Australian Government

Australian Digital Health Agency

Strategic Interoperability Framework: Summary Report

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Executive summary

The field of health data interoperability is often perceived as a largely technical endeavour, attracting little clinical interest. In reality, the sharing of patient health data between health and care providers, and organisations, could not be more clinically significant.

Every day, tens of thousands of patients experience transitions of care as they move between GPs, hospitals, aged care facilities, allied health professionals and a variety of other contexts. The way in which their information is shared, (or not shared, in many instances) has the potential to cause significant adverse events, or even death.

A lack of standardised clinical processes and poor quality, incomplete data, without structure and appropriate coding frequently results in an inability to confidently understand what was meant by other health and care providers. At best, this results in significant inefficiency. At worst, providers can make wrong decisions based on an incorrect understanding of diagnoses or medications, causing harm.

Interoperability is key not only to patient safety, but also to coordinated care, efficient delivery of healthcare services and ultimately to the equity of the health system.

In the absence of good interoperability, health and care providers have become expert at creating manual workarounds. From sending diagnostic images via WhatsApp to communicating via personal Skype accounts, these workarounds have often been honed to the point of efficiency entrenching them in everyday clinical workflow. It then takes true interoperability to show that these practices are often nothing like as efficient as they appear.

Following the recent publication of the National Digital Health Strategy, EY were engaged to undertake further work on the current state of interoperability in Australia, and to develop a Strategic Interoperability Framework. This assessment will assist the Australian Digital Health Agency (the Agency) in further, more detailed consultations over the coming year.

Fundamentally, the Strategic Interoperability Framework provides an approach to thinking about the complex challenge of interoperability. It defines interoperability and articulates its significance in delivering improved outcomes to patients and health and care providers. It looks at the current state of interoperability in Australia, and a series of environmental lenses through which the challenge can be framed. It then looks at the key enablers, or digital health foundations against which interoperability can be assessed, and the key barriers that have impeded progress towards interoperability in Australia.

Finally, the framework looks at the way forward, including how success can be measured, further questions that can and should be asked in future consultation, and next steps.

Interoperability is not a destination, but a constantly evolving challenge in the face of the growing data needs of the health system and changing digital expectations of health consumers.

However, by harnessing the market momentum generated through the collaborative approach of the Agency, and the significant intellectual capital available through key health stakeholders (particularly the Australian standards community and standards development organisations), rapid and meaningful progress is possible.

In delivering this progress, the benefits of interoperability will be quickly apparent to all Australians.

1 What is Interoperability?

1.1 What is interoperability?

The recently published National Digital Health Strategy*[1]* defines interoperability as:

> *"At its simplest, it is the ability to move information easily between people, organisations and systems …*
>
> *It is imperative that when information is shared between people and systems, its meaning is preserved from one context to another so that information is interpreted in the same way. That is, what was meant is the same as what is understood. This is the concept of "semantic" interoperability, which can be defined as: "The capability of two or more systems to communicate and exchange information, and for each system to be able to interpret the meaning of received information and to use it seamlessly with other data held by that system".*[2]

Interoperability is not a destination, but a constantly evolving challenge in the face of the growing data needs of the health system and changing digital expectations of health consumers.

The interoperability journey can, however, been seen as a maturity journey that has a series of distinct stages, as shown in the following diagram:

