LEADERSHIP IN CLINICAL INFORMATICS

A HISA WHITE PAPER

July 2018

HISA AUSTRALIA'S DIGITAL HEALTH COMMUNITY

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Foreword

HISA's Clinical Informatics Community of Practice (CoP) believes leadership in clinical informatics is imperative if we are to get digital health right. Leadership skills in clinical informatics must be developed if we are to ensure the application of technology brings value to healthcare delivery and patient experience.

Furthermore, this leadership capability needs to be acknowledged by organisations embarking on digital transformations and, by professional colleges who hold their registered healthcare professionals accountable for their conduct and practice.

Based on internal review, this White Paper underwent three major iterations from feedback received by the Clinical Informatics CoP Steering Committee. This was to ensure the right issues for clinical informatics in Australia were highlighted. Then, in November/December 2017 the paper was released for public consultation. More than 300 pieces of written feedback was received from 40 individuals and 14 organisations. Over 70 individuals contributed to the organisational responses.

The White Paper, *Leadership in Clinical Informatics* was developed to raise awareness and acknowledge the important role of clinicians in leading digital transformation in health. This paper, part of HISA's Clinical Informatics series, contributes to the clinical informatics leadership agenda and is recommended reading for clinicians at all levels of healthcare.

ABOUT HISA

The Health Informatics Society of Australia (HISA) is Australia's peak professional body for the digital health, e-health and health informatics community.

HISA members represent a broad and diverse stakeholder community including clinicians, researchers, healthcare managers and executives, data analysts, designers, project managers, business analysts, technologists, innovators and health informaticians.

With clinical alliances, corporate collaboration, education sector support and strong government relationships, members have unlimited opportunities for career advancement and professional development.

As a leading member of the global health informatics network, HISA is also the forum for sharing international best practice, digital healthcare trends and health system innovation.

This paper address two strategic priorities for HISA:

- **Workforce** – HISA builds the capacity of Australian health workforces to confidently and competently use and drive uptake of connected digital services
- **Leadership, Influence and Advocacy** – HISA is the authority and leading advocate for advancing digital health in Australia.

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HISA'S Clinical Informatics Community of Practice

HISA Clinical Informatics Community of Practice was established to lead and create opportunities to influence and shape the digital health agenda. The group has its origins at HIC 2016, where delegates attended a workshop to contribute to an emerging Clinical Informatics agenda for Australia.

HISA acknowledges current committee members for their leadership and generosity in sharing their time and wisdom for the benefit of their clinical colleagues throughout Australia: Jayne Barclay, Dr Damian Claydon-Platt, A/Prof Elizabeth Cummings, Michael Hosking, A/Prof Carl Kuschel, Dr George Margelis, Dr Mark Merolli, Chris O'Donnell, Dr Yasmine Probst, Dr Mark Santamaria & Dr Martin Seneviratne. The COP wishes to thank Dr Josie Di Donato for her authorship of the paper and Dr Louise Schaper for her assistance.

HISA clinical informatics.

Leadership in Clinical Informatics – An Introduction

Australia is gaining real momentum in digital health with large scale and accelerated investment in infrastructure, infostructure, the My Health Record, clinical software for GP practices and enterprise clinical information systems for public hospitals.

Commonwealth, State and Territory governments are to be commended for investing in the foundations for electronic health (e-health) which began with the formation of the National E-Health Transition Authority (NEHTA) in July 2005. To its credit NEHTA laid the foundations for digital health with integration infrastructure and standards for health information. The baton has now passed to the new statutory entity, the Australian Digital Health Agency (ADHA) whose role it is to progress the agenda further with a focus on engagement, innovation, quality and safety.

Although progress in digital health is being made, real transformative change in healthcare services is yet to be achieved at scale, with information silos persisting throughout healthcare.

While transformation of healthcare can take many forms, healthcare is mostly about information and knowledge. This information guides decisions about managing healthcare and achieving the best possible outcomes for patients. In practical terms, it is about having the most recent medication list, access to the latest clinical evidence, allergy and alert information, and information to support transitions of care across multiple settings and time.

