Policy Document

Digital Health (2023)

Position Statement

AMSA believes that:

1. Telehealth should become a routine part of healthcare, bolstered by concurrent efforts to improve digital literacy and accessibility.
2. Governments and regulators should collaborate to develop national strategies that address Artificial Intelligence's (AI) emerging roles in healthcare. These strategies should encompass the development of AI training databases, AI models, and their integration within healthcare settings.
3. Consistent research is required into the efficiency and effectiveness of digital health interventions to inform future development of this space.
4. Digital health research must be patient-oriented and incorporate patient satisfaction as an outcome.
5. Electronic Health Records should be universally adopted as they improve patient safety by allowing integrated access to best-practice frameworks and automated error warnings, reducing risks of medical errors and facilitating more timely intervention.
6. Renewed efforts to improve digital inclusion are necessary to ensure the equity of digital health interventions.
7. Governments should explore the potential for wearable technology to improve patient outcomes in clinical settings and/or enhance health surveillance.

Policy Points

AMSA calls upon:

1. AHPRA and Medical Board of Australia to:
    a. Develop internal Artificial Intelligence (AI) systems for working with clinical data and support clinicians to engage in research in this space;
    b. In relation to Electronic Health Records (EHR):
        i. Mandate the integration of EHRs as a standard practice across all healthcare facilities;
        ii. Establish guidelines for secure and standardised sharing of patient information amongst practitioners to ensure patient safety and continuity of care; and

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        iii. Monitor compliance with EHR adoption and provide guidelines for maintaining patient data privacy and security;
    c. Encourage practitioners to engage in continued professional development pertaining to digital health.

2. The Australian Commonwealth, State, Territory, and Local Governments to:
    a. Engage in consultations for the emerging roles of AI in healthcare and how to navigate this in the future;
    b. Develop and integrate national strategies for deploying AI in the clinic;
    c. Encourage the integration of telehealth as a routine part of healthcare; with an emphasis on addressing healthcare inequalities;
    d. Take measures to improve educational status, health literacy and internet access of all Australians to improve digital health equity; and
    e. Collaboratively develop a national framework for EHR adoption, ensuring consistent standards and interoperability across regions;
    f. Utilise the Lowitja Institute's Indigenous Data Sovereignty Readiness Assessment and Evaluation Toolkit when engaging with data, research or policy pertaining to Aboriginal and/or Torres Strait Islander peoples.
3. The Australian Digital Health Agency to:
    a. Develop health infrastructure, solutions and initiatives that continue to:
        i. Be secure;
        ii. Have equal interoperability between healthcare providers and systems;
        iii. Improve the visibility of health information for better consumer health outcomes; and
        iv. Be sustainable and cost-effective health services;
    b. Lead the digitalisation of health systems in a manner that is accountable;
    c. Develop and review its strategies and action plans, including but not limited to:
        i. Reflect Reconciliation Action Plans;
        ii. Leadership and Workforce Strategy;
        iii. Cyber Security Strategy;
        iv. Clinical Governance;
        v. Assessment framework for mHealth apps;
        vi. National Healthcare Interoperability Plan;
    d. Support further research into:
        i. Stratifying the advantages and disadvantages of telehealth for various patient groups, with an emphasis on both objective

        measurements as well as patient-satisfaction related outcomes;
        ii. Determining which features of telehealth are most appreciated by patients, and which aspects of telehealth require further improvement;
        iii. The benefits of telehealth on patient outcomes when used as an adjunct to in-person care, as opposed to as an alternative;
        iv. Evaluating factors that contribute to patient satisfaction and dissatisfaction in order to stay up-to-date with evolving public opinions;
        v. Addressing the barriers of inequitable investment into IT systems and its consequential effects on interoperability;
        vi. The defining factors of digital health systems in terms of use, delivery, and perception, particularly in the context of key demographics such as Aboriginal and/or Torres Strait Islander peoples;
    e. Create nationalised telehealth guidelines for:
        i. Practitioners in Australia to determine the situations in which telehealth will be most useful;
        ii. Optimising triaging in telehealth; and
        iii. Creating telehealth platforms, in liaison with the Australian Digital Inclusion Agency;
    f. Utilise the Lowitja Institute's Indigenous Data Sovereignty Readiness Assessment and Evaluation Toolkit when engaging with data, research or policy pertaining to Aboriginal and/or Torres Strait Islander peoples.
4. Developers for IT Platforms to:
    a. Make information packs for clinicians about models and transparently communicate risks;
    b. Recognise the main factors associated with patient satisfaction when designing new telehealth platforms, including:
        i. Convenience;
        ii. Timely access to GPs and acute care;
        iii. Improved accessibility;
        iv. Financial savings; and
        v. Perceived decreased healthcare resource consumption, when designing new telehealth platforms;
    c. Develop strategies that mitigate factors associated with patient dissatisfaction, including:
        i. Difficulties in expressing themselves;
        ii. A fear that 'something may be missed;

        iii. Limitations with technology;
        iv. Issues with obtaining prescriptions and pathology results; and
        v. Reduced confidence in their doctor;
    d. Include accessible user interface options to improve accessibility to older population groups;
    e. Include interpreter options to improve telehealth accessibility for people with a diverse language background;
    f. Design systems in a way that both facilitates and encourages continuity of care for patients with known practitioners;
    g. Adhere to established EHR standards and protocols to ensure compatibility and interoperability with existing EHR systems; and
    h. Research the usage behaviour, uptake and success of mHealth apps in Australia.

