2019c), collection notices inform individuals about the information being collected, who is collecting it, the purpose of collection, and any potential disclosures or access by others. They also include contact details for the collecting organisation. Collection notices provide transparency and help individuals understand what data they are providing and with whom it may be shared. Other jurisdictions may also require privacy collection notices and the relevant privacy principles should be referred to.

Third Parties

The complexity of where and how information is stored and

accessed has increased due to the involvement of third-party providers in health information management. Entities such as cloud storage services, analytics platforms, and app developers often collect, process, or store health information. Ethical practice dictates that individuals are fully informed about the involvement of any third parties, as outlined in collection notices and privacy policies. This includes understanding what data these parties will access, how they will use it, where it will be stored (especially if overseas), and what security measures are in place. Organisations engaging third parties must ensure that those parties adhere to the same high standards of privacy and security required under the relevant privacy legislation.

Data Breach Notification

The Notifiable Data Breaches scheme, established under the *Privacy Act 1988* (Cth), mandates that organisations, including those in the health sector, must notify affected individuals and the OAIC about eligible data breaches. Individuals have a right to know whether their health information has been compromised, the nature of the breach, the potential risks, and the steps being taken to mitigate harm. Healthcare organisations consistently report the highest number of data breaches to the OAIC due to a number of factors. Between January to July 2024, 102 health service providers reported data breaches (OAIC, 2024b). The causes

of these data breaches included malicious attacks, human error, or system faults.

Mandatory Data Breach Reporting

An eligible data breach occurs when there is unauthorised access to, or disclosure of, personal information that is likely to result in serious harm to the individuals involved (OAIC, 2025c). Examples include when a device containing personal data is lost, a database is hacked, or information is mistakenly provided to the wrong person.

Organisations are required to conduct a reasonable and prompt assessment to determine whether a data breach is eligible for notification (with a maximum timeframe of 30 days). If so, they must notify the OAIC as soon as practicable, providing details about the breach and the steps taken to mitigate harm. Affected individuals must also be notified, with recommendations on how to protect themselves (OAIC, 2025b).

In addition to the Notifiable Data Breach scheme as part of the *Privacy Act 1988*, notifiable data breach schemes exist at some state levels, such as the Mandatory Notification of Data Breach Scheme under the *Privacy and Personal Information Protections Act 1998* (NSW) in New South Wales, the Mandatory Information Breach Notifiable Scheme as part of the *Privacy and Responsible Information Sharing Bill 2024* in Western Australia and the Mandatory Notification of Data

Breach Scheme under the *Information Privacy Act 2009 (QLD)* in Queensland.

Part 3 – Informed Patient Consent and Legal Obligations

Informed consent is a cornerstone of ethical health information management in Australia, ensuring individuals retain autonomy over their personal health information. It signifies a voluntary agreement by an individual to participate in the collection, use, or disclosure of their information based on a comprehensive understanding of the proposed activity. This principle is embedded in the *Privacy Act 1988* (Cth), particularly within the APPs. It also is addressed in other jurisdictions' privacy principles as mentioned above.

The APPs state that an organisation or entity must obtain consent before collecting sensitive information, including health information. The OAIC (2022) provides guidance on achieving valid consent, emphasising that it must be:

- Voluntary: Freely given without coercion or undue pressure.
- Informed: Based on a clear understanding of the purpose, methods, risks, and benefits.
- Specific: Related to a clearly defined purpose and scope

of data handling.

- Current: Obtained at the time of collection or prior to a new use or disclosure.
- Provided by a person with capacity: The individual must have the legal capacity to consent (pp. B37-B61).

The traditional model of consent, often characterised by static, one-time agreements, is increasingly being challenged by the concept of dynamic consent (Goncharov et al., 2022). Dynamic consent recognises that individuals should have ongoing control over their personal information and how it is used. This approach empowers individuals to decide how their information is used. Instead of a single, irreversible decision, dynamic consent (a growing method of obtaining consent in healthcare) allows for continuous adjustments over time. As individuals' circumstances and priorities evolve, they can readily modify their agreed upon consent. This flexibility ensures that people retain authority over their information, fostering trust and transparency in how their information is utilised.

Additionally, consent can also be conveyed in different ways. Explicit consent (also termed express consent) occurs when a patient clearly articulates their agreement, either verbally or through written confirmation (more on this shortly) (OAIC, 2022). However, consent may be implied through a patient's conduct or actions. For example, if a patient wishes to make an appointment, they will provide their

contact details, which reasonably implies permission for that information to be used for the purpose of arranging and managing that appointment.

Written Consent vs Verbal Consent

While both written and verbal consent can be legally valid, their suitability varies depending on the context of health information management.

Written consent, typically documented through a signed form, offers a clear and enduring record of the individual's agreement (OAIC, 2022). This is particularly important for research projects involving large datasets or the long-term storage of health information. The National Statement on Ethical Conduct in Human Research highlights the importance of written consent for higher-risk research, ensuring transparency and accountability (National Health and Medical Research Council, 2023).

Verbal consent can be suitable for lower-risk activities, such as routine clinical information collection during a consultation. However, it relies heavily on accurate documentation of the discussion and the individual's understanding. The OAIC (2022) recommends that, even with verbal consent, a record of the conversation and the key elements discussed should be maintained to establish that the consent obtained was truly informed.

Regardless of the method, entities managing health information must provide individuals with clear, accessible information about how their information will be handled, including details on collection, storage, use, disclosure, and security measures (OAIC, 2022). Failure to adhere to the requirements of informed consent can lead to breaches of the *Privacy Act 1988* (Cth) and potential penalties. Privacy collection notices should be provided to patients to assist with this and can be provided for both written and verbal consent (OAIC, 2019c).

Ultimately, informed consent empowers individuals to make informed decisions about their health information and fosters trust in the responsible management of sensitive data within the Australian healthcare system (OAIC, 2022). From a health information management perspective, it is vital that consent is granted and recorded in an appropriate manner, and able to be modified in the future to facilitate dynamic consent and changing patient needs.

Legal Obligations

Healthcare organisations also have a legal obligation to maintain accurate and complete health information. Health information managers have a duty to assist in meeting these obligations by creating, monitoring, and evaluating policies and procedures supported by legislation, accreditation standards, and other governing documents. This could be

done in collaboration with other stakeholders (e.g., clinical governance, health informatics).

Documentation is a critical element in ensuring obligations are met (Australian Commission on Safety and Quality in Health Care, 2021). Clinical documentation needs to be documented in the endorsed health record, as undocumented information or informal documentation processes rely on memory, create silos of information, and can lead to misdiagnosis and harm.

Health information managers should consider the following when maintaining accurate health information:

- Policies and procedures for clinicians on what is expected for clinical documentation at the healthcare organisation (e.g., how addendums should be created, rules around when documentation should occur).
- Procedures for editing or changing health information once it has been documented in the health record.
- Processes or systems to authenticate which clinician made the entry, and the time and date.
- Review of security processes (e.g., the ability to interrogate an audit log).

As health records can also be used as evidence within court, other legal proceedings, or independent public inquiries (e.g., Royal Commissions), it is essential to ensure the health information is accurate, complete, and unaltered.

Confidentiality

Within healthcare, discussions frequently focus on the confidentiality and privacy of health information. It is important to note that these terms are not interchangeable. As discussed, privacy is governed by the *Privacy Act 1988* (Cth) or the relevant state and territory privacy legislation mentioned above. While confidentiality is "a broader obligation that limits the access to information provided by a patient to their healthcare provider during treatment" and arises from various sources, including common law, ethical codes and legislation (Confidentiality and Privacy of Medical Records – Queensland Law Handbook Online [opens in new tab]) (Caxton Legal Centre, 2023). Codes of conduct will often stipulate that healthcare providers treat information as confidential. The Medical Board of Australia (2024) released "*Good medical practice: A code of conduct for doctors in Australia"* [opens in new tab] in October 2020, which outlines a section for confidentiality and privacy for doctors. In addition, when confidentiality is spoken of within a cybersecurity context, it has a slightly different, but overlapping interpretation, as discussed in the next chapter.

Part 4 – Ethical Considerations When Using Health Data

Building upon a foundation of informed consent for collecting health information within the context of the privacy principles, ethical data use demands ongoing attention and a commitment to transparency. The sensitive nature of health information necessitates a higher standard of care, enabling individuals to know where their data is being stored, and how it is being used. It is important to consider this in a broad range of contexts, including how data are stored and used, in addition to any possible secondary uses (e.g. research and quality assurance).

Healthcare organisations should be committed to ethical use of data by following the National Statement on Ethical Conduct in Human Research (National Health and Medical Research Council, 2023) within Australia and follow external advice; for example, the Organisation for Economic Co-operation and Development's (OECD) "10 Good Practice Principles for Data Ethics in the Public Sector" (OECD, 2021) (Table 1). The National Statement's emphasis on respect for persons, beneficence, and justice provides a clear focus to enable the safeguarding of individuals' rights while promoting responsible data use for public benefit (National Health and Medical Research Council, 2023). Weaving these principles

into data governance structures can foster trust, facilitate ethical research, and maximise the potential of health data to improve healthcare outcomes.

Figure 1: 10 Good Practice Principles for Data Ethics in the Public Sector as Published by the OECD (2021).

1. Ensure data integrity is maintained.
2. Adhere to relevant protocols for trustworthy data access, sharing, and utilisation.
3. Integrate ethical considerations regarding data into decision-making processes within governmental, organisational, and public sector realms.
4. Exercise vigilance over data inputs, especially those influencing AI system development and training, and employ a risk-oriented approach to automated decision-making.
5. Clearly define the intended use of data, particularly when handling personal information.
6. Establish clear parameters for data access, sharing, and utilisation.

7. Promote clarity, inclusivity, and transparency in data practices.
8. Release both data and source code openly.
9. Empower individuals and groups to exert greater control over their data.
10. Demonstrate accountability and proactivity in risk management.

Health information managers can provide guidance when using health information and weighing up the ethical considerations.

Research Data

Health information holds immense potential for research that can lead to improved treatments, disease prevention, and better health outcomes for all Australians. Ethical considerations in research data use are guided by the National Statement on Ethical Conduct in Human Research (National Health and Medical Research Council, 2023). This includes obtaining specific informed consent for research participation, ensuring data are de-identified or anonymised where possible, and establishing clear data governance frameworks. The FAIR

principles [opens in new tab] can guide use of research data, and research data should be **Findable**, **Accessible**, **Interoperable** and **Reusable.**

Marketing

In some situations, healthcare organisations may want to market products or services to patients. It is critical that patients are asked to consent to marketing before any communication occurs, and if the patient opts out, they are not sent any further direct marketing correspondence. APP 7 of the *Act* is a direct response to how patients can be vulnerable people and the ethical considerations of marketing to individuals should be reviewed before something is launched (OAIC, 2019e).

Other Secondary Uses

Secondary use refers to the use of health information for purposes beyond the original reason for collection, as discussed in Part 1. For example, data collected during routine clinical care could be used for quality improvement activities. Although research activities must undergo an ethical review, quality improvement or quality audits are exempt from such reviews. In these cases, it is important to evaluate and approve these activities to ensure they are ethical, and that the benefits

of the activity justify the risks or burdens to patients (Wade, 2007). This could include mandatory reporting obligations in relation to collected data , even if this was not the original purpose for gathering the data.

In consultation with other stakeholders (e.g., legal, clinical governance), health information managers must carefully consider whether secondary use is compatible with the original purpose and whether additional consent is required. De-identification and aggregation techniques can help mitigate privacy risks, as discussed earlier in this chapter; however, a cautious approach is essential. Transparency with individuals about the uses of their health information, as outlined in privacy policies and collection notices, is fundamental to maintaining trust and ethical data practices.

Part 5: Building a Privacy Culture

To fulfil privacy goals and comply with regulatory requirements, healthcare organisations must have a robust privacy culture. Privacy culture refers to the collective attitudes, behaviours, and practices within a healthcare organisation regarding the handling of health information. A strong privacy culture is characterised by:

1. **Awareness:** Health information managers must be

aware of privacy risks and best practice. The importance of protecting health information and maintaining secure digital environments must be understood (OAIC, 2024d).

2. **Responsibility:** There should be a shared sense of responsibility for privacy across all levels of the organisation. Healthcare employees take ownership of their role in maintaining privacy and actively contribute to risk mitigation efforts (OAIC, 2019a).
3. **Training and Education:** Continuous training and education programs should be provided to enhance privacy knowledge and skills (NIST, 2024).
4. **Communication:** Open and transparent communication channels must be established for reporting privacy incidents, sharing updates on data breaches, and promoting collaboration among teams (OAIC, 2025b).
5. **Compliance:** Privacy policies, procedures, and regulatory requirements must be adhered to. The consequences of non-compliance must be understood, and privacy practices prioritised (OAIC, 2024a).
6. **Innovation:** A privacy culture should encourage a proactive approach to data protection rather than a reactive one, adopting a privacy by design approach (OAIC, 2021).

To establish this culture, and the components outlined above,

it is essential for health information managers to gain support from employees across the healthcare organisation. This means that it is important to celebrate successes and reflect on failures. The industry currently has numerous examples of privacy breaches that can be examined thoroughly within an organisation without needing to focus on any particular incidents at your own organisation; however, it is important to engage in such examinations and reflection at times.

As a health information manager, various methods can be used to foster a privacy culture, such as:

1. **Privacy training and awareness**: This can take the form of a training day or an online module, posters in break rooms to raise awareness, and email reminders. The goal of training and awareness initiatives is to encourage culture in a positive way, to enable employees to value privacy in relation to their day-to-day work activities. A Privacy Awareness Week is also a great opportunity to focus on privacy within the organisation and cover different topics each day.
2. **Privacy and confidentiality clauses:** Adding privacy and confidentiality clauses to systems when an individual logs in is another way to reinforce privacy messaging.
3. **Orientations:** Employee orientations can be used to provide information to new starters regarding the organisation's privacy expectations. It also enables

employees to ask any questions they may have.

4. **Auditing:** Privacy audits provide valuable insights into activities occurring at the organisation. If good privacy practices are in place, then this should be recognised and celebrated; however, if processes require improvement, they should be addressed.
5. **Discussing privacy impact assessments during committee meetings**: New projects or initiatives can be reviewed during these meetings, enabling the PIA process to be explained and highlighting the importance of completing one for new projects or initiatives involving the handling of personal information, especially health information.
6. **Utilising data breaches to enhance privacy awareness within an organisation:** Data breaches provide valuable opportunities to discuss privacy processes. Where teams who are making human errors are identified (e.g., sending emails to the wrong recipients, not using BCC when emailing patients if emailing a group of patients), this provides a valuable opportunity to discuss privacy procedures. If the organisation suffers a notifiable data breach, processes should be re-examined to determine how they can be improved, including retention and disposal practices.
7. **Maturity assessments:** Allow healthcare organisations to evaluate how mature their privacy practices are and provide some guidance on additional steps the

organisation may require to reach the next maturity level. For example, OAIC (2018b) has a Privacy Management Plan that organisations can use, and NSW Information and Privacy Commissioner offers a privacy self-assessment tool (Information and Privacy Commission, 2023).

Activity

Reflective Question: Can you think of some other activities you could undertake in a healthcare organisation to build a privacy culture?