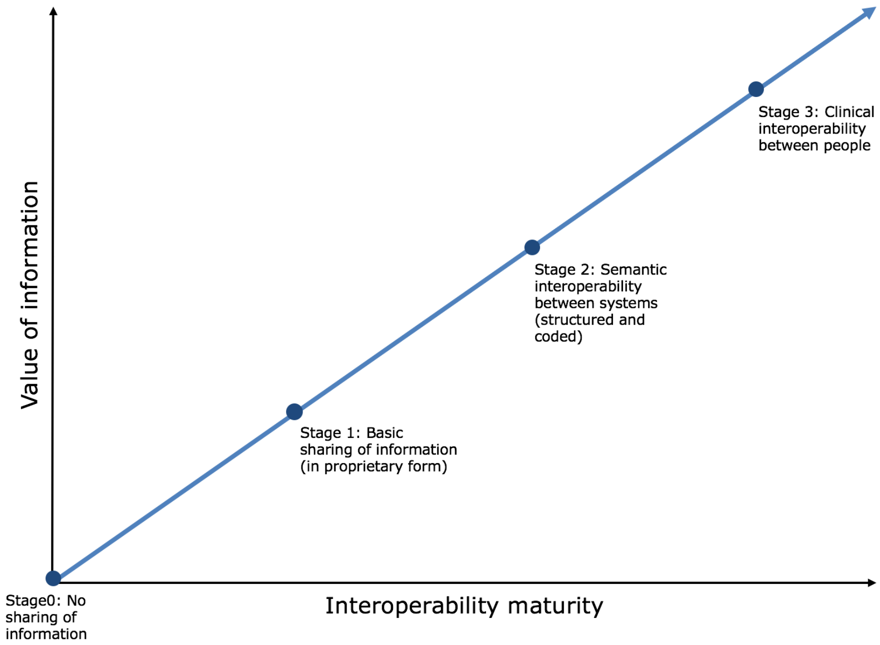

Figure 1 – Interoperability maturity stages

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[1] Australia's National Digital Health Strategy, https://www.digitalhealth.gov.au/australias-national-digital-health-strategy, 2017.

[2] Joint Initiative for Global Standards Harmonization (JIGSH). Health Informatics Document Registry and Glossary, Standards Knowledge Management Tool (SKMT) Michigan, United States of America: Joint Initiative Council; [Available from: http://www.skmtglossary.org/.

The maturity stages of the interoperability journey can be described as follows:

- **Stage 0: No sharing of information** – Systems are not capable of sharing information in any form.
- **Stage 1: Basic sharing of information** – Systems can share information, but only using proprietary formats. May have structure but no coding or shared meaning.
- **Stage 2: Semantic interoperability between systems** – Systems share information in a structured and atomic form, using nationally standardised code sets, resulting in a shared view of meaning.
- **Stage 3: Clinical interoperability between people** – Building upon semantic interoperability, the focus is on not just sharing information between systems, but ensuring that education and user experience aligns with interoperability to supporting health and care providers in developing a shared mental health information model.

Progress towards interoperability has seen slow progress, due to its inherent complexity. Previous efforts have been hampered by overly complex technical standards that were not always fit for purpose, clinical cultures where information sharing was not the default position, vendor commercial models that did not support interoperability, and other factors that are explored in more detail in section 2.5.

Interoperability in healthcare is further complicated by the large number of concepts in the domain compared with other industries, a lack of standardisation in models of care, and a lack of accepted processes that encourage and leverage the sharing of health information.

Interoperability is one of seven strategy priorities for the Australian Digital Health Agency (the Agency), reflecting its fundamental importance in delivering improved equity, coordination of care and safety in healthcare. The following diagram shows the strategic priorities described in the National Digital Health Strategy:

Strategic Priorities

1. Health information that is available whenever and wherever it is needed
2. Health information that can be exchanged securely
3. High-quality data with a commonly understood meaning that can be used with confidence
4. Better availability and access to prescriptions and medicines information
5. Digitally-enabled models of care that improve accessibility, quality, safety and efficiency
6. A workforce confidently using digital health technologies to deliver health and care
7. A thriving digital health industry delivering world class innovation

Figure 2 – The seven strategic priorities in the National Digital Health Strategy

1.2 Why is interoperability so important?

Historically, those working in healthcare information interoperability have not done a good job of articulating the importance and ultimate outcomes of this vital work.

To many healthcare stakeholders, interoperability is seen as a largely technical exercise, focused on data types, data structures and complex standards developed by health informaticians divorced from the realities of front-line healthcare.

Despite these common perceptions, interoperability could not be more important to improving healthcare outcomes. Whilst interoperability undoubtedly relies upon technology and standards, the end result of this work can be articulated in a way that is highly relevant to health consumers, carers and health and care providers:

- **Patient safety** – Every day in the health system, patient information is shared between health and care providers, or in some cases, critical information is not shared.

  When information is shared, an inability to clearly and unambiguously understand what was meant by other healthcare providers (particularly with respect to medications) in their medical records can result in adverse events, harming the safety of patients[3]. Many of these are preventable through the sharing of information that is interpreted in the same way.

- **Coordination of care** – A lack of shared information, or a lack of confidence in the meaning of shared information has a significant impact upon efforts to deliver team-based, integrated care.

  Allowing health and care providers to quickly and easily share patient information will drive an increased focus on the importance of high quality data and record keeping in an increasingly digital healthcare system. In turn, this will improve trust between health and care providers, creating a culture where coordinated, team-based models of care are common practice, underpinned by interoperability that works without being visible.