5. Healthcare professionals; including doctors, nurses and allied health staff, to:
    a. Develop awareness about the benefits of adjunctive telehealth amongst patients in underserved groups, including:
        i. Patients with mobility issues;
        ii. Aboriginal and/or Torres Strait Islander peoples;
        iii. Patients living in rural and remote areas; and
        iv. Patients living with chronic diseases;
    b. Maintain awareness that patient satisfaction is related to:
        i. Timely access to GPs and acute care;
        ii. Positive patient outcomes;
        iii. High accessibility;
        iv. Cost efficiency; and
        v. Low resource utilisation from the healthcare system.
    c. Develop understanding of privacy and confidentiality issues surrounding telehealth, so that patients may be adequately informed;
    d. Support implementation of infrastructure within local practices to support video-conferencing as a viable telehealth alternative;
    e. Research into and implement evidence-based mHealth apps that improve the management of conditions, particularly chronic disease;
    f. Remain knowledgeable about the range of patient resources available; and
    g. Provide personalised frameworks to patients for potential resources to use based on assessments of their level of health literacy.

6. Australian Medical Association and The Australian Medical Council to:
    a. Build data literacy in clinicians through professional development;
    b. Promote medical students to engage in research with AI systems in healthcare; and
    c. Advocate to raise awareness about the use and benefits of telehealth amongst health practitioners;
    d. Utilise the Lowitja Institute's Indigenous Data Sovereignty Readiness Assessment and Evaluation Toolkit when engaging with data, research or policy pertaining to Aboriginal and/or Torres Strait Islander peoples.
7. Medical schools, universities, and educational institutions to:
    a. Build data literacy in medical students by integrating digital health into the curriculum;
    b. Facilitate opportunities to research into AI systems in clinic;
    c. Promote basic information system skills to increase transparency of privately deployed AI models; and
    d. Integrate comprehensive training on EHR usage and management into medical education curricula.

Background

Introduction

Digital technologies are transforming health, health care, and public health systems across the world at an accelerating pace. Studies in Australia have found that the majority of healthcare workers, patients, students, and educators are all supportive of a digital health future despite heterogeneous expectations and evolving definitions of digital health. [1,2]

The Australian Institute of Health and Welfare defines digital health as "an umbrella term referring to a range of technologies that can be used to treat patients and collect and share a person's health information." [3] The scope of digital health technology includes:

- Telehealth and telemedicine;
- Mobile health (mHealth) and applications such as SMS reminders via mobile messaging, wellness apps, Medicare Online and COVID check-in apps;
- Electronic prescriptions;
- Electronic health records, including My Health Record;
- Wearable devices such as fitness trackers and monitors;
- Robotics and artificial intelligence.

This policy examines the broad range of digital health issues listed above using the best available evidence in Australia to build upon the existing Australian digital health strategy, and advocate for the continuous improvement of digital health implementation in Australia. [4]

National Digital Health Strategy

The Australian Digital Health Agency (The Agency) was established in 2016 by the Australian governments to develop and implement the National Digital Health Strategy. The Agency is responsible for managing health infrastructure, health data, authentication, security and standardised clinical communications in a high quality and reliable fashion. [5]

The purpose of the Australian Digital Health Agency is to deliver "seamless, safe, secure digital health services and technologies … for patients and providers." This purpose is delivered through the strategic objectives of health infrastructure, solutions and initiatives that are secure and have equal interoperability between healthcare providers and systems. Additionally, improved visibility of health information is a target for better consumer health outcomes, and sustainable and cost-effective health services. [5]

For consumer outcomes, Digital Health aims to reduce adverse drug events and medical errors, improve vaccination rates, and reduce duplication of pathology and radiology tests that will mitigate any extra costs. [6] Additionally, greater access for rural and remote Australians and improved health awareness and digital literacy are core targets of the strategy. The health strategy also outlines key areas where digital health provides better outcomes for patients including: cost comparison in specialists, remote access to services, medication safety risk reduction with access to My Health Record, better accessibility to pathology tests, access to Advanced Care Directives to have less invasive procedures, safe and secure requests for scripts, online access to mental health support, allergy alerts, and a Child Health mobile application to replace booklets. [6]

The strategies and plans governed by The Agency include the Reflect Reconciliation Action Plan, Leadership and Workforce Strategy, Cyber Security Strategy, Clinical Governance, Assessment framework for mHealth apps, and the National Healthcare Interoperability Plan. [6]

Analysis of the National Digital Health Strategy

The digital health initiatives outlined in the health strategy have the potential to improve patient outcomes if meticulously implemented; however, failure to do so can potentially complicate patient care further. Specifically, it is important to recognise the barriers to incorporating the provisions of the health strategy into day-to-day clinical practice. [7]

In practice, complex user interfaces and discongruent integration of novel digital health systems into existing hospital IT systems presents complications for providers. The adoption and acceptance of digital health can be impeded, particularly when complicated by personal characteristics such as cognitive constraints and anxiety in using technology. [8] Without adherence, the performance, manageability, feasibility, and safety to access digital health services can be limited. [9]