There are obstacles to change which are hardwired into the way healthcare systems are currently organised, financed, regulated and incentivised. What is needed is a significant shift in thinking from volume and throughput to one that focuses on outcomes and delivering the best possible value to patients and healthcare systems[1]. Value-based healthcare with be powered by an increasingly digitised clinical workflow and analytic approaches for using health-related data to deliver insights that improve health. However, it will require leadership in clinical informatics and a commitment to workforce development.

A professional informatics workforce trained in clinical care, informatics and change leadership is essential to achieve the difficult task of rethinking and redesigning clinical work. Lessons from other countries show that when informatics skills and change leadership capability are overlooked, expectations of better health, better healthcare and lower cost are not met.

LESSONS FROM OTHER COUNTRIES

National Programme for Information Technology (NPfIT) – United Kingdom

The focus [of NPfIT] was placed upon technology and not service change, and minimal attention was given to the adaptive elements of massive IT installations. There was no comprehensive strategy to engage clinicians or NHS executives to ensure they understood the reasons why NPfIT was being developed or implemented.[2]

Health Information Technology for Economic and Clinical Health (HITECH) Act and Meaningful Use – United States of America

Measured against its primary goal – digitising the US healthcare system – there was success in achieving computerisation for over 75% doctors' offices and over 90% hospitals.[3] The major downside of HITECH is that it opened the door to the overregulation of Meaningful Use Stages 2 and 3. In terms of its impact on clinical care, the US experience with health IT has been disappointing. Inadvertently, EHRs were designed to address billing/financial functions more than the clinical needs of doctors, nurses, and patients. [4]

A 2013 RAND Corporation study commissioned by the American Medical Association found that many doctors cited EHRs as a major source of burnout. The problem lies partly in poor design.[5]

Audience & Purpose for this White Paper

This paper has been developed by HISA's Clinical Informatics Community of Practice Steering Committee. It tackles the topic of leadership in clinical informatics to achieve a transformed and value-based healthcare system. It is informed by the lessons learned from international experience and is moderated by where Australia is situated along the digital health journey. It advocates for **clinicians** to undertake training in advanced informatics so they are well-prepared and able to respond positively to the adaptive nature of digital transformation. It also encourages **healthcare organisations** to support their aspiring senior clinical leaders in this endeavour - give them appropriate authority, time and resources to take healthcare teams along the 'journey'.

Digital health is unstoppable and shortly will be the way things are done in healthcare. Digitally enabling healthcare requires technical and personal change. The technical change of implementing technology is more straightforward than the change required when the work practice, policies, processes and skills of end users and leaders must also change. This paper is a call to action for **all** organisations and clinical disciplines working across public, private, small, medium and large health services to take decisive action to recognise, elevate and support clinical informatics leaders.

This White Paper

- makes the case to **recognise 'clinical informatics', as an area of specialisation** that enables individuals to work at the clinical-IT-business interface;
- highlights the **importance of change leadership** to: optimise and evolve digital solutions to meet clinical need; breakdown information silos and achieve better integration and sharing of information across the sector;
- **aligns to the National Digital Health Strategy** [6] with particular reference to strategic priority 6 "a workforce confidently using digital health technologies to deliver health and care".

A professional clinical informatics workforce trained in clinical care, informatics and change leadership is essential to achieve the difficult task of rethinking and redesigning clinical work.

Messages from Organisations

Below is a selection of comments provided from organisations as part of the public consultation phase of this White Paper.

"Strong clinical leadership from medical, nursing and pharmacy in informatics is essential – having a CMIO, CNIO and CPIO equivalent in all organisations is ideal… having a multidisciplinary CXIO team ensures all aspects of patient care are considered – both when purchasing systems/modules and in designing, training and implementation…. Don't forget the pharmacists. Medication management is the most complex part of implementing an eMR. CPIO leadership is essential for the implementation of electronic medication management."