Conclusion

This chapter explored the critical aspects of health information law, privacy, and ethics in the Australian healthcare context. It began by explaining the different privacy legislation across Australia through the key privacy terms health information managers need to be aware of and the different privacy principles across the different legislation. Privacy in practice

and the various tools that support privacy in healthcare organisations were then examined.

The chapter then explored the concept of informed consent, highlighting the requirements for valid consent, including written and verbal methods, and underscoring the need for dynamic consent models to empower patients to gain greater control over their health information.

Finally, the chapter examined the ethical dimensions of managing health information and the responsibilities associated with handling data. This was followed by suggestions for cultivating a privacy culture and the essential knowledge that health information managers require.

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CYBERSECURITY IN HEALTH

Joel Scanlan and Lachlan Hardy

Learning Outcomes

Upon completion of this chapter, learners will be able to:

- Explain cybersecurity's core principles in health information management, specifically through the lens of the Confidentiality, Integrity, Availability (CIA) triad to sensitive patient data.
- Understand the fundamental nature of cyber attacks, including data breaches, ransomware attacks, phishing, and denial-of-service.
- Describe different cybersecurity defence strategies, including defence in depth and zero trust, and explain how they can be used to protect health information.

Introduction

The Australian healthcare sector is undergoing a rapid digital transformation, with electronic health records, telehealth, and

connected medical devices becoming increasingly prevalent. While these advancements offer significant benefits for patient care, they also expose the industry to a growing range of cyber threats. With these changes, the number of opportunities for attackers to cause harm has increased, and the scope for impacts on healthcare consumers has likewise increased. In the first half of 2024 alone, Australia's healthcare sector reported a staggering 102 data breaches, highlighting the urgent need for robust cybersecurity measures (OAIC, 2024).

This chapter begins by examining cybersecurity from first principles, addressing what we are protecting and the objectives of cyber attackers. By comprehending the core goals of cybersecurity, health information managers can better understand why attackers may target our systems, and identify which data and systems require protection. These fundamental principles are particularly relevant to the sensitive patient data central to modern healthcare. Grasping the consequences of breaches in these areas is essential, encompassing compromised patient privacy and safety, disrupted care delivery, and significant financial losses for healthcare providers.

'We will also examine the diverse landscape of cyberattacks targeting the health sector, including ransomware attacks that cripple critical systems, data breaches that expose confidential patient information, and denial-of-service attacks that disrupt access to essential healthcare services. The recent spate of high-profile attacks on Australian healthcare providers underscores

the sector's vulnerability and the potential for devastating consequences (e.g. Medibank (Taylor, 2022) and MediSecure (Department of Home Affairs, 2024)).

Finally, we will explore key cybersecurity defence strategies, including defence in depth and zero trust, and discuss how these approaches can be implemented to strengthen the security posture of healthcare organisations. By understanding these strategies, health information managers can play a vital role in protecting patient data and ensuring the continued integrity of Australia's healthcare system. In the next chapter, Cyber Risk Management, we examine the methodologies and techniques we implement in line with these overall strategies to defend our systems and data.

What is Cybersecurity?

Cybersecurity is generally understood as simply protecting our devices and data from harm. While true, this definition does not' fully capture the complexity of the threats we face. Cybersecurity is a dynamic field, changing as systems evolve over time. This means that to understand the threats we face (and defend against them!), we first need to understand the foundations of cyber threats to understand what is happening.

Core to the broader field of information security is the Confidentiality, Integrity, and Availability triad (CIA) – alongside authentication. These principles are fundamental to

understanding vulnerabilities and safeguards in any environment, particularly in complex sectors like healthcare, which rely on interconnected networks and have many human actors involved in accessing, modifying, and sharing information.

Different environments prioritise these principles differently, requiring careful consideration of potential trade-offs. This section will equip you with the knowledge to understand key security questions and concerns, enabling you to consider how the implementation of protective measures in health enable the protection of consumer data, while also achieving other goals related to care delivery.

This following section describes the three goals of the CIA triad , which has been the dominant model for information security. Every cyber threat and attack can be understood through the CIA triad lens. It enables defenders to consider what is most valuable to them and what needs to be protected.

Confidentiality (C)

> ***"Assets of a computing system are accessible only by authorised parties." (Pfleeger et al., 2015)***

Confidentiality is likely the goal most individuals would consider synonymous with security, particularly in the context of data breaches witnessed in recent years. This definition above by Pfleeger et al speaks of "assets" which reminds us that

information systems consist of hardware, software, and data, and that confidentiality can be lost via physical theft, as well as unauthorised electronic access (Pfleeger et al., 2015). It also reminds us that data exists because it is useful to one, a few, or many people, and that it needs to be made available to them. This definition demands that only those authorised to have access to the data are allowed to do so. This requires techniques to identify and authenticate users of the system.

The term "parties" reminds us that people do not access digital data unaided; it is delivered to them via the operating system and a variety of software written and managed by people.

To ensure the goal of confidentiality of our data, we must trust many other people; the people who write the operating system code and application software, the people who install and maintain this, and also the hardware and the people provided with the authentication details that allows them to access the data.

You may note that (Pfleeger et al., 2015) definition says nothing about controlling what the authorised parties do with the data. However, some systems attempt to control and monitor the preservation status of confidential data; however, these are usually only found in very special environments. It is obviously no use to restrict access to data if an authorised user can then write it to an unrestricted file.

It is also worth considering that once confidentiality has been lost, it cannot be restored. Once private data about an

individual has been shared with unauthorised parties, it cannot be unshared. This is not the same for integrity, as any resulting losses from that cause can usually be corrected. Health information managers role is to protect the information assets within their organisation.

For example, generative artificial intelligence platforms like ChatGPT, Copilot, or Gemini are useful tools to create written outputs. Consider a health professional using one of these platforms in relation to their role and submitting possibly sensitive information to receive an answer. To create the output, the data provided to them is sent to a server, analysed, used to create a response, and then likely stored for later use by the platform. By storing the data that was used, these platforms contribute to a breach of confidentiality, regardless of whether that data can be directly accessed by another person (Attwooll, 2023).

Integrity (I)

> **"Every piece of data is as the last authorised modifier left it." (Schneier, 2015)**

Data integrity is vital, particularly within a healthcare context where care decisions are made based on data in electronic medical records and from tests and lab results. It is important to note that the definition above by Schneier (2015) did not say the data are accurate. Computer security techniques

cannot control the accuracy of data, as they are created or modified. However, they can try to ensure that only those with the **authority** can create, modify or even delete data.

As with confidentiality, integrity relies on the ability to properly authenticate who the actual user is and to maintain accurate and sufficiently protected tables of what each authorised user is allowed to do with the data managed by that information system.

Data integrity is vital if we trust this data as part of our decision-making process. If an unauthorised party has modified the data, then they are impacting the decisions being made, changing the outcome.

For example, cyber attacks targeting billing systems could change data in generated invoices, which could be sent to patients or come from suppliers. These changes often relate to the account number for payment and sometimes the payment amount, allowing the attackers to steal money and impact patient care provision through apparent non-payment, or care providers reputation as businesses (Australian Competition and Consumer Commission, 2024).

Availability (A)

> **"An attacker can't prevent legitimate users from having reasonable access to their systems." (Schneier, 2015)**

Availability is about ensuring systems and data are available when required – this has strong links to business continuity, and within the context of healthcare, an essential service, care systems must be available when the consumer needs them.

It is important to notice that the above definition is about ensuring that those who have the right can use the information system when it is normal for them to do so (Schneier, 2015). It does not say that a user can use a system whenever they feel like it. Indeed, many systems try to enhance their security by restricting when users can have access; for example, limited to only during their normal working hours. This is made easier by putting users into classes or groups, all of whom have the same access privileges or rights. This also makes it easier to change rights for a group when and if circumstances change.

For example, a common attack on availability is ransomware, where an attacker encrypts data, removing its availability to legitimate users. Although accidents such as power outages and weather events can also result in similar impacts and can be viewed with the same lens in responding to the risk.

Authentication (the extra A)

Finally, to add an additional meaning to the "A", it is quite common to consider authentication as a fourth security goal. The common thread through all the definitions above is that they rely on the ability to authenticate the identity of the

person using the information system. The cartoon below is a famous example that sums up the dilemma.



Figure 1. "On the Internet, nobody knows you're a dog" by Peter Steiner (1993). Reproduced with permission.

Two things must happen to authenticate a user of an information system or a person in the real world. First, we must identify the person and then confirm that we have made

the correct identification. We then determine what we will allow them to do. I am sure that in life you have misidentified people, and hopefully, that has not led to too great an embarrassment. Many cybersecurity issues we experience are the result of stolen credentials (i.e., passwords) where users are then impersonated by an attacker to gain access to systems (to breach confidentiality), or modify the data (breaching integrity), or in the common example of ransomware, remove access to the data (breaching the availability).

Passwords are highly usable and were a suitable solution for authentication in limited computing settings in the late 1960s (Yadron, 2014). However, they are not a resilient mode of authentication in the modern era (see activity below for evidence) and are very commonly paired with additional factors (i.e., something they have or are vs knows in the case of a password) to improve their security, called second factors. These additional factors can include biometrics (i.e., something we are, such as a fingerprint or facial scan), key cards or one-time codes via an application or SMS (i.e., something we have), or other forms of authentication that a user carries with them or can access to prove their identity. Effective authentication is vital to the security of systems and data, and commonly presents the weakest link that attackers can subvert.

Activity – Has your password been stolen?

The following website was created to enable users to search data leaks to discover whether their accounts have been leaked. By entering a username or email, it will search to see whether it has been in a leak – likewise you can search to see if a particular password has been leaked. It is a popular service, with many companies using it to monitor for leaks of current passwords within their company. Thirty-two different countries now also use it at a national level.

Visit haveibeenpwned.com [opens in new tab] and search for your email or username and see whether it has been in a published data breach. The website contains nearly 12 billion leaked accounts. It is safe to use – they are not stealing any of your information, just providing you access to what has already been stolen.

What is a Cyber Attack?

Understanding our security goals enables us to have a greater understanding of what a cyber attack is. Our impressions of

them from mass media or TV are likely quite far removed from the concepts described in the previous section, but a cyber attack is, fundamentally, any attempt to expose, alter, disable, destroy, steal or gain unauthorised access to a computer system. It can be as simple as a person we know guessing our password to access our device without our permission or a complex attack by a national state actor thousands of kilometres away. However, the outcome in relation to what goal is breached is not that different between those two attackers.

A cyber attack is the outcome of a motivated person using a vulnerability in a system to get it to behave in a way the owner does not desire (Schneier, 2015). A vulnerability is a weakness. It could be a flaw in the software, or it could be a guessable password. When noticed by a malicious actor, this weakness presents an opportunity for them to do harm. We call this opportunity a threat. An attack is that opportunity being realised, and the vulnerability being successfully exploited by the attacker.

As such, a cyber attack is comprised of these three elements:

- Vulnerability – An error or weakness in design, implementation or operation.
- Threat – An adversary motivated and capable of exploiting the vulnerability.
- Attack – The means (sequence of actions) of exploiting the vulnerability.

A key part of understanding how an attack works is to consider what the attacker is trying to do. If you consider the process that occurred in practical terms, a lot of attacks may leave you with the main thought of "How on earth did the person figure that out?". While this can often be an unavoidable thought, the reason that they could figure out the flaw in the system was likely about their mindset when approaching the system in the first place. When we consider what the goal of the attacker is and work backwards from that, they will aim for the simplest way or weakest link to achieve that goal. This may result in them examining systems in ways other people have not previously examined them. Thus, finding flaws (hard to locate vulnerabilities) in the security enables them to reach their goal.

The weakest link may be through accessing a leaked password and then logging in with a user's account, or it can be a software-based attack that beings with a user clicking on a link in an email. Software-based attacks are about utilising an exploit against the system to trick it into running different commands. Whether in the operating system or some task-specific application, software commonly contains millions of lines of code. Most lines of code are well-written and do their job admirably. However, the sheer amount of code in software means that it sometimes contains mistakes. Many mistakes are caught during the development and testing of systems and removed; others get missed, and often their security weakness is not obvious.



An interactive H5P element has been excluded from this version of the text. You can view it online here: https://oercollective.caul.edu.au/health-information-management/?p=94#h5p-2

In Cyber Risk Management chapter, we will discuss responding to the vulnerabilities within our systems. However, for the moment, if we consider the complexity of modern IT systems within healthcare, we can likely appreciate the level of complexity that exists. In addition to considering our goals and identifying health information managers need to prioritise our protection, understanding our vulnerabilities requires understanding our level of exposure to threat actors. A key element of this is understanding what our attack surface is.

The attack surface refers to all the points through which an attacker can enter or extract data from a system (Manadhata & Wing, 2010). With the proliferation of Internet-of-Things devices in healthcare (i.e., connected devices other than traditional devices), this surface widens significantly, presenting cybercriminals with numerous potential entry points to exploit vulnerabilities (Abdullah et al., 2022). These devices often collect and transmit sensitive patient data, making them lucrative targets for malicious actors seeking to

compromise the integrity of healthcare systems. The entry point to a network is not necessarily the device that has the data or access that an attacker will be aiming for, but a foothold to get into the system, where they can then move laterally to other devices within the network.

Reducing the attack surface is crucial for strengthening cybersecurity. This involves limiting what devices are on the network and the access they have, updating software and hardware so that known vulnerabilities are fixed, and implementing strong authentication. These steps, all present within Essential 8 (Australian Cyber Security Centre, 2017) (more on this in the next chapter), minimise the attack surface, and by doing so, healthcare organisations can significantly reduce their risk of cyberattacks.

What Cyber Attacks Have Occurred in Health?

We are increasingly becoming aware of cyber attacks through the mass media, often following the coverage across multiple days as the damage inflicted is being investigated. Below is a sampling of the higher-profile cyber attacks against health organisations in Australia in the last few years:

- I-MED – Unauthorised sharing of imagery of 40,000 patients (Wilson, 2024)

- MediSecure – Personal information of 12.9 million Australians (Department of Home Affairs, 2024)
- St Vincents – Data breach (Crozier, 2023)
- Medibank Private – Data breach affecting 9.7 million people (Taylor, 2022)
- Eastern Health – Ransomware affecting four hospitals (McDonald, 2021)
- Tasmanian Ambulance Service – Data breach of every ambulance request in the state for a three-month period (Baker, 2021)

However, it is worth noting that while we have seen these high-profile breaches, the OAIC (2024) reports that 63% of breaches affect less than 100 individuals, and 30% of breaches are the result of human error. As a result, the 102 breaches seen within the Health sector in the first half of 2024 are not all of the scale of Medibank private (OAIC, 2024). However, individuals are still affected, and the costs can be long-lasting, considering the privacy of the data involved and the impacts that can occur when care provision is hindered.

A 2023 survey of the healthcare industry across 14 countries by security vendor Sophos reported that 60% of organisations had been affected by ransomware in the previous year (Mahendru, 2023). In 2023, 24% of health organisations were able to stop the ransomware attack before it could encrypt data, down from 34% in 2022. For those that had data encrypted, 42% paid the ransom to retrieve data, while 73%

were able to use backups to restore the data (these numbers indicate that some organisations paid the ransom despite having backups) (Mahendru, 2023).