On a systemic level, there is an inequality of investment in IT systems across the healthcare and related sectors - leaving interoperability issues unaddressed due to the potentially siloed approach with implementing the health strategy. Specific barriers that would present with this include undiscriminating firewalls, poor internet/Wi-Fi coverage/speed, and lack of necessary hardware and software. [7,10] In spite of this, current data indicates high digital health technology uptake in rural and remote areas of Australia, spotlighting the potential efficacy in managing issues surrounding distance to, and use of, health services in underserved areas. [11]

With the limitations outlined, there is still insufficient research into the multifaceted nature of Australia's digital health ecosystem to support the effective implementation of the National Digital Health Strategy. [9] Fulfilling the vision of the health strategy would require substantial research into the defining factors of digital health systems, and its effect on use, delivery, and perception of these systems. Specific factors would include income level, ethnicity, education, languages and cultures, and geographical factors - also highlighting the importance of understanding the insights of key demographics, including Aboriginal and Torres Strait Islander peoples. [9,12]

There needs to be proactive uptake, maintenance, and advancement of digital health systems by the government, hospitals, patients, and healthcare professionals alike. In doing so, digital health systems can be used to improve the quality, continuity, and efficiency of patient care delivery in Australia. [7]

Telehealth

Use of Telehealth in Australia

The use of Telehealth in Australia is increasing, with 475,545 Medicare claims made between July 2011 and July 2016 in contrast to over 100 million between March 2020 and March 2022. [13] It is the Australian government's stance that telehealth is a "significant step forward in making access to healthcare flexible and easy", and in 2021, telehealth consultations became a permanent feature of the Australian health landscape. [14] As of 2022, health practitioners are free to incorporate telehealth into their model of care as they see fit, though are bound by the 30/20 telephone rule that aims to limit practitioners from over-reliance on telehealth services. [15]

Benefits Associated with Telehealth

Telehealth has been associated with improvements in the equity of access to healthcare. For those living in rural and remote areas, there is strong evidence to suggest benefits with regards to convenience, efficiency, satisfaction rates, and reduction in inequities with healthcare access, in both international and Australian studies. [16-18] Similar benefits have been shown for patients with mobility issues, Aboriginal and Torres Strait Islanders and patients living with chronic diseases, with evidence for improvements in mortality, quality of life and other objective measures for patient outcomes for the latter. [19-23] There remains, however, the need for studies with a patient-oriented focus that incorporate patient satisfaction as an outcome.

International studies demonstrate that telehealth may also objectively improve patient outcomes when used as an adjunct to in-person care. [24,25] However, Australian-based evidence is limited, and there is limited quantification of the degree of benefit in various scenarios. [26]

Telehealth has also been associated with decreased resource consumption and cost-savings for patients, though Australian reviews have not found this benefit to extend to the healthcare system in a significant way. [27-29] Other benefits include decreasing the failure-to-attend rate, which may have a positive impact on waiting lists, as well as facilitation of remote care in the setting of a pandemic. [30,31]

Telehealth may also improve global health and assist via foreign aid, through linking under-resourced areas to a global network of expertise. The World Health Organisation's third global survey on eHealth (2019) emphasises the potential of telemedicine in addressing global health challenges, such as infectious diseases, maternal and child health, and non-communicable diseases, through remote diagnosis, treatment, and patient monitoring. [32]

Clinician and Public Perception of Telehealth

Both international and Australian studies show that a majority of participants are satisfied with their telehealth experience, with 83-85% stating they would use it again if offered. The main factors with patient satisfaction included convenience; timely access to GPs and acute care; improved outcomes; improved accessibility; cost savings; and perceived decreased healthcare resource consumption. [33] The main reasons for dissatisfaction included lack of a physical exam, difficulties in expressing themselves, a fear that 'something may be missed', limitations with technology, issues with obtaining prescriptions and pathology results, and reduced confidence in their doctor. Dissatisfied patients were generally older, reported lower educational qualifications, lower health literacy, and lacked internet access, suggesting that education in these areas may be a potential intervention to improve the efficacy of telehealth in Australia. Detailed studies evaluating the efficacy of such measures are required.

Of note, many studies were conducted during COVID-19 pandemic and required the implementation of telehealth in a way that acted to replace face-to-face consultations in some locations, which differs from the complementary model promoted by the National Digital Health Strategy. Studies which reported patient dissatisfaction generally also noted that the desire to have the option for both face-to-face and telehealth consultations was a common theme. [34,35]

Provider experience with telehealth is very positive, with high satisfaction rates reported in several studies. [36] Major complaints were generally related to experiences with physical examinations and the occurrence of telehealth consults that are more suited to face-to-face consults. This suggests the need for effective triage systems that may indicate to a patient which type of consult to opt for. Of note, despite the opinion of telehealth being positive on average, some healthcare providers report negative experiences. [36] As such, whilst the literature should inform guidelines on when to use telehealth, and inform policy encouraging or discouraging its use, telehealth as a whole should still be an opt-in, opt-out type system, with the final decision about its use dependent on the providing practitioner.