Case Study: Current State Scenario

Greg has chronic respiratory disease, hypertension, diabetes, and sees multiple care providers, including a dietician and physiotherapist to help him feel his best, in the proactive management of his conditions.

Coordinated care across these multiple settings is challenging as no electronic communication follows Greg's care, and most communication is through paper letters or from personal diary entries that Greg records himself.

Greg has embraced smart technologies and there is an app for many tasks in his life, including health related. Greg is also frustrated that he can't connect his health application information from his phone and smart watch, his home monitoring devices and send this information to his GP and specialists who manage his care.

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[3] http://medicalinteroperability.org/desalvo-interoperability-crucial-to-patient-safety/

All of Greg's clinicians struggle to know what each other are doing to manage Greg's conditions and feel they are working in isolation. Greg is frustrated at the lack of a shared care plan and the frequent contradictory instructions he receives.

Illustrative Potential Future State

All of Greg's clinicians have electronic solutions that can systematically interoperate sharing and receiving Greg's relevant clinical information to manage his conditions.

Greg's devices and smart technologies can send periodic relevant information to his GP and specialist to update on his progress tracking his diet and exercise via his smart phone and watch.

Greg feels empowered in the management of his care, as he feels he plays a critical role in managing his own care and his clinicians all have the right information to do so.

Greg's care providers are always grateful seeing the complete results of these apps and can receive notifications when the program may not be going well for Greg, so they can follow up.

- **Efficiency of healthcare delivery** – Improved coordination of care will reduce unnecessary time spent on communication, remove unnecessary treatments, reduce adverse events and reduce repeated diagnostic testing.

  Improvements in the sharing of appropriate patient health information will have a significant positive impact on the efficiency of healthcare delivery in each of these areas.

- **Improved equity** – Ultimately, interoperability is about improved social equity, driving increased transparency, accountability and accessibility into the health system as patient information is shared safely, seamlessly and securely between health and care providers, with confidence that meaning and context are preserved, and that information is consistently interpreted.

1.3 The growing challenge of health system connectivity

The challenge of interoperability is not one that remains static. As the pace of the digital health revolution continues to accelerate, the growth in the volume and complexity of data to be shared is unrelenting.

Emerging sciences such as genomics (and the many other nascent 'omic sciences) will significantly stretch many health organisations' ability to store, secure and share large volumes of complex data. Exponential growth in data storage requirements (e.g. through increasingly high definition imaging and video) will cause tension between health providers organisations and government payers over who pays for data storage. The increasingly sensitive nature of data (e.g. genomic data) will create new requirements for secure storage with granular authorisation models. The complexity of genomic data and speed with which technology is developing will challenge health data standards organisations and their processes.

The rise of consumer mobile health apps poses another significant and growing challenge. The rapid inundation of the digital health market with solutions of significantly varying quality has left regulators on the back foot, with an urgent need to assist health consumers and providers in separating quality solutions from the many which are unhelpful, and to ensure that health apps are not responsible for creating new silos of patient data that are not integrated with patient medical records.

The pace of change in healthcare is relentless, with the rate of technology-driven change ever increasing. In this context, consideration must also be given to interoperability of health data through time, from an information system to the one that replaces it. It is vital that the structure, context and meaning of data is preserved, not just when sharing data between organisations, but in transitioning data between generations of in-place clinical information systems.

1.4 Key participants in interoperability

The benefits of interoperability extend to all corners of the health system, impacting all major stakeholder groups. The following table shows the various stakeholder groups, and the key requirements that each has regarding the outcomes desired from interoperability.

These requirements were initially captured during the "*Your health. Your say.*" consultation process supporting the development of the National Digital Health Strategy, and refined during the consultations for the development of this Strategic Interoperability Framework.