Cybercriminals target the healthcare sector due to the sizeable volume of valuable data, not only electronic health records, but also financial records. Several challenges make the healthcare industry a softer target compared to other high-value industries:

- low levels of cyber literacy among the workforce,
- insufficient investment in digital infrastructure,
- lack of robust cybersecurity measures,
- limited collaboration among different agencies, and
- high costs associated with implementing cybersecurity measures.

Collectively, these factors create numerous vulnerabilities and weak points for cybercriminals to exploit (Chipeta, 2024; OAIC, 2024; Seh et al., 2020).

One of the most pressing concerns regarding cybersecurity in healthcare is the potential for cyber attacks to disrupt care provision. Attacks that compromise medical devices can lead to delays in treatment putting patients' health at risk. Moreover, tampering with Internet-of-Things devices can result in incorrect data being provided to healthcare providers, potentially leading to misdiagnoses or harmful adjustments to treatment plans . Unfortunately, this threat is not something

far off in the future, but as seen in the two headlines below (McGee, 2021; Wetsman, 2020), we have already witnessed the first deaths in hospitals as the result of cyber attacks.



Figure 2. Cyber Threats in the Headlines: Real-world Examples of Digital Attacks Making News.

As we face these risks, we can take guidance from the *National Digital Health Strategy* (Australian Digital Health Agency, 2023), where we can see that security is embedded in much of the strategy moving forward. This gives us the responsibility to ensure our systems are cyber resilient. It equips us with the plan and language when discussing our priorities with management within the organisation to ensure that we can protect the privacy and security of our health information systems.

Philosophy of Cyber Defence

Understanding what attacks are, how they breach our goals, and in a health context, have possible impacts, not only on privacy but the health of consumers, informs the choices we make to defend against these threats. The next chapter describes some methods and techniques that we can implement; however, it is also important to consider our defence at a conceptual level to understand how it mitigates the risks we face.

The evolution of cybersecurity defence philosophy mirrors the evolving nature of cyber threats themselves. Early approaches were often reactive, focused on building walls and bolstering defences. However, as technology advanced and attacks grew more sophisticated, the philosophy shifted towards proactive strategies, recognising that absolute security is an illusion. Security is a process, not an endpoint we reach by implementing a particular countermeasure.

One of the earliest and most enduring principles is the principle of least privilege (Saltzer & Schroeder, 1975). This concept advocates for granting users and processes only the necessary permissions to perform their tasks, limiting the potential damage from a security breach. Any request outside of those permissions results in denied access, also known as *default deny*. This laid the groundwork for access control models and user privilege management, which are still fundamental today; however, at the time, it was still common

for wide scale access across organisation systems, and those within the organisation were broadly trusted to "do the right thing".

In the 1980s, the concept of "Defence in Depth" emerged, recognising that relying on a single security layer was insufficient. Like a medieval castle with multiple walls and moats, cybersecurity needed layered defences. This approach combines security measures like perimeter defences (firewalls) to keep attackers out, intrusion detection systems to respond if they get in, and strong authentication to create a multi-layered barrier against attacks. The intention is that if one layer is breached, other layers will hopefully still mitigate (decrease the impact) the attack.

As systems grew more complex, the focus shifted towards building security into the design phase itself. "Security by Design", a concept popularised in the late 1990s and early 2000s (McGraw, 1998; Viega & McGraw, 2001), emphasises incorporating security considerations throughout the software development lifecycle. This proactive approach aims to minimise vulnerabilities from the outset, rather than patching them later. Such an approach aims to create a resilient and cyber hardened system from the outset.

The rise of mobile devices, cloud computing, and remote work challenged traditional security models. Perimeter-based defences were no longer sufficient in a world where users and data resided outside the traditional network boundary. This led to the emergence of "Zero Trust" architecture in 2010

(Kindervag, 2010). Zero trust assumes that no user or device can be trusted by default, requiring verification at every access point – often termed as the principle "never trust, always verify". This approach emphasises continuous authentication, authorisation, and validation, even for users within the network.

Zero Trust is increasingly seen as the aspirational cornerstone of modern cybersecurity, which is nontrivial to adopt into existing systems. It reflects a shift from static defences to a dynamic, adaptive approach, recognising that threats can emerge from anywhere, even within the organisation. This philosophy aligns with an increasingly interconnected world, where data and users are constantly moving, and the heavy reliance on software and service supply chains increases the complexity of the information systems that organisations operate. With the adoption of cloud computing resulting in geographically dispersed networks, the software-defined perimeter emerged as a key component of cloud security and zero trust architectures. Software-defined perimeters shifted security focus from network perimeters to individual application access. This aligned perfectly with zero trust's "never trust, always verify" principle. Software-defined perimeter solutions authenticated and authorised every user and device before granting access to specific resources, drastically reducing the attack surface and mitigating lateral movement in cloud environments.

At a similar time as Zero Trust, Lockheed Martin published

a framework called *Cyber Kill Chain* (Hutchins et al., 2011). It outlines the seven distinct stages an attacker typically progresses through: reconnaissance, weaponisation, delivery, exploitation, installation, command and control, and actions on objectives. By breaking down attacks into these phases, defenders can strategically implement controls to "break the chain" at any point. This proactive approach allows for multiple layers of defence, increasing the chances of thwarting an attack before the attacker achieves their goal. The kill chain provides a common language and framework for security professionals to analyse attacks, develop mitigation strategies, and improve overall cybersecurity posture. While concepts like perimeter defence and defence in depth approaches are generally considered passive measures, the kill-chain approach takes an active step to understand the nature of attacks that are occurring, and has been built on by knowledge bases of known attacks such as in MITRE ATT&CK® [opens in new tab] (MITRE, 2025).

From the principle of least privilege to the concept of zero trust, the evolution of cybersecurity philosophy mirrors our continuous adaptation to an ever-changing threat landscape. This progression underscores a growing comprehension of the attack surfaces that systems and data present and the necessity for adaptive defences in response to the ever changing information environment. By understanding these foundational principles, we can more fully appreciate cybersecurity methods and techniques deployed at an

organisational level to safeguard our data and systems, as explored in the next chapter.

Summary

Digital health is now routinely embedded in healthcare, so we can only expect the number and level of digital systems integration to increase and, with it, the cyber events the industry has had and continues to experience. For digital health systems to be fit for purpose—to ensure clinical safety and quality—they need to be private and secure. However, to achieve this, we need to understand the threats we are facing to build an appropriate defence.

This chapter explained what cyber attacks are and how they can be described as an attacker aiming to breach one of our security goals. The lens of the security goals enables us to understand the impact and motivation behind attacks. Defending our systems and data from these risks is the next step, explored in the next chapter. However, in this chapter, we considered the evolution of cyber defence in recent decades. The approaches have changed from being only reactive to being proactive, to allowing wide levels of access to systems, to pivoting to a more locked down and default deny scenario, in line with the zero trust philosophy.

To build an effective defence against these risks, we need to consider the likely forms of attacks we are going to receive, our

budget, the usability needs of our stakeholders, and legislative requirements under the law (as described in the Health Information Law, Privacy and Ethics chapter) – all within the context of our security goals. There will be trade-offs in relation to how much defence we can afford and what an appropriate defence is that ensures our employees and other users can make effective use of our systems – this is the area of risk management, the topic for the next chapter.

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CYBER RISK MANAGEMENT

Joel Scanlan and Lachlan Hardy

Learning Outcomes

Upon completion of this chapter, learners will be able to:

- Explain the role of cyber governance in the context of health information management, including its role in establishing accountability, risk management, and compliance with relevant regulations and standards.
- Describe the five core functions of the National Institute of Standards & Technology (NIST) Cybersecurity Framework (identify, protect, detect, respond, recover) and explain how they provide a structured approach to managing cybersecurity risks in healthcare organisations (NIST, 2024).

Introduction

Health information management is no longer confined to filing cabinets and paper records. The transformation to a

digital health system has also brought forth a new set of challenges—the critical need for robust cybersecurity governance.

Traditional governance in health information management focuses on ensuring the accuracy, privacy, and confidentiality of patient data, primarily through policies, procedures, and ethical guidelines. However, the increasing reliance on interconnected systems and the growing threat of cyber attacks necessitates a broader perspective. Cybersecurity governance must be built into health information management processes, ensuring digital assets are protected with the same rigour and attention as physical records.

This chapter explores the crucial intersection of health information management and cybersecurity governance. It emphasises that protecting patient data is not just about preventing unauthorised access, but also about ensuring the integrity and availability of the data. A successful cyberattack can compromise patient safety, disrupt critical services, and erode trust in healthcare providers.

This chapter also considers how cybersecurity governance is used to establish accountability, manage risk, and ensure compliance with relevant regulations and standards. The NIST Cybersecurity Framework (NIST, 2024) will be examined as a key exemplar for structuring a cybersecurity management response, a valuable tool for healthcare organisations to improve their security posture. By understanding its five core functions: Identify, Protect, Detect,

Respond, and Recover —health information managers can develop a comprehensive approach to cybersecurity, safeguarding patient data and ensuring the continuous and secure delivery of care.

Cyber Risk Management

At its most fundamental level, cybersecurity is a breach of confidentiality, integrity, or availability (as discussed in the *Cybersecurity in Health* chapter). It is therefore a risk to the systems or data we rely upon that threatens one of those goals. In a health context, we frequently discuss breaches of confidentiality due to high-profile privacy breaches (as discussed in *Health Information Law, Privacy and Ethics* chapter). However, integrity breaches can impact the reliability of health systems, and the loss of access to health systems can mean that care cannot be provided. This unfortunately resulted in the first death as a result of a cyber-attack in 2020 (Wetsman, 2020). As such, a holistic response to all risks that healthcare organisations face needs to not only be enacted, but also monitored by existing governance structures as a core part of normal risk management processes.

The goal of cyber risk management is to lower the number and impact of risks that we face. We need to systematically provide cost-effective and efficient security for our systems and data in alignment with our security goals and priorities

(Schneier, 2015). We aim to decrease the visible attack surface that attackers have access to, and in the areas where we still have risks, we need to implement defensive tools to lower the impact when an attack occurs. To do this well, we need to understand our context as thoroughly as possible and the risks we face.

Risk management is about the balance between the money and resources available to spend on protecting our systems and our risk appetite (NIST, 2011). We cannot reduce our level of risk to zero, but we can prioritise the risks we are most likely to be affected by. Not only do systems change and evolve, making it hard to ensure we are protected, but attackers' capabilities also increase over time. The diagram below shows the relationship between the cost of preventative steps and the damage cost that could occur in an attack. The level of risk we are willing to accept is our risk appetite.

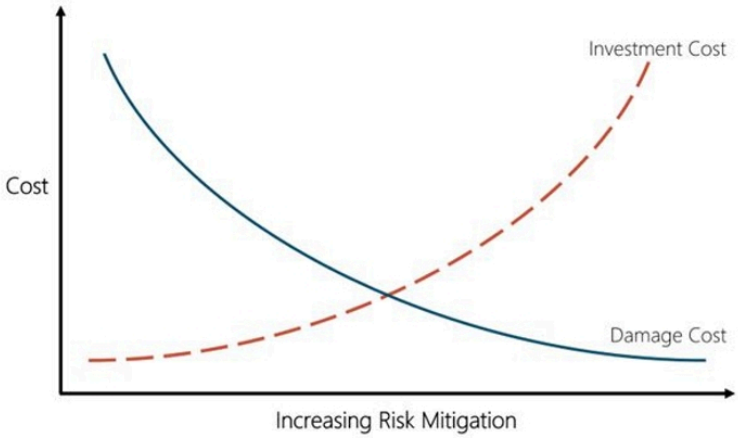


Figure 1. The Relationship Between Cost Versus the Level of Risk Mitigation

As it is not possible to remove all risk, we can only mitigate as much risk as our budget allows. It is essential to realise that we are never perfectly secure. Cybersecurity has no secure endpoint; security is a process. It is an ongoing activity that must be followed and maintained to enable us to achieve our security goals. The security measures we implement as a result of undertaking a cyber risk management process will include technical controls protecting our systems and data. It will include training and procedures to be followed by individuals, and will include management and governance procedures at an organisational level that enable a level of security assurance to be achieved.

The remainder of this chapter discusses risk management as described by the NIST Cybersecurity Framework (NIST, 2024). This de facto global framework for cybersecurity is used across a broad range of industries, has been translated into multiple languages, and has been adopted in many countries.

However, beyond the NIST Cybersecurity Framework, numerous other frameworks offer structured approaches to cybersecurity risk management, each with unique strengths and applications, including the Essential 8 [opens in new tab] maturity model in Australia (Australian Cyber Security Centre, 2017). In many respects, there is a sizeable amount of overlap across cybersecurity frameworks, with the fundamentals in each being highly transferable. The NIST Cybersecurity Framework (2024) is often used as the broader framework, with other frameworks (such as ISO27001 (ISO,

2022) and HITRUST Cyber Security Framework (HITRUST, 2025), mentioned below) used at a lower level within an organisation, enabling a degree of integration. The Essential 8 (Australian Cyber Security Centre, 2017) is discussed later in the chapter.

ISO/IEC 27001 [opens in new tab] is another internationally recognised standard that focuses on establishing, implementing, maintaining, and continually improving an Information Security Management System (ISMS) (ISO, 2022). It emphasises a risk-based approach, defining requirements for security controls while allowing organisations to tailor implementation.

COBIT [opens in new tab], developed by the Information Systems Audit and Control Association (ISACA, 2019), is a governance framework for enterprise IT. While broader than just security, it provides a comprehensive structure for aligning IT with business goals, including robust security management and control objectives.

The CIS Controls [opens in new tab], from the Centre for Internet Security (CIS, 2025), offer a prioritised set of actionable security controls. These controls are often mapped to other frameworks and focus on practical, technical safeguards against common cyber threats.

HITRUST Cyber Security Framework (2025) [opens in new tab] caters specifically to the healthcare industry, incorporating **Health Insurance Portability and Accountability Act** (HIPAA) requirements and other

regulatory standards but has a US focus, and is not mapped to Australian (or other country) regulatory frameworks. However, it does provide a prescriptive framework for protecting sensitive health information, with a focus on meeting compliance requirements in a health setting that can provide some value to other jurisdictions when considering measures to implement.

The NIST Cybersecurity Framework

The National Institute of Standards (NIST) Cybersecurity Framework (CSF) (NIST, 2024) was published in February 2014 and updated in 2018 and again in 2024, as a resource that guides how to manage and reduce IT infrastructure security risk. Its primary audience was private sector organisations, though it has been adopted by small and large alike.

The framework's core defines the activities you must undertake to achieve different cybersecurity outcomes, with the highest level comprising six functions, each further subdivided into categories for specific types of tasks within the functions (NIST, 2024). The following sections examine each function individually.


RECOVER
IDENTIFY
GOVERN
NIST
Cybersecurity
Framework
RESPOND
PROTECT
DETECT

1

Recover - Implement and maintain plans for resilience and to restore any capabilities or services that were impaired to do a cybersecurity event.
2

Identify - Develop an understanding of the cybersecurity risks to systems, assets, data, and capabilities.
3

Govern - Addresses an understanding of organisational context, including the
establishment of cybersecurity strategy and defining roles and responsibilities within the organisation in relation to cybersecurity.
4

Respond - Undertake appropriate activities to take action regarding a detected cybersecurity event to mitigate the impact.
5

Protect - Develop and implement the appropriate safeguards to ensure delivery of services relevant to the risks that are present.
6

Detect - Implement appropriate activities to identify the occurrence of a cybersecurity events.