AlfredHealth

Clinical informatics should not focus solely on the information technology imperative and ensure that clinical practice underpins advances in clinical informatics. Clinical informatics should be responsive to clinical needs in a rapidly changing health environment. Organisations that marry themselves to a single system and offer clinicians what the system can do, are going about things the wrong way. Technology is moving so fast a leadership team will be required rather than a single person. Each member of the team will have experience in specific aspects of clinical engagement.

Australian College of Nursing

A network of clinical digital health champions, who understand the benefits of digital health and encourage the upskilling of the workforce across the health system into the future, is important to build momentum and a critical mass of digital health proponents.

Clinical leadership networks, professional societies and peak bodies have responsibility for guiding their members on how to embed digital health into routine clinical practice and will be supported by the Australian Digital Health Agency to gather the evidence.)

Australian Government
Australian Digital Health Agency

Note that the majority of dentists work in small business practices, the dentist in most cases would likely be the Chief "X" information/ics officer unless that role is occupied by the practice manager either solely or jointly.

ADA SOUTH AUSTRALIA

Strongly agree that professionally, clinical informatics must be recognised as a clinical subspecialty. It is imperative this happens in order for faster progression of this specialty.

KUEE CONSULTING

I think we need to include something around looking at the integration of clinical systems within the larger ecosystem. Too many Australian organisations are making decisions based on departmental needs with just doctors making the decision and then later realising that they can't integrate the system with other systems or share any data within their ecosystem (or those transitions are unsafe). Using our clinical informatics leaders to ensure that systems selected can integrate within the organisational strategy is critical along with ensuring that multiple types of clinicians are involved in the decision making.

Cerner

[Despite Government investment in clinical information systems] there are gaps in understanding data, health information, health informatics standards, interoperability. As Australia is in early stages of informatics growth it would be impossible to fill these roles with specific educational requirements. Better to support education of the incumbents to improve knowledge and build capacity.

CLINICAL NURSING INFORMATICS COLLABORATIVE *(represent CNIOs across NSW and Vic)*

As a PHN, we have just completed a 3-year Digital Health Strategy which is designed to assist the primary care providers under our umbrella become digitally competent. Culture change is a people business which needs to be emphasised rather than clinical governance.

phn NEPEAN BLUE MOUNTAINS An Australian Government Initiative

To understand, use and apply data and electronic information is an emerging skill set that is still being developed and understood by clinicians. Agree that there is advantage of recommending core capabilities for the role. The pertinent issue is how can these roles be supported e.g. access to learning modules, peer support etc. This is a very important body of work, and will hopefully bring the standards, recognition and respect that clinical informaticians should have and deserve.

RACMA ROYAL AUSTRALASIAN COLLEGE of Medical Administrators

Clinical informatics should go beyond just reimplementing existing work practices so we get extra benefits. Some reflection [is needed] of the role of clinical informatics leadership in the establishment of new collaborative (shared decision making and person-centred) models of clinical care. After all, digital health is a big contributor to transformative changes in health care. Leadership in clinical informatics must recognise patients/consumers/citizens as key stakeholders.

RCPA The Royal College of Pathologists of Australasia

Strongly support the recommendation that a common set of core capabilities (for clinical leadership positions) to ensure comparable educational background and standards, clear career pathways and equity of recruitment and remuneration.

Government of South Australia SA Health SA Health

Not all size firms can replicate this…having a CXIO is dependent on size. What needs to be duplicated in smaller firms is the correct functional focus that still delivers the right quality outcome. There cannot be a one size fits all mentality.

Agree that having a standard for education and career pathways but its matter for the company over recruitment and remuneration.

SUMMITCARE WARMTH WORTH WELLBEING

… 'smart technology' should just be referred to as 'technology', as technology in and of itself is not smart, it is its use in clinical practice that is smart.…Chief Pharmacy Information Officer roles are extremely important but overlooked in the Australian context. The CPIO role extends well beyond medicines management and clinical practice, as it also ensures the multidisciplinary CXIO team can ensure all aspects of patient care are covered, as well as when purchasing or procuring digital systems/modules, and the subsequent designing, training and implementation. In the United States of America, the role of CPIO is embedded into almost all health service organisations. SHPA believes that hospital pharmacists capabilities need to be developed further to ensure the success of clinical informatics and maximise their potential. The establishment of CPIOs in all healthcare services, similar to the United States of America, will achieve this objective.

shpa

Clinical informatics needs to be integrated into every clinicians training. This is independent of career tracks and jobs. It is a clinical attitude and focus on patient outcomes especially safety that distinguishes a health informatician from IT informaticians.