Disadvantages Associated with Telehealth

Other disadvantages associated with telehealth include the inability to fully read non-verbal cues, connectivity issues, concerns about privacy, and concerns about equity of telehealth access. [37,38]

Most telehealth services require internet access, as well as access to a device such as a computer, laptop or smartphone, which not all Australians have reliable access to. [39,40] The combination of the degree of access to physical technology in addition to the degree of digital literacy a user has is termed "digital inclusion". Reduced digital inclusion is correlated with lower income, education and employment levels, highlighting the primacy of the social determinants of health in discussions surrounding digital health. [40] People aged 65+, people with disabilities, people living in rural areas, and Aboriginal and Torres Strait Islanders also have lower levels of digital inclusion. [40] These groups have poorer health outcomes compared to the general public, leading to concern that inequitable access to digital health may be contributing to this inequality. With the growing trend towards digitisation, much of which is supported by this policy, there is major concern for an exacerbation of the health divide faced by these groups. As such, improving digital inclusion is imperative for both preventing the exacerbation of the divide as well as helping address the current inequity. As discussed previously, telehealth indeed has the potential to help address the health inequalities in underserved groups, if implemented appropriately.

Whilst the levels of digital inclusion in Australia have been increasing, the rate of increase has been slowing. [40] Renewed efforts or different approaches may be required to maintain the existing trend. The digital inclusion roadmap proposed by the Australian Digital Inclusion Alliance was last updated in 2020. Updating these guidelines as per recent targeted research conducted towards analysing specific factors associated with the digital divide in these various groups, and current knowledge of potential interventions may aid in this endeavour. For example, this may include improving digital health literacy via recruiting health practitioners to teach, and the development of novel ways of teaching that are both adaptable to target various starting levels of digital health literacy, as well as non-digital modalities, as the increasing information availability on digital platforms has been attributed to increasing the digital divide. [41] In addition, access to high-speed internet services and video call-capable devices can be improved via investment in these technologies. The ‘better connectivity plan for regional and rural Australia’ includes government funding in the 2022-2023 October budget over 5 years to support this endeavour. [42] Whilst the specific factors vary across underserved populations, these are common factors which may form likely targets. An updated, comprehensive report is necessary to better guide solutions.

A review of barriers to telehealth adoption in older adults found that several barriers related to the user interface, including font size, unusual characters, bland graphics and poor colour contrast, the use of widgets, multiple screen transitions to complete a task, and menu bars that contain several layers. Physical factors, such as the use of a computer mouse, or inappropriate size of smartphone, and functional factors such as unskilled use of a smartphone or computer were other factors which were identified. [43] These may be potential targets for intervention to improve digital inclusion in this group. A separate review of privacy concerns in the aged care context found privacy concerns to be a barrier for this group, and concluded that privacy protection practices, such as informed consent, may improve telehealth engagement. [44]

There is also some concern about difficulties in communicating via telehealth for people who do not speak English as a first language. [45] This problem should be addressed, either through the telehealth systems themselves by offering translations or interfaces in different languages, or via improved triaging.

Telehealth services, particularly on-demand services, are at risk of a reduced continuity of care. Continuity of care has repeatedly been shown to reduce hospitalisations, mortality rate, healthcare expenses and improve various biomarkers, and has also frequently been reported by patients as improving satisfaction. [45-49] However, if implemented alongside traditional face-to-face care appropriately, telehealth has been found to help improve continuity of care as it improves a practitioner's reach. [50]

Video vs Audio

Despite the recommendation from the Department of Health and Aged Care that video consultations remain the preferred medium for telehealth, 96% of telehealth services are delivered over mobile phones instead. Reviews demonstrate that video conferencing has objective benefits for various patient outcomes, but this does not incorporate mortality or patient satisfaction. [51-53] Furthermore, evidence suggests phone consults better suit those with low levels of digital literacy, and also help alleviate some of the issues of poor connectivity, acting as a tool to reduce healthcare inequality in these contexts [47,54] .

Mobile Health

Mobile health (mHealth) technology continues to be a growing element of digital health, with estimates of mHealth applications ranging between 54,000 - 350,000 worldwide. [55] Applications from the Department of Health and Aged Care include Hearing Services Program, myAssessor application for Aged Care assessments, Dementia Discovery, Primary Healthcare Network (PHN) locator, Child Health Book, Disability Advocacy Finder, Healthdirect Coronavirus Symptom Checker, and My QuitBuddy for smoking cessation. mHealth applications also extend to include other medical devices, wellness and healthcare topics. [55]

mHealth has been introduced in the management of chronic diseases for patients. The Royal Australian College of General Practitioners reported that they would be willing to prescribe them for sleep monitoring, exercise/weight management and chronic disease management. [56] A pilot study in SMS self-management reminders for Type 2 Diabetes Mellitus over an eight-week period showed improved levels of patient engagement and satisfaction, and reduced pressure on existing resources from practice employees through an automated system. [56] Additionally, only one full-time equivalent (FTE) care manager per 300 enrolled patients was required, compared to other face-to-face care management programs reported in the literature that typically serve 30–100 patients per FTE staff member, proving it to be a cost-effective initiative. [56]

Previous barriers to mHealth uptake include security and responsibility of data sharing, legal regulation and benefits under the Medicare Benefits Schedule (MBS). [56] The ability of mHealth to link rural communities has been identified to improve quality and safety with access to patient records including medications, allergies and history, with immediate access to medical database applications, including Merck Index, MIMs and UpToDate, for safe and high-quality practice and professional development opportunities.