The interactive version of this H5P content is available at:
https://oercollective.caul.edu.au/health-information-management/?p=96#h5p-6

In addition to the framework functions outlined above, the framework specifies four implementation tiers (NIST, 2024). This enables you to establish what level of compliance you are in. The higher the tier, the more compliant you are. In addition, the framework also suggests the development of profiles that relate to the current status within a roadmap of improvement to facilitate planning and a greater understanding of what weak points may currently exist and how they relate to the implementation tiers.

Govern

The most recent release of the NIST Cybersecurity Framework was in early 2024, and was built on the existing framework with the key conceptual change to elevate *govern* to its own function, from being a category within *identify*. This highlights both the important role of governance in cybersecurity and provides a set of categories to facilitate action. While it places *govern* as the first function, clearly

stating that ownership of cybersecurity is the first step in protecting data and systems, it is also shown as ongoing throughout all other functions of the framework.

Govern includes several categories relocated from *identify* in the previous version of the framework, such as Risk Management Strategy and Supply Chain Risk Management, and several that were subcomponents of the Business Environment, with Policy being relocated from within *protect* (NIST, 2024). The figure below describes each of these briefly; however, the framework itself provides depth to enable organisations to structure their cyber risk management activities.

Organisational Context

The organisation's mission, objectives, stakeholders, and activities are understood and prioritised; this information is used to inform cybersecurity roles, responsibilities, and risk management decisions.

Risk Management Strategy

The organisation's priorities, constraints, risk tolerances, and assumptions are established and used to support management of cybersecurity risk.

Roles, Responsibilities and Authorities

Cybersecurity roles, responsibilities, and authorities to foster accountability, performance assessment, and continuous improvement are established and communicated.

Policy

Security policies (that address purpose, scope, roles, responsibilities, management commitment, and coordination among organisational entities), processes, and procedures are maintained and used to manage the protection of information systems and assets.

Oversight

Results of organisation-wide cybersecurity risk management activities and performance are used to inform, improve, and adjust the risk management strategy.

Cybersecurity Supply Chain Risk Management

The organisation's priorities, constraints, risk tolerances, and assumptions are established and used to support risk decisions associated with managing supply chain risk. The organisation has established and implemented the processes to identify, assess and manage supply chain risks.



The interactive version of this H5P content is available at: https://oercollective.caul.edu.au/health-information-management/?p=96#h5p-8

Identify

The *identify* function aims to enable organisations to understand and manage cybersecurity risk to critical systems, people, assets, data, and capabilities (NIST, 2024). It is based on the premise that you cannot effectively protect something if you are unaware of its existence or importance. *Identity* builds on the Organisational Context within *govern*, which involves

the creation of inventories as a formal accounting of all assets, systems, and data, which can then be utilised within a formal risk assessment process that will serve as the cornerstone of our risk process.

Asset Management

The data, personnel, devices, systems, and facilities that enable the organisation to achieve business purposes are identified and managed consistent with their relative importance to organisational objectives and the organisation's risk strategy.

Risk Assessment

The organization understands the cybersecurity risk to organisational operations (including mission, functions, image, or reputation), organisational assets, and individuals.

Improvement

Identify and implement improvements to organisational cybersecurity risk management processes, procedures and activities are identified across all CSF Functions.



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https://oercollective.caul.edu.au/health-information-management/?p=96#h5p-7

The core of the *identify* function is risk assessment, which goes beyond simply cataloguing your risks; it aims to identify potential vulnerabilities and evaluate the likelihood and impact of cyber threats on the organisation's security goals (NIST, 2024).

This proactive process aims to gain a deep understanding of your organisation's cybersecurity posture. It starts by pinpointing the vulnerabilities that attackers could exploit. These may include outdated software with known security flaws, weak password policies, or even human error like phishing scams. It then assesses the likelihood and impact of potential threats. What are the chances of a particular attack occurring, and what would be the consequences if it were successful? It is important to consider factors like the sophistication and motivation of potential attackers, the value of your assets, and the potential impact on your organisation's operations, finances, and reputation.

This process must leverage as much information as possible about the risks we may face to enable informed decisions to occur in the protect function that follows. Frameworks like

the cyber kill chain, pioneered by Lockheed Martin (2011) (as mentioned in the previous chapter), are instrumental in this process. MITRE ATT&CK [opens in new tab] (is a globally-accessible knowledge base of adversary tactics and techniques based on real-world observations) expands on the kill chain by providing a detailed matrix of adversary tactics and techniques observed in real-world attacks and makes them accessible to organisations and security vendors to implement (MITRE, 2025). By mapping risks to specific attacker behaviours within frameworks, organisations can better understand the threats they face, prioritise security controls, and proactively defend against cyberattacks. These frameworks empower a more granular and actionable approach to cybersecurity risk analysis. Threat intelligence about bad actors who have been targeting health organisations and their tactics can then inform the defence we implement within our own organisation.

The goal of risk assessment is not to entirely eliminate all risks, but to manage them effectively. This may involve implementing security controls to mitigate vulnerabilities (within the *protect* function, and formalised in policy within *govern*), developing incident response plans to handle attacks, or even transferring risk through cyber insurance policies (NIST, 2024).

Protect

The next step, once we have established a meaningful

understanding of our risks, is to undertake the process of mitigating the risks, and managing them in the long term (NIST, 2024). This is an ongoing process, where the risk register will need to be monitored, allowing for responses to changes that occur in relation to the business goals and the importance of systems or data changes, or new risks arising. Handling risk, mitigating its impact, is formally undertaken through the creation of policies, which then result in the implementation of technical measures and behaviours by users—policies are present within the *govern* function, but were formerly a part of the *protect* function, where many of them are implemented.

Security policies are the formalisation of our risk mitigation. These policies enable employees to understand the procedure and standards in relation to how systems and data function in alignment with our security goals. Policies can define simple concepts like the complexity and length of a password to how a firewall will operate on the network. Our policy document is a complete listing of user behaviour expectations as to how systems and data are to be treated and how technical countermeasures are configured and deployed.

Policies cover how users interact with systems (such as how they authenticate and access control); what procedures are in place to protect data while it is in use, transit, or storage; including encryption, the security tools used in software and hardware, and the training implemented for users (NIST,

2024). The figure below provides an overview of the key categories of the *protect* function.

Identity Management, Authentication and Access Control

Access to physical and logical assets and associated facilities is limited to authorised users, processes, and devices, and is managed consistent with the assessed risk of unauthorised access to authorised activities and transactions.

Awareness and Training

The organisation's personnel and partners are provided cybersecurity awareness education and are trained to perform their cybersecurity related duties and responsibilities consistent with related policies, procedures, and agreements.

Data Security

Information and records (data) are managed consistent with the organisation's risk strategy to protect the confidentiality, integrity, and availability of information.

Platform Security

The hardware, software (e.g., firmware, operating systems, applications), and services of physical and virtual platforms are managed consistent with the organisation's risk strategy to protect their confidentiality, integrity, and availability.

Technology Infrastructure Resilience

Security architectures are managed with the organisation's risk strategy to protect asset confidentiality, integrity, and availability, and organisational resilience



The interactive version of this H5P content is available at: https://oercollective.caul.edu.au/health-information-management/?p=96#h5p-9

Essential 8

The Essential 8 is a framework central to how cyber defences

are approached in Australia (Australian Cyber Security Centre, 2017). It was developed by the Australian Cyber Security Centre (2017) and provides a practical framework to translate those security policies into action. It prioritises eight essential mitigation strategies designed to protect organisations from various cyber threats. Think of it as a baseline for cybersecurity, providing a maturity model designed for the Australian context, used by both governments and private industry.

These eight strategies are not merely a checklist, but a carefully selected set of actions that address common vulnerabilities exploited in many cyberattacks (Australian Cyber Security Centre, 2017). By implementing the Essential Eight, organisations can significantly reduce their risk of incidents like ransomware, malware infections, and phishing attacks, while also limiting the impact should an incident occur.

The Essential Eight's effectiveness lies in its focus on prevention, limitation, and recovery (Australian Cyber Security Centre, 2017), and the controls are listed in the figure below.


The Essential Eight
APPLICATION CONTROL
PATCH APPLICATIONS
CONFIGURE MICROSOFT OFFICE MACROS
USER APPLICATION HARDENING
RESTRICT ADMIN PRIVILEGES
PATCH OPERATING SYSTEM
MULTI-FACTOR AUTHENTIFICATION
DAILY BACKUPS
Australian Government
Australian Signals Directorate
ACSC
Australian Cyber Security Centre



1

Application Control

- Application control is implemented on workstations.
- Application control is applied to user profiles and temporary folders used by operating systems, web browsers and email clients.
- Application control restricts the execution of executables, software libraries, scripts, installers, compiled HTML, HTML applications and control panel applets to an organisation-approved set.

2

Patch Applications

- A vulnerability scanner is used at least weekly to identify missing patches or updates for vulnerabilities in office productivity suites, web browsers and their extensions, email clients, PDF software, and security products.
- A vulnerability scanner is used at least daily to identify missing patches or updates for vulnerabilities in online services.
- An automated method of asset discovery is used at least fortnightly to support the detection of assets for

subsequent vulnerability scanning activities.
- Office productivity suites, web browsers and their extensions, email clients, PDF software, Adobe Flash Player, and security products that are no longer supported by vendors are removed.

3
User Application Hardening

- Internet Explorer 11 is disabled or removed.
- Web browsers do not process Java from the internet.
- Web browsers do not process web advertisements from the internet.
- Web browser security settings cannot be changed by users.

4
Restrict Microsoft Office Macros

- Microsoft Office macros are disabled for users that do not have a demonstrated business requirement.
- Microsoft Office macros in files originating from the

internet are blocked.
- Microsoft Office macro antivirus scanning is enabled.
- Microsoft Office macro security settings cannot be changed by users.

5
Multi-factor Authentication

- Multi-factor authentication is used to authenticate users to their organisation's online services that process, store or communicate their organisation's sensitive data.
- Multi-factor authentication (where available) is used to authenticate users to third-party online services that process, store or communicate their organisation's non-sensitive data.
- Multi-factor authentication is used to authenticate customers to online customer services that process, store or communicate sensitive customer data.

6
Restrict Administrative Privileges

- Requests for privileged access to systems, applications and data repositories are validated when first requested.
- Privileged users are assigned a dedicated privileged account to be used solely for duties requiring privileged access
- Privileged accounts (excluding those explicitly authorised to access online services) are prevented from accessing the internet, email and web services.
- Privileged accounts (excluding local administrator accounts) cannot logon to unprivileged operating environments.

7
Patch Operating Systems

- A vulnerability scanner is used at least fortnightly to identify missing patches or updates for vulnerabilities in operating systems of workstations, servers and network devices
- An automated method of asset discovery is used at least fortnightly to support the detection of assets for subsequent vulnerability scanning activities.
- Patches, updates or other vendor mitigations for vulnerabilities in operating systems of internet-facing servers and internet-facing network devices are applied

within 48 hours of release when vulnerabilities are assessed as critical by vendors or when working exploits exist.
- Operating systems that are no longer supported by vendors are replaced.

8
Regular Backups.

- Backups of data, applications and settings are performed and retained in accordance with business criticality and business continuity requirements.
- Backups of data, applications and settings are synchronised to enable restoration to a common point in time.
- Backups of data, applications and settings are retained in a secure and resilient manner.
- Restoration of data, applications and settings from backups to a common point in time is tested as part of disaster recovery exercises.



The interactive version of this H5P content is available at:

https://oercollective.caul.edu.au/health-information-management/?p=96#h5p-5

Technical Countermeasures

To provide a deeper level of security, those eight essential mitigation strategies (Australian Cyber Security Centre, 2017) must be complemented by a broader range of technical countermeasures. These countermeasures provide the specific tools and technologies required to defend against a wider array of threats from both unknown and unknown vulnerabilities and attacks.

A series of common countermeasures are described in the figure below, which form the layered defences in a defence-in-depth approach. Firewalls, intrusion detection systems, and antivirus software act as the first line of defence, while encryption, data loss prevention, and multi-factor authentication provide deeper levels of protection. Each layer reinforces the others, creating a comprehensive shield against attacks (Pfleeger et al., 2015; Stallings, 1995).

In a zero-trust environment (as defined and described in the previous chapter), technical countermeasures are essential for enforcing strict access controls and verifying every user and device. This includes strong authentication methods and

network segmentation to isolate sensitive data and limit the impact of breache s.

By strategically deploying and managing a diverse range of technical countermeasures, organisations can go beyond the baseline provided by the Essential Eight (Australian Cyber Security Centre, 2017). They can build a truly resilient cybersecurity posture that adapts to the evolving threat landscape, effectively protecting their assets and ensuring business continuity.



An interactive H5P element has been excluded from this version of the text. You can view it online here: https://oercollective.caul.edu.au/health-information-management/?p=96#h5p-13

Awareness and Training

Finally, it is necessary to acknowledge that users are vital to our defence. An informed user is a safe user. They need to know the policies that protect the systems from cyberattack and how they operate. "Breaking the rules", going around a policy or procedure, is a common way for breaches to start. If users understand the threats they face, they will play their

part to defend the systems by following the rules and ensuring other employees they interact with are following them.

User education comes in many forms, from seminars and courses to posters around the workplace reminding staff of key policies. It also can include testing that policies are followed, including by external service providers who make phone calls asking for private data or fake phishing emails to see if staff open or download attachments. Creative approaches that re-enforce present risks are a good way to maintain a security culture throughout the organisation.

User education is not just for frontline workers. It is also important for decision-makers. C-suite executives (CEO, CTO, CFO, etc) must understand the risks an organisation faces so that resources are allocated to mitigating risks to ensure data is kept safe and that business continuity is preserved.

Cyber Hygiene

Much like hand hygiene has become standard healthcare practice to ensure patient safety and recovery, cyber hygiene is integral to mitigating cyber risks. Practices common to good cyber hygiene include strong passwords, regular software updates, secure data backups, use of antivirus software, and being cautious with sensitive information and data. Cyber hygiene often translates beyond the workplace, and becomes most effective when it becomes habit, as summarised in

personal security advice provided by governments and organisations (e.g., Personal Security Guides [opens in new tab] by the Australian Cyber Security Centre (2024a)).

Many organisations have a password policy, usually something like a minimum of 10 characters including lower and upper case, numbers, and special characters. When these policies were created, the passwords they generated were considered strong; however, as computing power has increased, the time it takes to break such a password has reduced from weeks to seconds. Another problem with such policies is they cause people to create passwords that are difficult to remember, which often results in the passwords being written down in a notebook or on a sticky note. The current recommendation from the Australian Government has shifted from passwords to passphrases, which are longer and can be loosely themed to have some meaning to you, which makes them harder to forget (Australian Cyber Security Centre, 2024b).