HEALTH

LEADERSHIP IN CLINICAL INFORMATICS

Leadership in clinical informatics is imperative if we are to get digital health right

The Health Informatics Society of Australia (HISA) issues this call to action for all organisations and clinical disciplines working across public, private, small, medium and large health services to take decisive action to recognise, elevate and support clinical informatics leaders and to build a professional clinical informatics workforce.

Better health, better care and better value for healthcare depends on new ways of working supported by digital innovation

The 'Why' of **Clinical Informatics**

WHY

We believe in solving the problem and realising safe healthcare depends on new ways of working supported by digital innovation

WHAT

Leadership in clinical informatics. A professional clinical informatics workforce trained in clinical care, informatics and change leadership

HOW

We:

- Rethink and redesign clinical work – to make technology work for us and our patients
- Lead the change – taking healthcare teams along the digital journey
- Commit resources, time and build expertise – we need to be recognised and supported
- Are the bridge between clinical expertise, the healthcare ecosystem, and the supporting information and technology
- Value the patient, information sharing and health data use in real-time

WHO

CLINICAL INFORMATICS LEADERS COME FROM
ALL HEALTH PROFESSIONAL GROUPS

In the (near) future, as technology embeds in the system of healthcare, clinical informatics will transcend discipline-specific nuances.

CALL TO ACTION

Clinicians

- **Upskill** - undertake training in informatics, upskill in digital health
- **Lean in** - be leaders in better health through digital health

Healthcare Organisations

- **Support** - support your aspiring senior clinical leaders in their clinical informatics career
- **Professional Recognition** - recognise their unique skills and knowledge
- **Elevate** - give them appropriate authority, time and resources to take healthcare teams along the digital 'journey'
- **Build** - build a professional clinical informatics workforce

HISA AUSTRALIA'S DIGITAL HEALTH COMMUNITY

Digital Health – Ready. Set. Go!

Our health system is currently data rich and information poor. Information is either duplicated or siloed – neither of which is ideal. No clinician or system of healthcare delivery can perform to their potential without access to patient information when and where it is needed. Interoperability and communication will be critical as we do more with less and move from volume to value. As technology becomes the norm and information sharing seamless, healthcare services will become less siloed due to consolidation and shared sources of information.

EMR-tethered portals and wearables will further strengthen the capacity of more engaged patients who will no longer be spectators of their healthcare. Increasingly patients will read and contribute to their own clinical notes. Clinical informaticians are needed to work at the clinical-IT-business interface, to adapt to the change that is increasingly driving healthcare provision outside of clinical settings to communities, home and on-the-go.[7]

The healthcare sector has moved on from debating the need for technology to now depending on these systems to deliver on healthcare efficiencies. Insights from commentators on the megatrends shaping healthcare describe a rapidly evolving landscape[8]. Artificial intelligence, sensors, real-time analytics and a sharing economy is the next wave of health technology. As the baby boomer workforce exits, the future is for subsequent generations, for whom technology is a way of life, not a choice. Machines will also become workers and so the human role in this new world of digital innovation needs to be understood.

Installing computers or using an App without altering clinical practice is not digital transformation. In fact, technology can get in the way if it is not well integrated into the clinical workflow. Digital is a moving target with high speed innovations changing very fast, appearing and fading away easily. That means upskilling in digital health must be agile, integrated to clinical practice, bring about real improvement in the health of populations, and be kept up-to-date.[9]

As expressed in the National Digital Health Strategy, it is imperative that the whole health and care workforce is appropriately engaged with emerging digital health technologies and services.[10] Clinical informatics recognises the contribution of all clinical groups to healthcare journeys. This paper is a call to action for all clinical disciplines.