The National Digital Health Strategy developed a framework to assess mHealth apps to ensure developers, consumers and healthcare professionals make informed choices about credible apps before recommending them to patients. [55] The assessment follows a triage, assess, publish and re-assess model for application development. The assessment of mHealth apps consults health professionals, consumers, Aboriginal and Torres Strait islander peoples and speciality groups, across all data sharing levels from no personal information to patient records for medical device applications, healthcare applications and wellness applications. [55]

Electronic Health Records

The electronic health record (EHR) is defined as a longitudinal collection of electronic health information about individual patients and populations. [57] Australia has a heterogeneous system of EHRs with the national My Health Record (MHR) and various local EHRs operated by state governments and or individual providers. Typical EHR in hospitals and local health networks would collect information from clinical assessments, diagnoses, immunisation, medical imaging and pathology results as well as digital prescriptions and other notes from specialist reviews. [58,59]

Benefits of EHR

EHR development is not simply driven by the ubiquitous digitisation of most major industries. Digitisation of health records holds great promise in improving the quality of care and reducing costs at the level of global health care using three particular functionalities: clinical decision support (CDS) tools, computerised physician order entry (CPOE) systems, and health information exchanges (HIE). [57]

CDS systems improve clinical workflow efficiency and effectiveness by providing the latest information about patient observations and management options. An example of a CDS system includes displaying the latest guideline information with drug interaction warnings based on a patient's recent vitals and medications. As more and more CDS systems are used, one can expect a reduction in medical errors and better adherence to best practice guidelines. [60]

CPOE systems allow clinical orders such as drugs, laboratory tests, radiology, allied health referrals to be entered digitally. This improves system efficiency by forming more rigid request structures that minimise missing information in orders and prevent subsequent needs for clarification. Furthermore, this also eliminates potentially dangerous medical errors caused by poor legibility of handwriting. [61,62]

HIE refers to the process of sharing patient-level electronic health information between different organisations. [63] By allowing secure and potentially real-time sharing of patient information, HIE can improve healthcare efficiency by reducing the communication time required between workers of different health services. This can thus help maintain continuity of care. Furthermore, it can also prevent excessive testing conducted by multiple health services.

Together, EHR has significant benefits to healthcare efficiency, effectiveness, and patient safety. For clinicians, EHR allows integrated access to best-practice frameworks, automated error warnings, real-time access to vitals monitoring, and enhanced communication within multidisciplinary teams and other facilities; for patients, there is reduced risk of medical errors, more timely intervention and reduction in redundant testing; for hospital management, EHR provides means to assess, research and evaluate patient management indicators and more effective resource allocation. [57,58]

Challenges Created by EHR

While integration of EHR in Australian healthcare appears inevitable, it comes with inherent challenges. [47,64] The major challenge is during the transition between EHR and paper-based documentation. Several studies have demonstrated temporary losses in productivity due to healthcare workers learning to navigate the new system. Australian studies have shown the integration process to be temporarily associated with delays in theatre start times, increased emergency length of stay, and increased work demand for clinicians. [65-68] Furthermore, these inherent challenges will continue to exist beyond the initial integration phase. Ongoing maintenance and unexpected adverse events of EHR may require system downtime, causing healthcare workers to switch back and forth between paper-based workflow and EHR and increase risk of iatrogenic harm. [69] The reduced efficiency caused by these downtimes are also increasing the financial burden.

The financial burden is frequently cited as the largest barrier to adoption of EHR. [70] The many financial benefits of EHR generally do not accrue to healthcare providers but rather to to patients in the form of errors averted and improved efficiencies, which translate into reduced claims payments. [69] This is also compounded by the ongoing maintenance cost required to cover software updates and to ensure up-to-date cybersecurity infrastructure. [57,69] Although the cost of EHR is expected to decrease as they become more commonplace, studies in Australia are yet to demonstrate the overall cost-effectiveness of EHR purchases. [69]

Most importantly, from a patient's perspective, EHR poses a risk of privacy violation. Patient concerns such as lack of informed consent for data storage, unauthorised access, and data breaches are often inadequately addressed when health officials begin changes to EHR systems created at state and national levels. This results in widespread media criticism, fueling patient distrust towards the Australian government and health authorities. [71,72] In clinical practice, distrust from patients can lead to purposeful withholding or withdrawal of information after giving consent to information sharing. [73] Patients may be harmed if vital information is omitted during their medical consultation. On the other hand, patients may also be harmed physically, mentally, and financially in the event that their health data is leaked to stalkers, employers and private health insurance providers. [71,74]

Outside privacy considerations, cybersecurity concerns can also pose a threat to patient safety. IT service downtime due to ransomware attacks has been linked to patient death on multiple occasions outside Australia. [75,76] Cybersecurity incidences and costs are all on the rise as Australia moves towards digitised healthcare. [77]

My Health Record

The My Health Record (MHR) system is a national patient-centric electronic health record system managed by the Australian Digital Health Agency. [78] Established in 2012, the MHR contains an online summary of patients' health and medical records. [78] It was proposed that the ability for multiple service providers to share health information between each other would potentially increase healthcare quality and safety. [79] For the healthcare system, it would promote the practical requesting of pathology and radiology results and the proper prescription of medications, which would have improvements for the efficient use of resources and budgets in the health system. [78] This is especially important when contemporary literature strongly highlights the issues associated with overprescribing and the ordering of unnecessary diagnostic tests such as increased cost to health systems, systemic slowdowns, and the potential for patients to be placed at increased risk of harm. [78] Literature showed that medication errors and adverse drug events result in over 230 thousand Australian hospitalisations annually costing more than $1.2 billion to the health system.