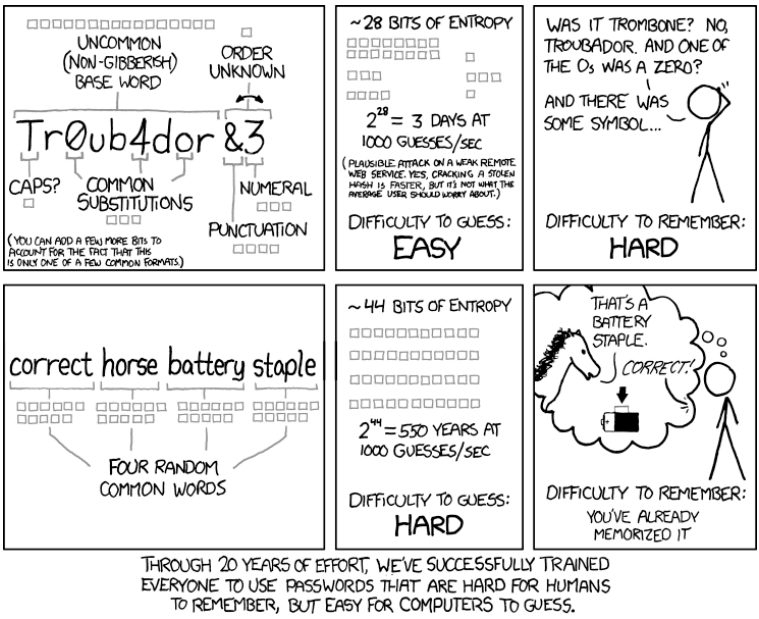


Figure 4. "Password strength" by xkcd.com is licensed under CC BY-NC 2.5

Consider the following passphrase example "doberman!hawthornMountain11sassafras" at 36 characters it meets the length requirement for security, as it would take well over 100 years to break. It may seem complex, but each word could have individual meaning; for example, the rowing club near your favourite dog park could be named the Dobermans, not (in computer terms "!" often means not) hawthorn could relate to your least favourite football team, Mountain11 could be the number of mountains you want to climb, or have climbed, and sassafras could be the material of a coat hanger

you received as a gift. The resultant passphrase is therefore memorable to you, but seemingly random to anyone else.

As discussed in the Cybersecurity in Health chapter the previous chapter, vulnerabilities in software can occur if the developer has made a small mistake, or when one system has a strange interaction with another system. When the software vendor discovers the vulnerability, they will often create and distribute a patch that fixes the problem. However, software updates are often not applied, as the patch is never installed, usually because it would be inconvenient to reboot the computer. Patching systems soon after an update is released is critical to maintaining security and reducing the number of vulnerabilities that may be present. This has become especially true with the rise of personal devices (phones and laptops) being used for work. An unpatched app on your phone that connects to your work Wi-Fi could allow an attacker to gain access to your work's network.

Creating backup data and system recovery plans can enable your organisation to have minimal disruption in the event of a cyber incident by ensuring you maintain availability of the data and systems. Creating backups of critical data is becoming more necessary as the threat of ransomware grows, especially in healthcare, where the data under threat are often sensitive and private. If ransomware affected a system and it was restored from a backup, then there would be minimal disruption, but what if the backup was also infected? This is why creating system recovery plans is crucial for reliable data recovery. Many

organisations operate on a staged backup process; for example, 12 hours, 2 days, 1 week, and 1 month, with the data from each stage rolling over to the next as time moves forward. The backup process may also target different data and systems, as some may take longer to backup than others, or their backup could be much larger and require special storage.

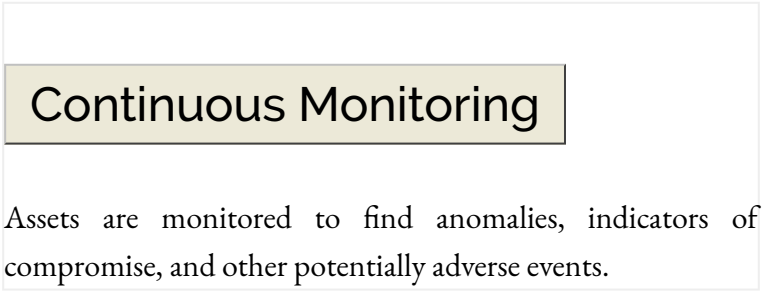
For many security needs, antivirus software is effective at blocking known malicious files from infecting our systems. Most computers will come with an effective antivirus software (e.g., Windows Defender for the Windows operating system), which will protect your computer as one of the defensive layers. However, you do need to keep the antivirus software updated, as those updates tell it what to look for and how to look for it.

Finally, you must be aware of your physical environment as a means of securing computer systems. For example, you should ensure that no one is watching over your shoulder when you type your password, or that people do not follow you through a door that requires secure access. Given how common social media has become, it is also important to understand that when you put data or information on the internet (including social media), they may remain there forever. While it is difficult to change the past, it is important to remember this going forward, as this information could be used to create a profile of you or it could include software information that an attacker can use to find a vulnerability.

Detect

The timely detection of a cyber incident is the primary way that its impact can be mitigated. The faster it can be detected and responded to, the less damage is likely to occur. This is accomplished by understanding the traffic flowing on our networks, monitoring for indications of compromise, and employing active defence techniques to provide early warning of an attack (Stallings, 1995). By understanding what normal activity looks like, we can take note of behaviours that are not normal and are likely to be a cyber incident that needs to be responded to.

The *detect* function is a continuous function, or normal activity, within the framework (NIST, 2024). We need to always be observing and monitoring whether, despite our planning, an attacker has gotten into the system. The categories within *detect* are briefly outlined in the figure below.



Adverse Event Analysis

Anomalies, indicators of compromise, and other potentially adverse events are analysed to characterise the events and detect cybersecurity incidents.



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Firewalls, operating systems, and other applications can create a tremendous amount of data based on the events occurring on our network and systems. Intrusion detection systems monitor this audit trail in real-time to discover a cyberattack when it is underway, provide an alert, and enable a response to stop the activity. It is similar to an antivirus, but focuses more on network and user activities than the software running on our devices. Intrusion detection systems can operate on host devices on the network or sit on the network monitoring traffic as it goes by, examining what data are present to detect attacks as they occur.

Host and network based systems "sensors" for a more

centralised system in modern networks. Such systems are called Security Event and Incident Management (SEIM) solutions. They are products (or services, as they can span organisations, provided by a third party) that provide real-time analysis, monitoring, and alerting on security logs generated by applications, hosts, and network devices. Such approaches have been enabled in the last decade as connectivity has increased at an ever-decreasing cost.

As networks have grown in size and complexity, the ability to understand and respond to alerts from the massive amounts of data that can be stored within SEIM solutions has resulted in the creation of Security Operation Centres (SOC). SOCs are operated by large organisations, feeding all their security data and decision-making through a central point staffed by experts in the field. Such services have also become commonly outsourced, where a SOC may then be run, making security decisions that matter to a range of networks in one location. So, a SOC operating in a city may be responsible for the security of a range of different companies and organisations within the city.

Fortunately, our systems are not under attack most of the time, so our data is hopefully safe and secure. However, we must test our systems to ensure they provide effective security. If our systems are not providing adequate security and our detection processes have failed, we are likely living with a false sense of security, and our data has already been stolen. Testing and auditing of systems needs to be a normal business process.

A key example of this understanding is what is referred to as Penetration Testing, where an external consultant (who approaches the defence with a fresh perspective) is hired to attempt to access systems to subvert our security measures. If they are successful, this indicates the need to strengthen our security, and we have learned this without actual harm occurring.

Respond

The *respond* function focuses on taking swift and decisive action when a cybersecurity incident occurs. It is about having the right plans and capabilities in place to contain the damage, investigate the cause, and begin recovery.

The first step in responding to an incident is mitigation. The goal is to contain the incident as quickly as possible, limiting its negative impacts. This may involve isolating affected systems, disabling compromised accounts, or adjusting network configurations to prevent the spread of malware or unauthorised access.

Containment is key; however, it is important to achieve this without destroying valuable evidence. Rebooting or shutting down systems can erase crucial data required for investigation. Instead, focus on isolating the affected systems while preserving their state for forensic analysis.

Once the incident is contained, the investigation begins. This involves carefully examining systems and logs to

understand the nature and scope of the attack, identify the attacker's methods and motives, and assess the extent of the damage. Digital forensics plays a crucial role in this process. Experts meticulously collect and analyse evidence, ensuring its integrity for potential legal proceedings. This can help identify the perpetrators and hold them accountable, while also providing valuable insights to improve future defences.

The *respond* function is not just about reacting to incidents; it's about learning from them. By analysing what happened and how, organisations can identify weaknesses in their defences, improve their incident response plans, and enhance their overall cybersecurity posture. A description of each of the categories within the *respond* function is provided below:

Incident Management

Responses to detected cybersecurity incidents are managed.

Incident Analysis

Analysis is conducted to ensure effective response and support forensics and recovery activities.

Incident Response Reporting and Communication

Response activities are coordinated with internal and external stakeholders (e.g. external support from law enforcement agencies).

Incident Mitigation

Activities are performed to prevent expansion of an event, mitigate its effects, and resolve the incident.

Improvements

Organizational response activities are improved by incorporating lessons learned from current and previous detection/response activities.



The interactive version of this H5P content is available at:

https://oercollective.caul.edu.au/health-information-management/?p=96#h5p-11

Recover

Following an incident, it is vital to restore normal operations quickly and minimise reputational harm. In health, it is key that we restore the systems as quickly as possible so we have full availability of our digital health systems, as not having full availability may impact care provision. This is the goal of the *recover* function, getting systems and data back online securely and efficiently, minimising downtime and preventing future incidents.

Recovery involves more than simply restoring data from backups. It includes a thorough assessment of the damage, identifying affected systems and data, and implementing security measures to prevent a recurrence of the incident. This may involve rebuilding systems from scratch, patching vulnerabilities, and strengthening security configurations. It also includes reviewing and updating incident response plans based on lessons learned from the incident.

Communication is crucial throughout the recovery process. Keeping stakeholders informed about progress and any remaining risks helps maintain trust and manage expectations,

and deal with the media fallout from the event occurring (Cichonski et al., 2012). It also likely includes reporting requirements if a data breach has occurred, which needs to be undertaken by the correct employee as defined by the roles and responsibilities within *govern* (and discussed within the *Health Information Law, Privacy and Ethics* chapter).

The *recover* function also emphasises the importance of resilience. This means designing systems and processes that can withstand disruptions and recover quickly, minimising the impact on business operations and ensuring continuity of service. A description of each of the categories within the *recover* function is provided below:

Incident Recovery Plan Execution

Recovery processes and procedures are executed to ensure the restoration of systems or assets affected by cybersecurity incidents.

Incident Recovery Communication

Restoration activities are coordinated with internal and external parties (e.g. coordinating centres, Internet Service

Providers, owners of attacking systems, victims, other Computer Security Incident Response Teams (CSIRT), and vendors).



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Summary

The cyber risks we need to manage are not specific to health, and so, this chapter has aimed to approach the topic in a generalised and transferable way by structuring it around the NIST Cybersecurity Framework (2024). It has a strong foundation in governance that enables it to be easily leveraged by health information managers when working with IT teams and other stakeholders in developing and deploying a strategy to ensure the privacy and security of patient data and health systems are maintained.

However, cybersecurity is not an endpoint, but a journey. The implemented processes and procedures need to be revisited and evaluated over time to ensure that they still

provide the level of protection required. An organisation's risk management approach needs to be based on the cybersecurity and business goals of the organisation. If they are not firmly grounded in the organisational context, they will not provide the protection required and will likely be a hindrance in the event of a cyber incident.

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PART 6 THE FUTURE OF HEALTH INFORMATION MANAGEMENT

THE FUTURE OF HEALTH INFORMATION MANAGEMENT

Sallyanne Wissmann; Sheree Lloyd; and Joel Scanlan

Learning Outcomes

- Understand the future for health information management and emerging opportunities and challenges.
- Explore the different approaches health information management professional associations are adopting to educate and support the careers of health information management professionals.
- Understand the imperative of policy, advocacy, and global collaboration.

Introduction

"Gazing into the crystal ball is fraught with risk: prediction requires acknowledgement of evidence from

the past melded with an understanding of current practices and trends" (Robinson & Lee, 2021).

The future presents both opportunities and challenges for the profession of health information management (HIM). Health information management professionals will continue to be a critical resource within healthcare organisations and supporting agencies. Their expertise is needed to continue to drive, manage, advocate for, and lead best practice information management practices through people, processes and systems in healthcare. The achievement of the global Sustainable Development Goal to ensure healthy lives and promote well-being for all at all ages depends on the effective collection, management, use and analysis of health data. Effective decision making for patient health and wellbeing, healthcare investment, service delivery, system efficiency, outcomes and research priorities depend on the availability and accessibility of appropriate and accurate data.

Societal and healthcare system changes are continuous. Issues of inequity, accessibility, and demand combined with increased cost, changes in population demographics, and workforce challenges will continue to put pressure on the healthcare system. Healthcare organisations need to find increased efficiency and effectiveness in their service delivery while governments need to demonstrate value for money while meeting the population's healthcare needs. The need to further integrate and embed technological solutions to improve patient care, support consumers to engage and take

control of their health, enable workforce efficiency, and improve access and equity to health services is inevitable. Healthcare is on the verge of being significantly transformed by the use of AI-enabled technologies.

New models of care for delivering health and embedding digital health technologies offer promise and can improve access and equity to health services, but privacy and security of data must continue to be addressed together with the fundamental principles of health information management. Building on other chapters in this text, we describe the opportunities and challenges that will impact upon health information management practice.

Opportunities and Challenges

Patient Safety

Errors in healthcare records are caused by missing information, incomplete communication, errors or failure to document changes (Lloyd, 2025). Difficulty finding important information in a timely manner or delays in reporting can contribute to errors, misdiagnosis and inappropriate treatment. Healthcare teams also report that the use of mixed record systems (paper and electronic) and electronic records cause problems (Lloyd, 2025; Lloyd et al., 2024). 'Note bloat'

due to copy and paste has been determined to perpetuate wrong information and is a well-known hazard leading to errors (Lloyd, 2025; Lloyd et al., 2024), burnout and wasted time (Steinkamp et al., 2022). Abbreviations used in healthcare records, in particular medication charts, can be misunderstood or misinterpreted leading to errors (Australian Commission on Safety and Quality in Healthcare, 2021 [opens in new tab]). A Swedish study [opens in new tab], that involved patients reviewing the notations in their own records found one-third identified an error (35.98%) or omission (26.37%), and (17.56%) were offended by the content of the notes, with even higher percentages noted by mental health patients (Bärkås et al., 2023). Health information management professionals can contribute to improved documentation and the reduction of errors in health care records.

However, whilst HIM professionals play a vital role in ensuring safe patient care through the management of health information, the empirical evidence directly linking their impact on patient safety remains surprisingly limited (Kemp et al., 2025; Kemp et al., 2021).The HIM profession was established to support healthcare delivery through the provision of high-quality information management (Kemp et al., 2025; Kemp et al., 2021). Health records serve as a key communication tool for patient safety (Australian Commission on Safety and Quality in Healthcare, 2021; Lloyd, 2025). HIM professionals fulfil essential functions that directly influence patient safety outcomes (Kemp et al., 2025;

Kemp et al., 2021). These functions encompass information governance, corporate governance, data quality management, and comprehensive health information management, with particular emphasis on accurate data capture throughout the patient care journey (Kemp et al., 2025; Kemp et al., 2021).