Clinical Informatics: Inclusive of All Clinical Disciplines

Clinical informatics has a broad scope in improving quality and safety. This requires all health professional groups to be involved. Clinicians are required to be better users of information systems, to harness the power of technology to manage information overload and to develop new clinical capabilities. By doing so they are supporting and contributing towards a better performing healthcare organisation and industry. If we simply digitise paper-based processes then we miss the opportunity to transform healthcare that helps reduce clinical errors, promote evidence-based practice, improve quality and efficiency and use information to make new discoveries.[11] . If clinicians don't know what is going on in digital health or can influence it, how is it going to be possible to implement digital technologies that will transform healthcare?

Given Australia's current state of digital maturity, the problem currently faced is the reality of solutions and their poor fit with *current* clinical workflow which reduces productivity. This creates a challenging situation where clinician acceptance is low and transformation limited until such time people begin to reimagine new ways of working. [12] It is a worthy reminder that it's not a case of replacing paper with a computer - rather it's about discovery and improving on how work is done. Clinical informatics is more about the clinical, new ways of communicating and less about the technology imperative. Although, the fact that some are challenged by the technology is not a design flaw in the people, it's a design flaw in the technology. [13] Clinicians, skilled in clinical informatics must be included in efforts to improve healthcare so that clinical need influences decisions about technology design, procurement and use.

The American Medical Informatics Association (AMIA) has endorsed clinical informatics as a subspecialty of the medical profession, irrespective of primary practice and training[14]. This is not to suggest that clinical informatics is the exclusive domain of medicine. Instead, it recognises knowledge of patient care and access to information enabled by technology as essential to improving medical decisions at the point of care. Clinical informatics is a broad term and AMIA maintains that inside the healthcare sector, clinical informatics is essentially the same regardless of the health professional group involved (whether a dentist, pharmacist, doctor, nurse, or other health professional). That clinical informatics is concerned with information use, the smart application of technology and will lead the change to a better, safer health care system.

At this point in time, the application of clinical informatics needs to recognise differences across clinical groups. In the (near) future, as technology embeds in the system of healthcare, clinical informatics will transcend discipline-specific nuances.

In contrast, the sentiment expressed by the digital health community to an early draft of this White Paper has been that *while the broad context of healthcare is shared across clinicians, discipline-specific roles and information needs are not*. This would suggest that despite significant investment and aspiration for digital transformation, we are yet to rethink the nature of clinical work and for organisational and cultural change to occur. At the time of writing, clinical specialisation and working in professional silos remains unaffected. Each discipline contributes specific knowledge, roles and experience and because of this, have specific requirements for information that need to be supported. Furthermore, while any health professional can engage in clinical informatics, engagement with doctors around changes to systems and practice rests with other doctors. Nurses, pharmacists and allied health informaticians may road map change, but they would be less effective in engaging and delivering change with senior clinical doctors. At this point in time, the application of clinical informatics need to recognise differences across clinical groups. In the (near) future, as technology embeds in the system of healthcare, clinical informatics will transcend discipline-specific nuances.

Technology is moving so fast that to be effective it will take a wide team to ensure the spectrum of clinical needs are appropriately addressed. In short, clinical informatics must be **inclusive of all clinical disciplines.**

Clinical informatics (see figure 1)[15], brings value to health through an understanding of clinical processes and workflows, the healthcare ecosystem, and the supporting information and technology. In short, clinical informatics is the sweet-spot. AMIA's 2014 definition of clinical informatics unpacks this sweet-spot as the science of [16] *'analysing, designing, developing, implementing and evaluating information and community systems that enhance individual and population health outcomes, improve patient care, and strengthen the clinician-patient relationship'*.

HISA maintains that it is the crossing of boundaries between the healthcare and IT domains that will result in improvement that is not only greater, but entirely different to the individual parts that contributed. That is, it's truly transformed.

Doctors, nurses, pharmacists and allied health professionals possess the basic *clinical* training and knowledge of patient care. What is yet to be achieved is clinician readiness to adopt new solutions that adds value to the clinical process and changes it. The mere existence of information technology and quality data is insufficient to bring about improvements if it is not clinically useable and embedded into the local clinical culture. While this paper is primarily focused on clinical informatics, the contribution of IT specialists should not be underestimated because it is this domain that brings an understanding of the possibilities - something that a typical clinician would not have as part of their clinical training.