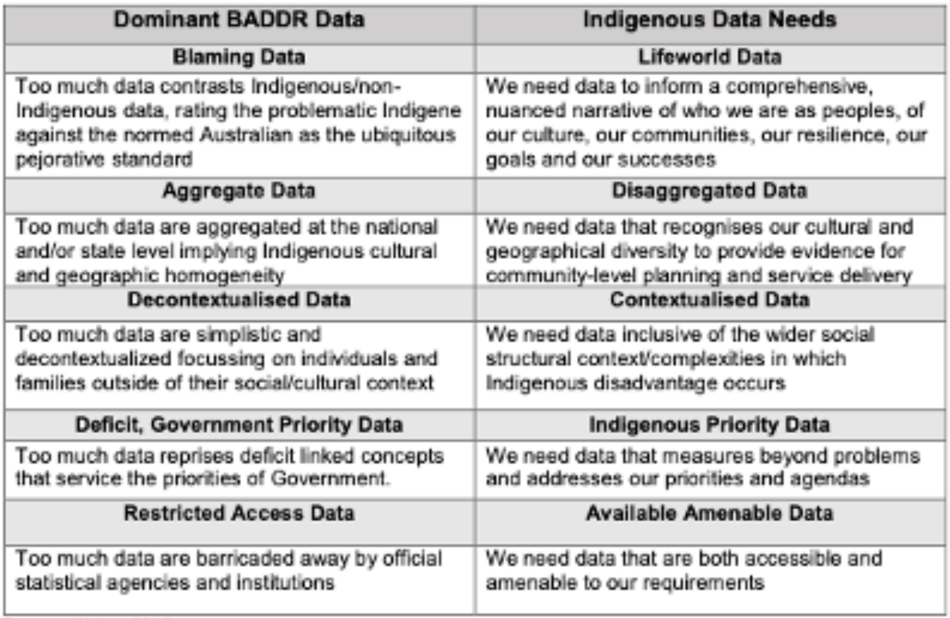
Being a patient-centric system, individuals have the ability to control what information is within the MHR, which service providers can access the information and the ability to request to remove their profile. [78] Concerns of privacy and confidentiality forced the Australian Government to implement an opt-out period for the My Health Record system in 2018, after which over 2.5 million Australians decided to leave the program. [80,81] The remainder of the population continue to have MHR profiles, with new-users to Australia's healthcare system including immigrants and babies automatically included unless applications were made for profile removal. [80]

Of the individuals that did opt out of the My Health Record system, it was noted that they more likely to have a degree, multiple health conditions or be a member of a community affected by sexually transmissible infections, contradicting the aim of MHR, to improve healthcare, especially for those living with complex medical conditions and individuals of underserved populations. [82]

Indigenous Data Sovereignty

Indigenous Data "refers to information or knowledge, in any format or medium, which is about and may affect Indigenous peoples both collectively and individually."[109] The Lowitja Institute define Indigenous Data Sovereignty as "the right of Aboriginal and Torres Strait Islander peoples, communities and organisations to maintain, control, protect, develop, and use data as it relates to us". [110] Indigenous Data Sovereignty recognises that data is a strategic, cultural and economic asset for Aboriginal and Torres Strait Islander peoples.[109] Implementing policies on Indigenous Data Sovereignty is important in our contemporary society, given the fact that non-Indigenous people have historically had control over data relating to Aboriginal and Torres Strait Islander people and communities. [111] This control has been extremely harmful, causing an emphasis on producing deficit-based data, [112] as well as the paradox that while a lot of data is collected from Indigenous people, they have rarely gained any amenable value from it. [109] Systemic discriminations and engrained biases continue to dismiss Aboriginal and Torres Strait Islander priorities.[110] The glaring issues that the Indigenous Data Paradox identifies can be mapped across five types of Indigenous data failure, which are described in the below table by Dr Maggie Walter. [113]

Table 1: BADDR Data Outcomes versus Indigenous Data Needs



Dominant BADDR Data	Indigenous Data Needs
Blaming Data	**Lifeworld Data**
Too much data contrasts Indigenous/non-Indigenous data, rating the problematic Indigene against the normed Australian as the ubiquitous pejorative standard	We need data to inform a comprehensive, nuanced narrative of who we are as peoples, of our culture, our communities, our resilience, our goals and our successes
Aggregate Data	**Disaggregated Data**
Too much data are aggregated at the national and/or state level implying Indigenous cultural and geographic homogeneity	We need data that recognises our cultural and geographical diversity to provide evidence for community-level planning and service delivery
Decontextualised Data	**Contextualised Data**
Too much data are simplistic and decontextualized focussing on individuals and families outside of their social/cultural context	We need data inclusive of the wider social structural context/complexities in which Indigenous disadvantage occurs
Deficit, Government Priority Data	**Indigenous Priority Data**
Too much data reprises deficit linked concepts that service the priorities of Government.	We need data that measures beyond problems and addresses our priorities and agendas
Restricted Access Data	**Available Amenable Data**
Too much data are barricaded away by official statistical agencies and institutions	We need data that are both accessible and amenable to our requirements