Professional values, especially integrity, are integral to HIM practice and influence interactions with clinical and other colleagues (Kemp et al., 2025; Kemp et al., 2021). These values underpin health information management professional practice and influence interactions with both colleagues and patient information management. As healthcare continues to evolve and become increasingly data-driven, the role of HIM professionals in ensuring patient safety through accurate, accessible, and well-managed health information becomes ever more critical (Kemp et al., 2025). For the future it is important that patient safety and the nexus between documentation accuracy, timeliness and coding and patient safety is included in HIM curricula (Kemp et al., 2025; Kemp et al., 2021).

Information Governance

"…. health information governance should be regarded as a necessity in the health systems of various countries to improve and achieve their goals, particularly in developing and underdeveloped countries" (Ghaffari Heshajin et al., 2024).

Effective information governance is underpinned by valuing

information as a strategic asset (Hanson, 2011). Information governance is a core component of corporate strategy and must be integrated into the broader governance frameworks of the organisation (Smallwood, 2018). Success relies on securing leadership and commitment from senior management and fostering a collaborative approach across teams. Information governance must support legal, reporting and privacy compliance, align with organisational objectives, and uphold information security, privacy, quality, and integrity (Kwan et al., 2022). It encourages a culture of knowledge sharing and collaboration, adopts a risk-based approach, and ensures authorised stakeholders have access to reliable and accessible information throughout its lifecycle. Information governance provides an effective and increasingly recognised framework within which to articulate and operationalise health information management practices. Health information management professionals continue to lead in information governance, and our expertise and knowledge are critical to effective governance over the information assets of health and social care systems (Kwan et al., 2022). The profession fosters cross-sector collaboration, with information technology staff, clinicians and other stakeholders, to ensure health information assets and digital health solutions are fit for purpose and managed well across the information lifecycle.

Health information management professionals and others working in governance are required to work with established and emerging governance frameworks such as COBIT, ITIL

and TOGAF (The Open Group Architecture Framework) to name a few (Smallwood, 2018). In the chapter on Cyber Risk Management we introduced critical cyber risk and other relevant frameworks that are integral to comprehensive governance.

The adoption of relevant standards to promote consistency and best practice is an important component of information governance. Health information management professionals are encouraged to be involved in the development, advocacy, adoption and assurance of international and national standards. Relevant standards will include both health centric and non-health centric standards such as ISO 4143:2022(en) [opens in new tab], a standard that relates to **Information Governance (Information and documentation),** and ISO/IEC 38500 [opens in new tab], a standard for **Governance of IT for the Organisation.** There are important standards in health information management related to terminology (SNOMED CT), ICD and many others (Owen et al., 2023) described more fully in Healthcare Classification and Terminologies. The Australian Digital Health Agency publishes the Digital Health Standards Catalogue [opens in new tab] to provide access to the digital health standards that support the ongoing digital transformation of Australian healthcare and ensure interoperability of systems and data. Health information management professionals need to keep abreast of industry standards development and adoption. Standards such as FHIR and HL7 will be routinely

adopted by vendors and expected by the purchasers of health information systems.

Health Information Use and Reuse for Research

Health information management professionals, through their oversight of disease and operation indices, actively support health service management and clinical research (Henderson et al., 2025; Riley et al., 2024). Reusing health information and research data is crucial for advancing knowledge, improving patient care, and maximising the value of research investments; however, the data must be trusted by researchers if they are to utilise it (Riley et al., 2025; Riley et al., 2023). When researchers and healthcare professionals can access and analyse previously collected data, they can identify patterns, trends, and correlations that might not be apparent in smaller, isolated studies. This practice also helps validate previous findings, test new hypotheses, and conduct meta-analyses that provide more robust evidence for clinical decisions. Data reuse reduces redundant data collection efforts, saving time and resources while minimising the burden on research participants and healthcare systems. The reuse of health information and research data can promote transparency, reproducibility, and collaboration within the scientific community (Henderson et al., 2025; Riley et al., 2023). Sharing and reusing data allows

researchers to build upon existing knowledge, potentially leading to new discoveries and innovations in healthcare.

Data reuse can be guided by principles and frameworks such as FAIR [opens in new tab] and the Five Safes Framework [opens in new tab]. The FAIR principles state that research data should be Findable, Accessible, Interoperable, and Reusable, which means data should be easy to localise, retrieve, work with other datasets, and be well-documented. These principles ensure that both humans and machines can easily discover, understand, and reuse the data, ultimately promoting open science and maximising the value of research data. Organisations such as the Australian Institute of Health and Welfare in Australia use Five Safes [opens in new tab] as an approach to thinking about, assessing and managing risks associated with data sharing and release. HIM professionals ensure appropriate governance is in place to enable authorised secondary use of health information while ensuring compliance with privacy, confidentiality and security requirements.

Digital Health

Whilst it is not possible to predict the future, as health systems continue to digitise, future challenges in health information management will increasingly centre around the professional requiring advanced competencies in data and analytics, information governance, privacy, cybersecurity, people and

change management. The proliferation of health data—driven by technologies such as wearable biosensors, smart implants, and AI-powered diagnostic tools—will require health information management and other professionals to critically evaluate data quality, interpret predictive analytics, and ensure ethical information and data governance systems are in place.

Decentralised data storage and cloud-based platforms will continue to demand robust cybersecurity protocols and privacy frameworks. Managing these complexities will require adaptability, governance and leadership strategies to support the integration of future innovation and new ways of working. Leadership in digital health strategy and system design will be vital in navigating emerging technologies and patient, consumer and workforce expectations. The health information management professional will need to advocate for, and guide the implementation of interoperable systems that incorporate virtual care platforms, AI-driven clinical decision support, and real-time population health dashboards. Real-time dashboards in healthcare management are crucial for enabling fast, data-driven decisions providing visibility over key performance indicators, patient flow, resource allocation, and clinical outcomes with the aim of improving operational efficiency and patient care quality. High quality, timely, reliable, valid and complex data is needed to underpin decision support systems. Trust in health information and that healthcare organisations will protect sensitive and confidential will remain an imperative (Ruotsalainen & Blobel, 2020).

Many healthcare organisations are already adopting digital health solutions to support clinicians, new models of care and 'digital front doors', allowing patients to book their own appointments and access patient portals (Australian Digital Health Agency, 2025). In some general practice and community healthcare settings these solutions are well advanced, and consumers can book appointments, vaccinations and order medications from home and at times suited to their lifestyles.

Health information management professionals are well suited to lead and significantly contribute to digital system procurement, implementation and management based on their knowledge of clinical concepts and workflows, healthcare operations, and information science. Their ability to work effectively across all segments of clinical practice and healthcare operations while maintaining a core focus on the custodianship and governance of health information makes them a core asset and key partner in the digital healthcare environment. To continue to be effective, HIM professionals must continually invest in their learning of emerging digital and Information, Communication and Technology (ICT) tools and software and assess their impact on health information management.

Interoperability and Health Information Exchanges

Health Information System (HIS) interoperability refers to the ability of different healthcare information technology systems and software applications to communicate effectively, exchange data, and utilise shared information across organisational boundaries (Owen et al., 2023). This encompasses technical, semantic, and process interoperability, ensuring that data flows between systems but is also consistently interpreted and meaningfully incorporated into healthcare workflows (Owen et al., 2023). When healthcare systems achieve seamless interoperability, they enable healthcare providers to access complete patient records, make better-informed clinical decisions, and coordinate care more effectively (Owen et al., 2023). This integration can reduce errors, eliminate duplicate testing, and streamline administrative processes, ultimately leading to improved patient outcomes and reduced healthcare costs. The foundation of this seamless operation relies on standardised protocols like HL7 and FHIR, robust security measures, and effective integration capabilities through APIs and interface engines (Ang, 2025a; Australian Digital Health Agency, 2023).

Successful implementation of seamless interoperability requires consideration of technical requirements, organisational factors, and regulatory compliance (Owen et al., 2023). Healthcare organisations must address challenges such

as legacy system integration, data format differences, resource constraints, and privacy concerns. This demands strong governance, comprehensive staff training, and effective change management strategies to ensure successful adoption and utilisation of interoperable systems. Healthcare organisations, when acquiring new solutions, must robustly defend and advocate for the selection of systems that comply with relevant standards to support information sharing.

A Health Information Exchange (HIE) enables the secure and efficient sharing of health-related data among various healthcare organisations, such as hospitals, general practices, pharmacies, and laboratories (Hyppönen et al., 2019; Hyppönen et al., 2014). It allows clinicians to access a patient's comprehensive record regardless of where the care was provided and systems such as My Health Record in Australia support patient access and control (Australian Digital Health Agency, 2024). The seamless flow of information supports better coordination between providers, reduces duplication of tests and procedures, and enhances the accuracy and timeliness of clinical decisions.

Health Information Exchanges (HIEs) are being developed and implemented across the globe, with various nations taking different approaches to enable the secure sharing of patient health information. The European Union's eHealth Digital Service Infrastructure (eHDSI), facilitates cross-border exchange of health data through ePrescriptions and patient summaries, and Australia's My Health Record system (Ang,

2025a; Australian Digital Health Agency, 2024) provides a national digital health record platform. Other significant initiatives include Singapore's National Electronic Health Record (NEHR) (Ministry of Health Singapore, 2025), Canada Health Infoway, and the UK's NHS Digital infrastructure (Canada Health, 2025; National Health Service, 2025).

The importance of HIEs lies in their ability to improve patient outcomes, reduce healthcare costs, and support public health initiatives. By ensuring that critical health information is available when and where it is needed, HIEs can help prevent errors, streamline administrative processes, and empower patients to be more involved in their care. Additionally, they play a vital role in disease surveillance, outbreak management, and meeting regulatory requirements for data sharing and privacy (Ang, 2025a). Increased data sharing through interoperable digital solutions requires governance to be applied to all components of data transfer, storage and use across multiple organisations, increasingly the breadth and complexity of governance required by HIM professionals.

Artificial Intelligence (AI)

This topic is covered in depth in another chapter, Navigating the Future however there is no doubt that AI will significantly impact upon the practice of health information management and healthcare delivery. According to Stanfill and Marc (2019),

the use of healthcare data in artificial intelligence is influenced by data management practices, legal frameworks, and regulatory requirements that can hinder or facilitate the advancement of AI technologies. Health Information Management (HIM) professionals play a crucial role in preparing for future AI integration by prioritising data accuracy and proactively reviewing existing policies and procedures (Stanfill & Marc, 2019). To enhance the reliability of healthcare data, HIM professionals should adopt systematic approaches to identify, evaluate, and correct data inconsistencies (Stanfill & Marc, 2019).

AI Governance Frameworks will continue to emerge and mature as various AI use cases are researched, piloted and implemented. In Australia, a National Policy Roadmap for Artificial Intelligence in Healthcare [PDF] has helped to set the direction for AI in healthcare considerations, with ongoing changes expected as a result [PDF] of legislation and regulation review, and consideration of the safe and responsible use of AI in healthcare (Australian Government Department of Health, 2025). With guidance also provided by the Australian Commission on Safety and Quality in Healthcare [opens in new tab] and the Australian Alliance for Artificial Intelligence in Healthcare [opens in new tab].

Guidance for HIM professionals has started to emerge with an IFHIMA Position Statement on Ensuring Responsible Use of AI in Healthcare Information Collection and Use that promotes the essential role of data governance, 'human in the

loop' to safeguard AI driven healthcare, and AI risks and the need for strong compliance (International Federation of Health Information Management Associations, 2025b).

International Federation of Health Information Management Association (IFHIMA)

Position Statement: Ensuring Responsible Use of AI in Healthcare Information Collection and Use [opens in new tab]

Call to Action

"AI holds transformative potential for healthcare systems across the globe. But realising its benefits requires accountability, transparency, and a commitment to ethical oversight. IFHIMA urges policymakers, healthcare leaders, and technology developers to:

- Mandate human-in-the-loop safeguards for all AI systems in healthcare.
- Embed health information professionals and

practices in every phase of AI development, implementation, and use to ensure patient data protection and integrity
• Standardise data governance and AI risk assessment frameworks
• Support health information education" (International Federation of Health Information Management Associations, 2025b).

The Australian Clinical Coding AI Adoption Guideline produced by HIMAA provides an outline of the benefits of adopting AI for clinical coding while identifying barriers to adoption that need to be overcome for effective autonomous clinical coding to occur (Health Information Management Association of Australia, 2025a). The Guideline aims to support the responsible, ethical, and effective integration of AI into the clinical coding process, supporting high standards of accuracy, quality, and safety, by adherence to the principles of governance, risk management, privacy and security, ethical and safe use, quality improvement, collaboration and partnership, and human expertise, or 'human in the loop' – principles also relevant to other emerging use cases relevant to health information management. HIM professionals need to learn to apply and adapt health information best practice to AI enabled

ecosystems to ensure AI benefits realisation occurs without compromising privacy and information governance requirements.

Reflection

There are many applications for AI in health. Read the following case study and paper.

Silverchain pilots AI voice assistant for in-home aged care and more briefs [opens in new tab] (Ang, 2025b)

Identifying Facilitators and Barriers to Implementation of AI-Assisted Clinical Decision Support in an Electronic Health Record System [opens in new tab] (Finkelstein et al., 2024)

Consider, how can HIM professionals effectively lead change in organisations adopting AI-driven assistants and AI driven clinical decision support systems?

Education and Workforce

Development

"The management of health data and information requires a highly competent, resilient and sustainable workforce with the capacity and size to meet the needs and demands of the healthcare sector, in all care settings, and in epidemiological and health policy, research, funding and planning environments" (Wissmann et al., 2024).

Education and workforce development is an ongoing priority for the health information management professional. Globally there are different approaches to workforce development including education through Universities, vocational training organisations, professional associations and many other providers. Short courses, certification and other education innovations have emerged in response to a need for more flexible study options and to meet the learning needs of professionals across their careers. In this section we describe the education and workforce development priorities for the future.

Health Information Management and Health Informatics

"Data is the new infrastructure in health" Professor

Andrew Morris (Director, HDR UK at Health Data Research UK (HDR UK))

Health Information Management (HIM) and health informatics have emerged as growth areas, driving the development of new professional roles such as EHR analysts, data quality specialists, and digital health project managers. Software tools that can assist with visualising complex health data to assist decision makers and the rise of clinical decision support systems, driven by the availability of electronic health record data are now enabling timely data driven decision making.

Vast quantities of data are being generated from clinical research, healthcare facilities, public health centres, pharmaceutical developments, community-based health systems, mobile health tools, and wearable technologies (Sherifi et al., 2021). The continued rise of bioinformatics, personalised medicine, and the exponential increase in health data presents both opportunities and challenges for HIM professionals (Sherifi et al., 2021).

To meet these demands, many HIM practitioners are pursuing postgraduate qualifications or engaging in ongoing professional development in areas such as data analytics, population health, and cybersecurity. HIM education programmes are continually adapting to balance core knowledge with emerging technologies and deeper specialisation. Similarly, health informatics programmes face the challenge of offering flexible curricula that cover

foundational concepts while allowing for focused study in areas such as artificial intelligence, public health, and risk management (Sherifi et al., 2021).

Higher education institutions are responding by launching new programmes and refining existing ones, aiming to equip students with the necessary skill sets and a lifelong commitment to learning and adaptability (Sherifi et al., 2021).