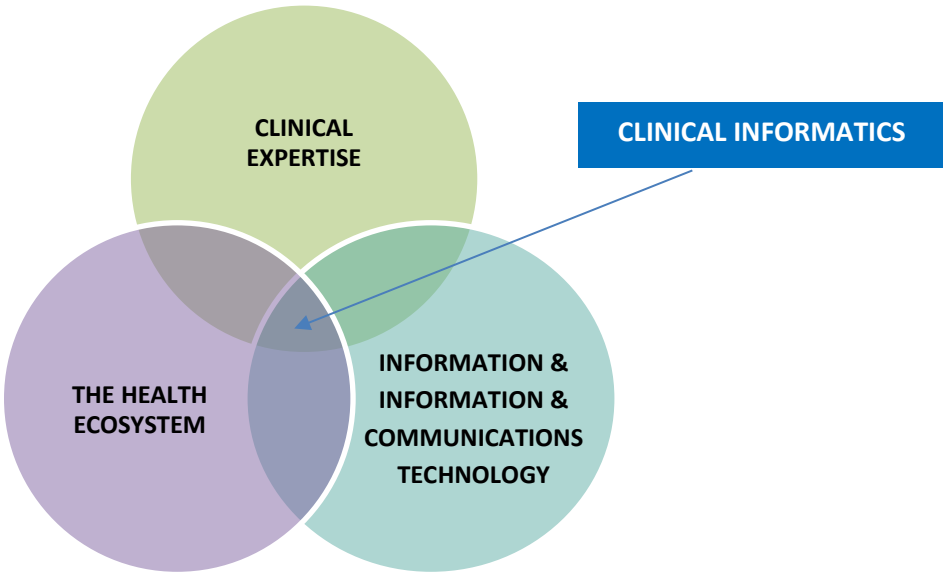

Figure 1: The Clinical Informatics sweet spot

Change Leadership: Cultural Readiness for Digital Transformation

Healthcare remains fundamentally a human pursuit. Getting the most out of technology and data in health requires social change, leadership, transformation in culture and mindset by all involved: governments, policy makers, providers, administrators and the public. Data needs to be valued and treated as a core asset of healthcare systems, not as a by-product of clinical activities for administrative reporting or billing purposes. While technology offers a 'copy-and-paste' capability this does not infer this is good practice for clinical documentation. Instead, learning how to write a good clinical note in a digital environment that improves care is needed because clinical notes are the mechanism by which clinicians communicate with each other and with patients.

While this paper is primarily focused on clinical informatics, the contribution of IT specialists should not be underestimated because it is this domain that brings an understanding of the possibilities - something that a typical clinician would not have as part of their clinical training.

Certain problems attributed to the implementation of a particular clinical systems may in fact be a people or leadership problem. Regarding technology adoption, evidence is gathering which suggests that failing to integrate digital health into clinical workflows may lead to poorer health outcomes for the Australian community[17]. The "datafication of health"[18] led by technological advances, techniques and methods to store and analyse data, creates several tensions that are challenging the existing institutional frameworks of healthcare systems.[19] An organisational climate open to change and a culture of leadership that recognises the contributions of IT must be developed if organisations are to sustain change beyond simply deploying new "clinical IT systems". Our healthcare services already possess a culture that strives to deliver better care. What is yet to be achieved is agreement that the right technology can be the solution to change and enhanced care.

Healthcare organisations need senior executives (including Board members) and clinicians to lead organisational understanding and application of clinical informatics. They need to address the generally negative culture around clinical informatics which is probably in part due to a lack of leadership to coordinate changes coming from multiple sources and garner buy-in. The result is that clinicians have lacked the passion to engage.