Source: Walter 2018

While it has been established that Indigenous data collection in the past has not been in accordance with Indigenous Data Sovereignty principles, its importance and necessity in practice is vital as society practices moves to an age of big data mining and algorithms. [109] WIthout careful, decolonised intervention, algorithmic bias is likely to reinforce discriminatory practices in healthcare. As such, all stakeholders engaging with data, research or policy pertaining to Aboriginal and/or Torres Strait Islander people must utilise the Lowitja Institute’s Indigenous Data Sovereignty Readiness Assessment and Evaluation Toolkit.[110] This document seeks to decolonise and improve processes through a whole-of organisation approach. Furthermore, all implementations of LLAMA-based Large Language Models in healthcare must recognise and remove BADDR data from training datasets.[113]

Digital Innovation and Artificial Intelligence

Emerging Roles of Generative AI and Automation in Healthcare

Globally, healthcare is undergoing rapid digital transformation, driven by rapid advancements in technology and the convergence of artificial intelligence (AI) and automation in clinical settings. These emerging technologies offer unprecedented opportunities to enhance the efficiency, accuracy, and accessibility of medical care, as well as to unlock novel avenues for medical discovery and innovation. In particular, generative AI systems and decision assist automation tools have great potential for practical use in Australian healthcare settings if they are equitably accessible and are developed and tested by clinicians and medical students.

Generative AI in the context of clinical practice refers to the application of artificial intelligence systems, particularly generative models, to assist in the development, analysis, and decision-making processes in clinical settings. Generative AI models are a subset of AI models that are designed to generate new content, such as text, images, or even entire data samples, based on patterns and information learned from existing data. Both closed-source and open-source deployments of generative AI are being actively explored, with intelligent speech transcription tools or image-analysing chatbots showing great promise in improving administrative aspects of clinical work. [83,84]

Similarly, LLAMA-based Large Language Models have emerged in recent times as robust, open-source models, which can be easily fine-tuned on domain-specific databases and integrated with novel datasets, databases, APIs etc through frameworks such as LangChain. [85,86] Collectively, this demonstrates potential for highly advanced AI agents to be deployed within hospital systems in a local capacity with strong data security (owing to the ability for model inputs, outputs, operating hardware, and model software to be contained within the physical setting of the hospital in a server etc). Looking to the future, it is also crucial to ensure that clinicians and medical students continue to play a central role in the development of clinical AI systems to maximise their clinical benefit and ensure they are equitably accessible by all population groups.

Looking at existing AI systems used in clinical practice, data-annotation stands as a key factor in ensuring diagnostic prowess of clinical AI systems. For example, MONAI is an emerging open-source platform that enables private medical imaging datasets to be annotated, analysed by Intelligent AI Models, and then deployed to clinical settings. [87] In this context, the development of clinical AI systems is following a decision-assist framework, and will likely involve integrating AI systems into existing imaging technologies within the hospital, with potentially minor roles in operative aspects of medicine, such as intra-operative imaging or tool stabilisation for laparoscopic surgeries.

Such systems support clinicians to build powerful AI models for clinical deployments and so represents an important step in expanding the data literacy of clinicians and medical students, and the necessity of this in building highly advanced AI systems that will be integrated into Australia’s Healthcare System and Health Networks in the future. This inclusive approach to developing emerging AI systems also enables these models to be developed with a focus on health equity. Even in its early stages, as AI systems have exhibited diagnostic bias in underserved population groups, and thus, mitigating these biases represents an emerging focus area in clinical AI research. [88,89]

In summary, clinical Artificial Intelligence systems such as Large Language Models are rapidly acquiring the ability to analyse most forms of clinical data, imaging, intra-operative audio transcripts, equipment views, etc. and can interpret these in the context of a given patient. Currently, the ability of many of these AI models is supported by human supervision and annotation of datasets, which is often labelled by clinicians. Correspondingly, this represents an emerging opportunity for learning for medical students, and engaging medical students with clinical AI research and/or systems development will be necessary to ensure common teething problems of such systems such as diagnostic bias can be identified and mitigated to ensure innovation in this space provides an equitable health benefit to all Australians, including those who are currently underserved.

Digital Determinants of Health

What they are

"Digital determinants of health" are all the ways in which digital technologies can influence health and wellbeing. [90] They include the availability of digital technologies that directly impact health, such as electronic health records, telehealth or sensors like pulse oximeters; as well as the availability of digital technologies that indirectly impact health, such as productivity apps, or online shopping. [90,91]. From a societal perspective, "availability" refers to the ability to build or acquire, implement and maintain the various technologies. From an individual's standpoint, "availability" includes aspects of digital literacy as well as access to infrastructure such as broadband and the internet. [92,93]

The digital determinants of health are similar to the social determinants of health where non-medical factors influence health outcomes of individuals. [94] The quality of digital connectivity, effective digital services, content and integration into health practice are indirect impacts of determinants of health that influences its effectiveness [95].