Future Skills and Competencies

"Technology won't replace HIM professionals – but it will shape what we do. Let's adapt, not react" (International Federation of Health Information Management Associations, 2025a [opens in new tab])

Future skills and competencies in health information management reflect the increasing complexity of digital health environments. Professionals are expected to uphold privacy standards, contribute to data and information governance, participate in the implementation of health information systems and technologies and manage cybersecurity risks, while also navigating organisational change. Leadership in digital health strategy and system design is becoming essential, as HIM professionals contribute to the planning and implementation of technologies that support safe, efficient, and equitable care. Lifelong learning is no longer optional—it is a core professional responsibility. Continuous education ensures that HIM professionals remain current with evolving

regulations, technologies, and best practices, enabling them to lead and adapt in a rapidly changing health system.

Education Challenges

The future of health information management education in Australia and internationally faces significant challenges that require innovative solutions to ensure a robust workforce pipeline of trained professionals. In Australia, there is a concerning trend of declining enrolments in HIM programs and a reduced number of universities offering traditional HIM courses. This threatens to exacerbate workforce shortages at a time when the healthcare system's data management needs are rapidly expanding. This decline can be attributed to various factors, including the limited awareness of HIM career opportunities, competition from other healthcare disciplines, and the evolving nature of healthcare technology that may make traditional curricula seem less relevant to prospective students. In other countries, HIM related courses do not exist, and professional associations are emerging but will take time to gain maturity.

To address these challenges, educational institutions are exploring flexible and accessible pathways, particularly at the postgraduate level, to attract practicing clinicians, seeking career alternatives and other healthcare professionals into HIM roles. The development of online and hybrid learning models has become increasingly important in meeting the

needs of diverse learners, including working professionals seeking career transitions and those working in remote areas. These adaptive education delivery methods accommodate various learning styles, family and work commitments and aligns with the uptake of digital health solutions that is occurring within healthcare. Additionally, institutions are forming stronger partnerships with healthcare organisations to ensure curriculum relevance and provide practical experience opportunities, helping to create a more appealing educational pathway for future HIM professionals. Professional associations in Australia and internationally are also responding to these challenges.

Lifelong learning is a professional imperative—enabling practitioners to remain current with technological advancements, governance requirements and global health priorities, and to lead confidently in shaping the future of healthcare delivery. Professional associations and education providers are adapting to learner needs with certification, short courses, degrees and post-graduate qualifications available to support health information professionals acquire and update skills across their careers.

International Federation of Health Information Management Associations (IFHIMA)

The mission of IFHIMA is to represent and advance the global

Health Information Management (HIM) profession. Its vision is a healthy world empowered by high-quality health information. IFHIMA has developed a series of learning modules to foster global education and communication among professionals in health records and information management. These modules [opens in new tab] are designed to be accessible and flexible, allowing individuals to review them at their own pace and share them with colleagues who may benefit. IFHIMA provides guidance on HIM education curricula for the future and the drivers that will impact the sector. The education sector should be poised to evolve and change curricula as AI, interoperability, governance and ethics are of increasing importance (International Federation of Health Information Management Associations, 2025a). There is an increased reliance on education providers to work with industry and technology companies to co-design education to meet the demands of a technology driven healthcare context (International Federation of Health Information Management Associations, 2025a)

American Health Information Management Association (AHIMA)

The American Health Information Management Association (AHIMA) represents health information management professionals in the United States. AHIMA has responded to evolving industry demands by modernising its professional

development and certification frameworks (American Health Information Management Association, 2024, 2025b). A cornerstone of this response has been the introduction of microcredentials and updated certifications, including the Certified Professional in Health Informatics (CPHI), which reflect the need for increasing knowledge about health technologies and data analytics. These credentials have been designed to be targeted and flexible, allowing professionals to demonstrate specific competencies in emerging areas while maintaining the standards that the healthcare industry demands. The modular nature of microcredentials particularly appeals to working professionals who need to upskill incrementally while maintaining their current positions (American Health Information Management Association, 2025b).

AHIMA's approach emphasises the development of practical skills that directly translate to workplace requirements. AHIMA also provides mentorship programs, networking opportunities, and interdisciplinary educational initiatives that reflect the increasingly collaborative nature of modern healthcare. This recognises that success in health information management requires not only technical expertise but also the ability to work effectively across various healthcare disciplines and departments (American Health Information Management Association, 2025a).

Canadian Health Information

Management Association (CHIMA)

Over the past few years, the Canadian Health Information Management Association has implemented several initiatives to enhance the development of the health information management workforce (Canadian College of Health Information Management, 2025a). A Career Matrix helps students and professionals map their career paths across seven core HIM competency areas, outlining roles from entry-level to executive, coupled with a Pathway Navigator Tool to guide individuals toward certification and career options across over 300 roles within health information practice (Canadian College of Health Information Management, 2025b). The Canadian College of Health Information Management offers guidance for professionals changing careers into health information management recognising accredited diploma and degree programs to help individuals leverage transferable skills to enter the HIM profession (Canadian College of Health Information Management, 2025b).

Pathways to becoming a Health Information Manager are changing in Canada through academic collaborations, such as Brock University's partnership with the Canadian Health Information Management Association (CHIMA). Brock's Master of Public Health (MPH) programme offers an online specialisation in Health Information Management (HIM), designed to equip graduates with the skills to work in health information management. This specialisation is accredited by

the Canadian College of Health Information Management (CCHIM), making it the first graduate programme of its kind in Canada (Brock University, 2024). Options are provided to begin with a Graduate Micro-Programme (GMP) in HIM, which includes targeted courses in health data governance, information systems, and analytics and a pathway to further study. Completion of the GMP enhances career readiness but provides a pathway into the full MPH degree (Brock University, 2024). Graduates are eligible to sit the national certification exam and become certified HIM professionals, prepared to lead change in public health at local, national, and global levels (Brock University, 2024).

Health Information Management Association of Australia (HIMAA)

The challenges facing the health information management profession in Australia include declining options in higher education, changing education preferences, lack of understanding from Executives, emerging diversity in career pathways for professionals, evolving government policies, and national and regional skills shortages. Meanwhile, drivers of change for the profession are sustainability, ensuring the profession is fit for purpose, digital disruption, future of work trends, and education innovation.

In response, HIMAA has taken a profession-centric approach to support, advocate for, and enable a relevant and

sustainable profession. Starting with professional identity, the Health Information Management Profession Identity Statement outlines the identity of the profession in Australia including roles, skills and specialisation areas (Health Information Management Association of Australia, 2025c). This Statement articulates the key executive value of HIM professionals in relation to strategic decision-making, data governance and compliance, operational efficiency, and leadership in digital transformation. By positioning HIMs as integral members of the leadership team, organisation's signal their commitment to data-driven, patient-focused strategies (Health Information Management Association of Australia, 2025c). Investing in credentials and continuing education for these professionals not only attracts top talent but also builds trust with stakeholders, patients, and regulators (Health Information Management Association of Australia, 2025c).

Returning to the profession-centric approach, HIMAA is progressing a program of work to continue to enhance and evolve professional competencies, education pathways, practice standards, accreditation, credentialing, life-long learning activities, and engagement of the HIM professional community while improving the measurement of impact and value in meeting the needs of the health sector.

In relation to the health information management workforce, HIMAA has identified that the enablers of change are funding support, education pathways and career-transitions, industry co-design, integrated learning, supervisor

support, and increased utilisation of vocational education and training. HIMAA is aiming through its leadership as the professional association for HIMs, to meet future workforce demand, expand capacity to support students, ensure job-ready graduates, and support the strategic direction of the profession while understanding and embedding change associated with the future of work. (Health Information Management Association of Australia, 2025b)

Policy, Advocacy, and Global Collaboration

Policy, advocacy, and global collaboration are central to the HIM profession. High quality health information is foundational to good policy and understanding the performance of a healthcare system (Australian Institute of Health and Welfare, 2024; Lloyd & Cooper, 2006). HIM professionals continue to have a strategic role in influencing policy in activity-based funding and classification (Chisholm, 2004; Chisholm et al., 2003; Reid et al., 2000a, 2000b). Opportunities exist for increased influence in national policies and initiatives related to data, information and digital in health, disability and aged care. In Australia, HIMAA advocates for the recognition of HIM professionals and works to influence national health policy. In the United States, the AHIMA leads efforts to shape data policy and promote the use

of health information to address social determinants of health (SDOH). IFHIMA works to promote health information and collaboration across the globe. These initiatives highlight the value of international collaboration, where shared knowledge and coordinated approaches can improve data standards, workforce development, and health system performance across borders.

The Future of Health Information Management

The future of health information management (HIM) is constantly shaped by social, political, technological and healthcare system change requiring ongoing knowledge of change and adaptation of practice (Robinson & Lee, 2021; Wissmann et al., 2024). HIM professionals have expanded opportunities to contribute their expertise to the achievement and advancement of local, national and international health and wellbeing outcomes. As custodians of health data, HIM professionals are increasingly stepping into leadership roles in ethical data use and digital governance, ensuring that privacy, transparency, and equity are upheld in technologically advanced healthcare environments.

Interdisciplinary collaboration, global connections with peers, colleagues and professional associations, and continuous innovation are requirements for a healthy future for the

profession. As healthcare systems become increasingly data-driven and integrated, HIM professionals must adapt by embracing new technologies and approaches while maintaining the security and confidentiality of data, shaping the policy for data use and information governance. The profession calls for active engagement in driving digital health, ongoing upskilling to meet emerging demands, and leadership to deliver the benefits of a digitally enabled healthcare system. HIM practitioners are not only stewards of health information—they are agents of change, responsible for guiding the sector toward more efficient, equitable, and informed care.

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GLOSSARY

Activity Based Funding

Activity based funding refers to a systematic method of remuneration to healthcare providers based upon a predetermined episode of care payable to the provider upon the separation of the patient from the providers of the healthcare (i.e., conclusion of the healthcare service). ABF differs from fee-for-service in that all the constituent services associated with the continuum of care are bundled into the one fee payable upon completion of the care.

Adaptive Leadership

A leadership approach that involves being flexible and responsive to complex challenges and changing conditions, encouraging continuous learning and experimentation to navigate ambiguity in environments like healthcare.

AI Data Privacy

The protection of personal and sensitive patient information to prevent unauthorized access and ensure

confidentiality, particularly when using AI tools in healthcare (Reddy & Shaikh, 2025).

AI-powered Image Analysis

The use of machine learning models, particularly CNNs, to analyze medical images and detect conditions such as tumors, fractures, or other abnormalities with high accuracy (Rajpurkar et al., 2017).

Algorithmic Bias

The potential for AI algorithms to unintentionally produce biased outcomes, often due to unrepresentative data, leading to inequities in healthcare decision-making (Iqbal, Hsu, Celi, & Li, 2024).

AR-DRGs

The Australian Refined Diagnosis Related Groups (AR-DRG) classification provides a clinically meaningful way to relate or group the number and type of patients treated in admitted acute episodes of care to the resources required in treatment (Independent Health and Aged Care Pricing Authority, 2023e).

Artificial Intelligence (AI)

A branch of computer science that involves creating systems capable of performing tasks that typically require

human intelligence, such as diagnostic processes, personalised care, and predictive analytics (Reddy et al., 2019).

Attack Surface

Attack Surface is the sum total of all the points in a system or network that are vulnerable to potential cyber attacks.

Authentic Leadership

A leadership style where individuals understand their purpose, practice professional values, build strong relationships, and exhibit self-discipline, which can lead to improved job satisfaction among their teams.

Authentication

The process of verifying the identity of a user, device, or system to ensure that they are who they claim to be. It typically involves presenting credentials, such as passwords, biometric data, or cryptographic keys, and validating them against a trusted source.

Authorisation

The process of granting or denying access to resources or systems. It determines what a user or entity is permitted

to do, and follows the verification process undertaken by authentication.

Automated Barcode Medication Administration (BCMA)

A system that ensures correct drug delivery by scanning barcodes on medications and patients, reducing medication administration errors (Poon et al., 2010).

Availability

The security goal that aims to ensure that data, resources, and services are accessible and usable when needed by authorised users. It involves preventing disruptions, downtime, or denial of service attacks that could hinder access to critical systems or information.

AVRO and Parquet

According to IBM [opens in new tab] "Avro is an open source project that provides data serialisation and data exchange services for Apache Hadoop. These services can be used together or independently. Avro facilitates the exchange of big data between programs written in any language."

According to IBM [opens in new tab] "Apache Parquet is an open source [opens in new tab] columnar storage format used to efficiently store, manage and

analyse large datasets [opens in new tab]. Unlike row-based storage formats such as CSV or JSON, Parquet organises data in columns to improve query performance and reduce data storage costs".

Big Data Analytics

The process of examining large and varied datasets to uncover hidden patterns, correlations, and other insights that can be used to improve healthcare outcomes (Jiang et al., 2017).

Blockchain in healthcare

A decentralised technology that enhances data security, transparency, and patient consent management by providing tamper-proof records of health data transactions (Agbo et al., 2019).

Change Management

The process, tools, and techniques used to manage the "people side" of change to achieve required business outcomes on time and within budget.

Clinical Coding

The process of translating clinical documentation from a healthcare record into standardized codes from a

classification system, which is essential for funding, research, and health system planning.

Clinical Decision Support

A technology-driven tool within EMRs that provides clinicians with evidence-based recommendations, alerts or reminders to enhance decision-making in patient care.

Clinical Decision Support System (CDSS)

A health information technology system that provides healthcare professionals with knowledge and recommendations to enhance decision-making, often powered by AI (Nardone et al., 2024).

Clinical Governance

The set of relationships and responsibilities established by a healthcare organization to ensure good clinical outcomes, patient safety, and continuous improvement in the quality of care.

Collaborative Human-AI Systems

A model where AI supports human decision-making rather than replacing it, ensuring that qualified healthcare professionals maintain control over clinical decisions (Iqbal, Celi, & Li, 2020).

Competency Framework

A structure that outlines the specific knowledge, skills, and attributes required for professionals, such as Health Information Managers, to perform their roles effectively at various levels of experience.

Confidentiality

The security goal refers to the protection of sensitive information from unauthorised access or disclosure. It ensures that only authorised individuals or systems can access certain data or resources, thereby preventing unauthorised parties from obtaining or using confidential information.

Convolutional Neural Networks (CNNs)

A class of deep learning algorithms particularly well-suited for image recognition, widely used in medical imaging to detect abnormalities in X-rays, MRIs, and other diagnostic images (Esteva et al., 2017).

Cyber Risk

Cyber Risk is the potential harm or adverse consequences that can result from the exploitation of vulnerabilities in digital systems, networks, or information assets.

Cyber Risk Management

Cyber Risk Management involves the identification, assessment, and prioritisation of potential cyber risks faced by an organisation.

Data Breach

A security incident where unauthorised individuals access or disclose sensitive information, such as a hacker stealing the financial details of patients.

Data Collection

The process of gathering health information from various sources, including patients, healthcare providers, and medical devices.

Data Dictionary

According to the Harvard Medical School, "a data dictionary serves as a centralised repository that provides detailed information about data, including its meaning, relationships to other data, origin, usage, and format. Essentially, it acts as a metadata repository. Regardless of the dataset's size or complexity, it should always include a data dictionary. This dictionary should be accessible to everyone involved in the design, collection, storage, transformation, and interpretation of the data. It is a

crucial training tool for those engaged in data collection and transformation".