Existing clinical informatics leadership roles have emerged organically. Typically, organisations that have accelerated digital health and created such roles are those implementing an electronic medical record (EMR). Individuals with cross-disciplinary skillsets and experience are in short supply and so organisations utilise respected and influential clinicians to take on initially temporary, and then part-time roles in health IT within the organisation. These clinicians bring clinical credibility and the capacity for collaboration to these roles. This approach does not address the need for a broader skillset to function in an informatics leadership role. Assigning clinical informatics leadership has been reactive without a good understanding of what would be required to act as an influencer, educator and motivator who understands how to leverage informatics knowledge and capability. The transition from great Clinician to Manager to Change Agent is not necessarily aligned with expertise in clinical practice. Some of the best clinicians, without appropriate training, make poor leaders and change agents.

It is the oversight by clinical informaticians that is required to bridge the clinical and IT world. Bill Gates called this out many years ago, "it's impossible to properly re-engineer a process using technology in an area without oversight of someone who can bridge [the different] teams."[20] Recognition and support of leadership roles in clinical informatics are needed to harness the power of technology to achieve better quality care.[21]

Consider the following case study and reflect on the change leadership capability required. It needs to champion change for technology, data sharing and partnering with patients:

Mobile health applications are flooding the market. According to one estimate, more than 165 000 health apps were available in 2015, a figure that has doubled since 2013. These apps perform a constellation of functions: medication reminders, tracking movement and activity, monitoring fertility and progress of pregnancy, and analysing a person's speech to help in the management of mental health problems. Mobile health (mHealth) has the potential to improve health care by: continuous monitoring and timely response; interactions between patients and health professionals beyond traditional settings; and communication with systems that can provide real-time feedback along the care continuum, from prevention to diagnosis, treatment and monitoring. Such potential is welcome at a time of rising prevalence and incidence of chronic diseases and multi-morbidity. As people's contact with the health care system shifts from short episodes of acute care to more sustained, long-term monitoring and management that requires a team-based approach, the utility of smartphones and portable devices will rise. In addition, mHealth favours patients' empowerment and engagement in the management of their own conditions. mHealth has the ability to put people at the centre of managing their health, to bring care closer to them, and to connect them with the right information, services and institutions at the right time. But existing frameworks, processes and institutions are not adequately equipped to address these new technologies. Passive adoption of mHealth will not guarantee success in terms of either clinical outcomes or value for money. Successful integration of mHealth in health care systems requires a number of adaptations: the performance and clinical utility of mobile applications must be assessed for reliable and efficient use in health care, and financial incentives are needed to encourage take-up of mobile applications that are effective and cost-effective. In addition, exchanges of information must be protected by appropriate levels of security, and the expected individual and societal benefits balanced with privacy and security risks.[22]

Clinical Informatics Leadership: Roles and Skills Required

In order for healthcare organisations to make best use of technology it is critical to have clinical informaticians who are trusted and understand how to influence and steer future advances in informatics. As health IT systems evolve and mature, so too the workforce and leadership must be appropriate for the task.[23]

One of the driving forces for creating Chief "X" Information(ics) Officer (CXIO) roles has been the failure rate of EMR implementations.[24] Historically, digital health leadership roles across the globe reported into the C-suite. Research conducted in 2014 suggested that CXIOs were more focused on the clinical aspects of acute care EMR implementations, serving as adoption coaches and superusers of the system and only pulled into tactical problem-solving when required to support the technology or its uptake.[25] In recent years, a more strategic CXIO role, elevated to sit alongside the Chief Information Officer (CIO) role has been emerging.

Practically, not all sized organisations would have capacity to create a CXIO role. However, ADHA would expect that all organisations, irrespective of size would **at a minimum**, ensure a trained, digitally aware workforce, appropriately equipped with hardware, software and digital literacy.[26] The benefit of building expertise among healthcare providers is to overcome professional reluctance to change and to embrace opportunities presented by better use of data in health.

In larger, more complex hierarchical organisations (such as hospitals), the Chief X Informatics Officer role would be expected as a key Executive role. These organisations would have invested significantly in technology and leadership capability to mature their digital footprint and harvest the benefits from their investments.