From a societal perspective, improvements in digital technologies have generally led to improvements in health, via improving quality of life, patient outcomes, and healthcare efficiency. [96] Whilst healthcare technologies are directly designed and tested to improve outcomes, other technologies are generally aimed at improving quality of life in some way. Though disadvantages do exist, such as information overload, hate and bullying, misinformation and marketing of unhealthy products, the general trend remains upwards. [92,97]

From an individual perspective, however, inequitable access to digital technology can lead to a relative inability to benefit from this trend, leading to poorer health outcomes. Most factors which lead to positive impacts on an individual, such as improved health, wellbeing, financial status, educational status, and social determinants of health have a bidirectional relationship with other factors, leading improvements in one to cause improvements in others. [90] As a result, however, a relative disadvantage in one, can exacerbate disadvantages in others, leading to a "trapping" of the individual in a perpetual cycle. [91] Thus, as digital technologies improve, whilst the general societal trend is upwards, for the disadvantaged individual, the relative trend may paradoxically be downwards. [90]

Causal agents for this not only include the inability for an individual to access devices or softwares, but also that public policy generally aims to favour the majority. Furthermore, as data collected becomes more and more digital, those without adequate access run the risk of their data being missed in analyses which inform public policies [91].

As previously discussed, there are groups in Australia with reduced digital inclusion, including those with income, education and employment levels, people aged 65+, people with disabilities, people living in rural areas, and Aboriginal and Torres Strait Islanders. [33] From a community scale, a significant proportion of Australia's population (4%) did not have access to the internet in January 2023. [95,97,99]. This indicates the need for improvement in equity of digital access.

Reflection Reconciliation Action Plan (RAP)

Throughout the development of the Agency, a Reflection Reconciliation Action Plan (RAP) was established to increase awareness, education and digital literacy for Aboriginal Health Services and communities that focussed on translating resources into community languages and educational programs groups delivered through Aboriginal Community Controlled Health Organisations. [100] Additionally, during the My Health Record Expansion, ongoing education and health literacy awareness continued following the opt out period for these communities. [100]

Tracking the progress of the RAP has been established with set targets of achieving the RAP commitments, establishing an effective RAP Working Group, accountability and transparency with RAP achievements and challenges, and continue key stakeholder input from Aboriginal and Torres Strait Islander communities of the development of the next RAP. [100].

Wearables

Wearables have become increasingly popular in the healthcare industry for monitoring various aspects of health and wellness. They are used in both acute care settings and general wellness applications. Key examples of each are discussed below and their potential for further development and adoption.

In recent years, the healthcare landscape has witnessed a notable surge in the adoption of wearable devices tailored for general wellness applications. These devices have revolutionised how individuals engage with their health by providing continuous and personalised monitoring of various vital parameters. Prominent among these wearables are smartwatches, exemplified by the Apple Watch and Samsung Galaxy Watch, which offer comprehensive health tracking functionalities encompassing heart rate monitoring, activity quantification, sleep analysis, and even electrocardiogram readings. In conjunction with smartwatches, fitness trackers such as Fitbit and Garmin have become quintessential tools for monitoring physical activity and overall fitness. [101] Furthermore, the emergence of smart scales, exemplified by Fitbit Aria and Withings Body+, provides users with insights into their body composition, while wearable temperature sensors like Tempdrop enable precise tracking of basal body temperature for fertility and menstrual cycle monitoring. [102,103] This wave of general wellness wearables extends beyond physical health, with stress and relaxation devices like Spire Health Tag and Muse headbands promoting mental well-being. [104] These recent developments signify a transformative shift in how individuals actively engage with their health, making proactive wellness management accessible to a wider audience through innovative and user-friendly technology.

However, without clinical oversight, these tools offer minor clinical benefit and often prompt users to consult specialists, potentially unnecessarily. This was observed in a recent apple watch atrial fibrillation screening study where over 1000 participants from a cohort size of 400000 participants consulted a cardiologist following heart rate abnormalities detected by a smartwatch. [105] In the context of public healthcare in Australia, it is unclear what the clinical benefit of these consultations is and how they would compound existing wait times for specialist medical services or impact population health outcomes. However, clinically-relevant tools such as blood pressure and blood glucose monitors have also been transformed by this wearable revolution, and so highlight the promise of these therapies in capturing episodes of malignant hypertension which do have a considerable clinical burden.

By contrast, deployment of wearables in acute care settings has improved health surveillance in hospital settings, improving patient outcomes. Pulse oximetry is a great success story in this regard. [106] Similarly, portable ultrasound scanners represent a growing class of wearable technology that can obtain imaging data, and so have the potential to operate synergistically with emerging AI systems to triage patient care. [107] Capsule endoscopy also stands as a novel wearable technology with diagnostic applications in a clinical setting, although its adoption has been hindered by its high costs. [108] Ultimately, the place of wearables in acute care settings is well established and future developments in this space will likely centre on real-time diagnostics and non-invasive imaging modalities, which will eventually become integrated into consumer devices.

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