Source: Harvard Medical School, Data Dictionary Definition [opens in new tab]

Data Disclosure

The release of health information to authorised individuals or entities, following proper procedures and patient consent, when required or permitted by law.

Data Fragmentation

The issue where disparate healthcare systems use different data formats, hindering data exchange and disrupting the continuity of care (Peiris et al., 2024).

Data Governance:

The overall management of the availability, usability, integrity, and security of data used in an organization, ensuring data is handled consistently and properly through its lifecycle.

Data Management

According to the Project Management Institute, data management describes creating, implementing, and overseeing strategies, policies, programs, and practices that govern, safeguard, deliver, and enhance the value of

data and information assets. This means ensuring that the necessary procedures, processes, and infrastructure are in place for the efficient collection, storage, processing, and compilation of data. It encompasses concepts such as data cleansing, data quality, data maintenance, database administration, data warehousing, metadata management, and data security.

Source: Project Management Institute Data Management [opens in new tab]

Data Minimisation

The principle of collecting and processing only the personal data absolutely necessary for a specific purpose, like only asking for a birthdate when it's required.

Data Quality

Data quality refers to the extent to which data is appropriate for its intended use. From a health perspective, quality health data is error-free, timely, and produces expected outcomes. In other words, it is data that is suitable for its purpose. It includes several characteristics such as accuracy, completeness, consistency, and timeliness, ensuring that the data is reliable, trustworthy, and suitable for decision-making, analysis, and other applications.

Reference: Ehsani-Moghaddam B, Martin K,

Queenan JA. Data quality in healthcare: A report of practical experience with the Canadian Primary Care Sentinel Surveillance Network data. Health Inf Manag. 2021 Jan-May;50(1-2):88-92. doi: 10.1177/1833358319887743. Epub 2019 Dec 5. PMID: 31805788. https://pubmed.ncbi.nlm.nih.gov/31805788/

Data Sovereignty

Data sovereignty refers to the concept that digital data is subject to the laws and governance of the country in which it is physically stored or processed. Simply stated, data that is stored and processed in the country where it was generated.

Data Storage

The secure maintenance of health information in electronic or physical formats, ensuring its confidentiality, integrity, and availability.

Data Use

The ways in which health information is utilised within a healthcare setting, such as for analysis, treatment and payment.

Data Warehouse

According to Microsoft, a data warehouse is a central repository where an organisation stores electronic data, including datasets, metadata and the tools used for extracting, transforming and loading this information. Data warehouses are useful as they facilitate reporting and analysis enabling users to extract and transform data into meaningful insights at the individual record level as well as generating summary reports.

Source: Microsoft, What is a data warehouse [opens in new tab]

De-identification

Modifying data to remove identifying details, protecting individual privacy. For example, replacing names in a dataset with unique numerical identifiers.

Deep Learning

A type of machine learning that uses neural networks with many layers (deep networks) to analyse complex data, such as medical images or genomic information (Wang, 2023).

Digital front door

According to the Australian Digital Health Agency

[opens in new tab] a digital front door is "a secure, single-access, user-friendly platform that combines healthcare data, services and information into one place. It is designed to improve the clinician and patient experience, making it easier for clinicians to access health data and consumers to access digital health services".

Digital Imaging and Communications in Medicine (DICOM)

Global standard for storing, transmitting and viewing medical imaging data such as X-rays, MRIs and CT scans, ensuring compatibility across devices and systems.

EHR Adoption

The process through which healthcare systems transition from paper-based records to electronic systems, aiming to improve clinical outcomes, efficiency, and care coordination (Tsai et al., 2020).

Electronic Health Records (EHRs)

In Australia, we use the term EHR to refer to the longitudinal health records that contain summary information of a person's health information, from cradle to the grave and includes immunisation records, discharge summaries, medications and prescriptions

filled, imaging and pathology results. It can be used interchangeably with EMR or electronic medical record.

In other countries it is a term used to describe the digital version of a paper chart. It includes a comprehensive collection of a medical history, such as demographics, progress notes, medications, vital signs, past medical history, laboratory data, and radiology reports from a particular provider (American Medical Association [opens in new tab]).

Electronic Medical Records (EMRs)

A digital version of a patient's medical history maintained by healthcare providers, used primarily for documenting diagnoses, treatments and care.

EMR/EHR Usability

The ease with which electronic health records (EHRs) can be used by healthcare professionals, influencing safety outcomes and adoption (Classen et al., 2023).

According to ISO 9241-11, "usability is the extent to which a product can be used by specified users to achieve their goals with effectiveness, efficiency, and satisfaction in a specified context of use."

Source: ISO/TS 20282-2:2013(en) Usability of consumer products and products for public use — Part 2: Summative test method [opens in new tab]

Ethical Leadership

A form of leadership where decisions are guided by moral principles, focusing on honesty, integrity, fairness, and respect for the rights and dignity of others.

Exploit

Exploit refers to a piece of software, code, or technique used by an attacker to take advantage of a specific vulnerability or weakness in a system or network.

Fast Healthcare Interoperability Resources (FHIR)

A modern standard for exchanging healthcare data in real-time, designed to facilitate interoperability through the use of APIs (Mandel et al., 2016; HL7 International, 2023).

A set of standards developed by HL7 that enables electronic health records and other systems to exchange and integrate healthcare information efficiently using modern web technologies like APIs.

Source: Australian Digital Health Agency FHIR [opens in new tab]

Foundational Interoperability

Basic data exchange between systems without the need for data interpretation (Hughes & Karla, 2023).

GDPR

This acronym describes the European Union General Data Protection Regulation (GDPR) Source : Voigt, P., & Bussche, A.V. (2017). The EU General Data Protection Regulation (GDPR): A Practical Guide. Springer, Cham, Switzerland. https://dl.acm.org/doi/10.5555/3152676

General Practitioner (GP)

A primary care physician who provides healthcare services to individuals and families, focusing on preventive care, diagnosis and treatment of a wide range of non-emergency conditions.

Genomic Data Analysis

The use of computational tools and AI to analyze genetic data to identify disease markers, enabling personalized treatment and targeted therapies (Nardone et al., 2024).

Governance

Governance refers to the framework through which an organisation is directed and managed, including the processes that ensure accountability for both the organisation and its members. Key components of

governance include ethics, risk management, compliance, and administration.

Source: Governance Institute of Australia [opens in new tab])

Health Informatics

An interdisciplinary field that combines computer science, healthcare, and information science to improve healthcare delivery, decision-making, and management through the optimization of health information collection, storage, retrieval, and utilization (Buntin et al., 2011).

Health Information

Under the Privacy Act in Australia, health information includes personal data related to an individual's health, such as illnesses, disabilities, and injuries. It covers opinions about health, future health services, provided health services, donation information, genetic data, and details like name, address, billing information, and Medicare number. It is classified as sensitive information.

Source: Commonwealth of Australia (1988) The Privacy Act [opens in new tab]

Health Intervention

A health intervention is defined as “an act performed for,

with or on behalf of a person on a population whose purpose is to assess, improve, maintain, promote or modify health, functioning or health conditions" (World Health Organization, 2025c).

Health Level 7 (HL7)

A set of international standards that guide the exchange, integration and retrieval of electronic health information, promoting interoperability among health information systems.

Source: ISO: Global standards for trusted goods and services

HIPAA

An acronym that stands for the Health Insurance Portability and Accountability Act. This Act, from the United States is designed to improve efficiency and requires health services to adopt national standards for electronic health care transactions and code sets, unique health identifiers, and security.

Source: HIPPA for Professionals [opens in new tab]

Hospital Acquired Complication

A hospital-acquired complication (HACS) is defined by the Independent Health and Aged Care Pricing Authority (2022) as "a complication that occurs during

a hospital stay and for which clinical risk mitigation strategies may reduce (but not necessarily eliminate) the risk of that complication occurring"(IHACPA, 2024).

Information Governance

A framework of principles, policies, and procedures for managing an organisation's information assets to support its strategic, clinical, and operational goals.

Integrity

The security goal that aims to ensure that data remains accurate, complete, and unaltered during storage, transmission, or processing. It involves maintaining the consistency and trustworthiness of data and systems, guarding against unauthorised modification, tampering, or corruption.

Interoperability

The ability of different healthcare systems and devices to exchange and use patient data in a coordinated manner, which improves care and reduces errors (HIMSS, 2021).

Iterative Testing

A process of continuously refining digital tools through repeated cycles of testing, feedback, and adjustment to

improve usability and engagement (Vilardaga et al., 2018).

Key Performance Indicators (KPIs)

Quantifiable measures used to evaluate the success of an organisation or a specific activity in achieving its key objectives.

Leadership

Leadership: The social relationship between two or more persons who depend on each other to attain certain mutual goals in a group situation (Babich and Smith, Leadership and Management in Learning Organizations)

Local Health District (LHD)

A regional health authority in New South Wales, Australia, responsible for managing public hospitals and healthcare services within its designated area to deliver integrated care.

Mandatory Reporting

A legal requirement for organisations to report certain data breaches to authorities and affected individuals, often within a specific timeframe, under the Notifiable Data Breach (NDB) scheme a 30-day timeframe for

assessing and reporting eligible data breaches was established.

Metadata

Metadata provides essential information about data, for example, how it was collected and descriptions of data items. This enables accurate interpretation and understanding of data quality. Metadata, for example clarifies date formats and explains derived data such as age based on date of birth, including any assumptions or fillers used. This helps users assess data reliability and avoid misinterpretation.

Source: Australian Bureau of Statistics [opens in new tab]

Mobile Health Apps

Applications designed for smartphones and wearable devices that allow patients to monitor their health, manage chronic conditions, and communicate with healthcare providers (Goel & Taneja, 2023).

My Health Record

Australia's national personally controlled electronic health record system, which provides an online summary of an individual's key health information.

National Institute of Standards and Technology (NIST)

NIST stands for the National Institute of Standards and Technology, a non-regulatory federal agency in the United States that develops and promotes standards, guidelines, and best practices for various fields, including cybersecurity.

National Minimum Dataset (NMDS)

According to the Australian Institute of Health and Welfare, in the health context, a "National Minimum Data Set (NMDS) is a standardised core set of data elements agreed upon for mandatory national collection and reporting in the health sector, allowing for uniform data collection while permitting additional data gathering for specific needs. In the Australian context, definitions of the individual data elements are contained in the National Health Data Dictionary stored in METEOR along with the specifications for each NMDS".

Source: Australian Institute of Health and Welfare (2003), Admitted patient care national minimum data set: national health data dictionary version 12 https://www.aihw.gov.au/reports/hospitals/admitted-patient-care-nmds/summary

Natural Language Processing (NLP)

A branch of AI focused on enabling machines to understand, interpret, and respond to human language, often used to analyse unstructured clinical text in EHRs and medical records (Miotto et al., 2016).

Ontology

An ontology is a formal system that defines and organises concepts, categories, and relationships within a specific domain or field of knowledge. It's essentially a structured way of representing what exists and how different things relate to each other. At its simplest, think of ontology as a detailed map or classification system that shows how various concepts are connected and interact with one another.

An ontology is a formal description of knowledge as a set of concepts within a domain and the relationships that hold between them. It ensures a common understanding of information and makes explicit domain assumptions thus allowing organisations to make better sense of their data. (Ontotext, 2025)

Ontology-based

An ontology-based definition, in the context of computer science and information systems, refers to a structured and formalised way of representing knowledge

about a specific domain. It defines the entities, their properties, and the relationships between them, creating a shared and understandable vocabulary for users (Ontotext, 2025).

Personal Information

Personal information refers to any details that can identify an individual, including their health records, demographics, and contact information. The definition included within the Privacy Act (1988) [opens in new tab] is 'Information or an opinion about an identified individual, or an individual who is reasonably identifiable: whether the information or opinion is true or not; and whether the information or opinion is recorded in a material form or not.'

Precision Medicine

A personalised approach to healthcare that tailors treatments based on individual genetic profiles, lifestyle, and other characteristics, facilitated by advancements in genomics, big data, and AI (Collins & Varmus, 2015).

Privacy

The protection of individuals' personal information and their rights to control how their data is collected, used, and shared. It involves implementing measures to

safeguard sensitive data from unauthorised access, misuse, or disclosure.

Quality Improvement

Quality improvement (QI) utilises a wide variety of methods and tools to understand quality issues and causes and design solutions to solve problems.

Risk Appetite

Risk Appetite is an organisation's willingness or tolerance to accept and manage risks.

Risk Management

The systematic process of identifying, analysing, evaluating, treating, and monitoring risks to minimise their negative impact on an organisation.

Robotic Process Automation (RPA)

The use of AI-powered software robots to automate repetitive, rule-based administrative tasks such as appointment scheduling, billing, and claims processing (Radaelli et al., 2024).

Semantic Interoperability

Allows systems to interpret and use exchanged data

meaningfully, ensuring that the data retains its context and relevance across different platforms (Hughes & Karla, 2023).

Sensitive Information

Private data requiring extra protection due to its sensitive nature, like health records, financial details.

Servant Leadership

A leadership philosophy where the leader's main goal is to serve their team and organisation, focusing on the growth and well-being of people and the communities to which they belong.

SNOMED CT

SNOMED CT (Systematized Nomenclature of Medicine -- Clinical Terms) is a comprehensive, multilingual clinical healthcare terminology system that provides standardised clinical terms and codes for documenting patient care, enabling consistent sharing and analysis of health information across healthcare systems.

Stakeholder Management

The process of managing the expectations and

engagement of individuals, groups, or organisations that have an interest in a project or organisation's outcomes.

Standards Adoption in LMICs

The challenges faced by low and middle-income countries (LMICs) in adopting universal data standards, creating disparities in health data exchange capabilities (Borges et al., 2023).

Strategic Leadership

A leadership style focused on setting long-term vision and direction, motivating and inspiring others, and adapting to change to ensure the organisation's sustained success.

Structural Interoperability

Ensures data is organised and preserved during exchange between systems, facilitating meaningful use of the data (Hughes & Karla, 2023).

Telehealth or Telemedicine Expansion

The growing use of remote healthcare services, including virtual consultations and monitoring, particularly in underserved regions (Grygorian et al., 2024).

Transformational Leadership

A leadership style where leaders inspire and motivate their team to innovate and create change that will help grow and shape the future success of the organisation.

Universal Health Coverage (UHC)

Universal Health Coverage (UHC) means that all people have access to the full range of quality health services they need, when and where they need them, without facing financial hardship.

Unsolicited health information

Health information received by a healthcare organisation where the healthcare organisation has not taken any steps to collect the information.

Source: Office of the Australian Information Commissioner, Chapter 4 APP4 Dealing with unsolicited personal information [opens in new tab].

User Experience (UX)

The overall experience of users when interacting with a system or product, including ease of use, efficiency, and satisfaction.

User-Centred Design (UCD)

A design approach that involves end users (patients, clinicians, etc.) in the development process to create intuitive and effective digital health tools (Johnson et al., 2005; Duffy et al., 2022).

VERSIONING HISTORY

This page provides a record of changes made to this textbook. Each set of edits is acknowledged with a 0.01 increase in the version number. The exported files for this toolkit reflect the most recent version.

If you find an error, please contact library.resources@utas.edu.au

Version	Date	Change	Details
1.0	October 2025	Published	