In Australia, a number of different senior clinical informatics roles have been created across different clinical streams, including Chief Medical Information (or Informatics) Officer (CMIO), Chief Nursing Information Officer (CNIO), Chief Pharmacy Information Officers (CPIO), Chief Dental Information Officers (CDIO). In organisations without separate streams, or where multiple streams require a single reporting line, there exists a Chief Clinical Information Officer (CCIO) role. It is anticipated, that as the need for domain expertise increases, additional sub-specialty roles may emerge in addition to an overarching CXIO.

Development of clinicians to take on informatics leadership roles is also incumbent on the health education sector addressing significant gaps in their preparation of technology adoptive and adaptive clinicians. Currently, clinicians who are not technology natives, have rudimentary computer skills limited to basic word, browsing and email functions. There

is a need to address the training needs of clinicians currently in the workforce. HISA has prioritised workforce development in its three to five- year outlook.

The skills for CXIOs have not been well described which had made it difficult to provide guidance for organisations seeking appropriately credentialed informatics leaders, or professional development for those aspiring to this type of role. [27] By providing clarity on the skills required, organisations can plan and build workforce capability and career structures for clinicians who aspire to work at the clinical-IT-business interface. There is now a need to consider the skills required for our future digital health leaders. This is to assure appropriate skills, experience and training inform decisions about future investment in digital health.

HISA recommends a common set of core competencies to ensure comparable educational background and standards, clear career pathways and guidance on remuneration. In agreement with AMIA, it is HISA's position that an agreed set of skills for clinical informatics leadership positions is required.

Only a few universities in Australia offer courses related to health informatics either fulltime undergraduate or postgraduate degree in this area [28] and at this time, recognition of health informatics skills in the Australian health workforce is limited.[29] The Australasian College of Health Informatics (ACHI) have announced the proposed development of a health informatics accreditation framework for university programs which will assist to raise levels of awareness.

Complementary to university education, the Health Informatics Society of Australia (HISA), in collaboration with the Australasian College of Health Informatics (ACHI) and the Health Information Management Association of Australia (HIMAA) developed an industry professional certification in health informatics, the Certified Health Informatician Australasia (CHIA). One-third of CHIAs in Australia are clinically trained. Currently, CHIA provides certification for experienced health informaticians which cover six domains. These address informatics concepts, methods and tools:

- Information and Communication Technologies (5 competencies)
- Health and Biomedical Sciences (10 competencies)
- Information Science (8 competencies)
- Management Science (5 competencies)
- Core Principles and Methods (20 competencies)
- Human and Social Contexts (4 competencies)

At this time, CHIA gives aspiring clinical informaticians a credential affirming they are knowledgeable to a level expected of a competent practitioner in health informatics. However, it is acknowledged that additional domains and a deep dive into areas such as, clinical decision making, ethics, privacy, security, workflow, governance, leadership and

change management would be required to meet the requirements for certification in clinical informatics.

CHIA gives aspiring clinical informaticians a base level credential.

Professionally, clinical informatics must be recognised as a clinical specialisation for all healthcare professions. For this reason, the CXIO should be a clinical role with the dual requirements to be proficient in both a clinical specialty and informatics. Advancing to a CXIO role also requires knowledge and understanding of leadership, but also a working knowledge of new and evolving technologies, in line with the organisation's strategic directions. Given this, the following skills are required:

- **Leadership** - ability to think strategically, collaborate, motivate, govern and make decisions
- **Management of Change**- ability to assess and influence organisational culture (including safety culture) and behaviour, engage clinicians and senior management on ICT issues and opportunities
- **Understand the global healthcare context** - Australia and internationally
- **Competent in the language and concepts of technology** – able to converse effectively across clinical, business and IT domains on professional informatics standards, best practice, emerging technology and how to incorporate these in organisational strategic plans
- **Understand clinical environment and clinical workflows** – to undertake workflow analysis, refine and redesign care processes
- **Data analysis** – to assess and use data beyond reporting to inform clinical practice
- **Informatics education** and ability to educate others about informatics
- **Maintain currency -** on developments of health information systems, megatrends and informatics credentials.
- **Safeguard ethical, privacy and security –** technology is logical but not necessarily 'ethical'

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