Stakeholder group	Description	Key requirements
Health consumers and carers	Health consumers and their carers who access health and wellbeing services.	• Information about me or those I care for, is accurate, trusted, secure and understood • I choose who has access to my information and can be alerted on who has accessed it • Relevant information about me is easily accessed by my chosen clinicians • All my clinicians know who I am and have access to my approved clinical information • All my clinicians are aware of my care plan(s) and do not give me conflicting instructions
Health and care providers	Public and private sector health and care providers, including general practitioners, practice nurses, hospital clinicians, allied health professionals, specialists, aged care personnel, pathology and diagnostic labs	• I can easily access accurate clinical information about my patients using my chosen tools and systems, including information from other clinicians • Digital tools support how I work and the critical decisions I need to make • I can search for and access current healthcare services when I need to share information with them • I trust and understand the information that is shared by other clinicians • I feel able and equipped to practice team-based, integrated and coordinated care
Industry and peak bodies	Suppliers, such as large and small software vendors, systems integrators and other vendors, industry peak bodies and other key participants such as	• I am aware of the long-term interoperability vision and objectives for Australia and can make informed investment decisions to position my products/services • I can easily access and understand the minimum standards I am required to implement • The national infrastructure can be easily utilised,

	standards organisations	allowing me to innovate
Government	Federal and state governments, with a focus on healthcare policy, programmes and other key related policy domains including safety and quality, digital standards and privacy	• The vision and governance to support an interoperable healthcare sector is clear • There is targeted investment in national infrastructure, leaving broader solutions to the market • Co-design approaches are effective • Policy, legislation and other regulatory requirements support and promote interoperability • Health policy and programs are effective and efficient • National healthcare services are delivered equitably to improve the wellbeing of the community • We bring industry and relevant bodies together to develop minimum guidelines, specifications and/or standards • We can demonstrate improved outcomes for health consumers and health and care providers

Table 1 – Key interoperability requirements by stakeholder group

1.5 The impact of interoperability

Successfully sharing health data within and between health organisations has requirements that will have significant impacts on people, processes and required infrastructure. The following areas will be impacted:

- **Digital literacy and workforce training** – The sharing of health data will require increasing levels of digital literacy amongst health providers, with workforce training being used to reinforce the expectation that the sharing of patient information is part of good clinical practice.
- **Availability of high speed networks** – The availability of high speed networks is still not ubiquitous in healthcare organisations. Given that network connectivity is a key prerequisite to the sharing of health data, additional investment will be required to ensure that health providers are not left behind, particularly in rural and regional, and older hospital settings.
- **Security and privacy** – An increase in the sharing of health data will seriously test current security and privacy models. Given that an overall system is only as secure as the weakest link in the chain, the current model of security will require a significant increase in maturity, with clear guidance for organisations, particularly smaller medical practices, on how to secure data.
- **Storage requirements and associated cost burden** – A rapid progression in imaging capability, resulting in increasingly high definition images and videos is resulting in rapid growth in the cost of storage for imaging. With more of this imaging being shared, this will create discussions about sharing the burden of this storage costs between multiple parties, including government.

- **Information governance** – An increase in the sharing of health data will require new levels of maturity in responding to the challenges of information governance. Ownership of information, and responsibility for ensuing that it is accurate, up to date and transparent must be ensured, even as health data is shared between multiple parties.

1.6 The growing role of the health consumer

In the context of an increasingly digital healthcare system, it is important to note the changing role of the health consumer in driving interoperability outcomes. Many engaged and empowered patients are taking accountability for their own health outcomes, and are demanding access to and ownership of their own personal health information.

Health consumers are challenging the traditional clinical culture of medical records written by and for health and care providers, and playing a role in viewing, checking and changing their information when it is incorrect. Such models are increasingly common, and are adding new requirements scenarios that need to be considered by parties involved in delivering interoperability outcomes.

These include a stronger focus on data quality, including consistency and completeness; a desire to access patient health information on mobile devices; the ability to share aggregated information from consumer health devices (wearables) with health and care providers, where appropriate; the ability to capture patient reported outcomes against the stated goals of care plans; and the ability to share health information with friends and family (i.e. the "circle of care").

2 Where are we at in Australia?

2.1 Interoperability in Australia

State and territory governments are embarking on major projects to implement state-wide electronic medical records and to achieve integration across the range of clinical information systems in hospitals and health services managed by a state or territory government. While each state and territory is working within its own investment cycle, with its own software and integration partners, and is at a different point in achieving this goal, there is a common pursuit to make health (and, for some jurisdictions, human services) information available in a more timely and usable way.

Similarly, private hospitals, aged care service providers and community health services are investing in information systems and technology to improve quality and service delivery. Innovation in data analytics and increased expectations from consumers and funders to improve the experience and reduce avoidable errors and re-admissions to hospitals are among the drivers of investment in the non-government sector.

Given the progress that is being made within geographic areas, individual health services or within a health sector, there is a risk that uncoordinated investment in technology that does not meet a common set of standards will exacerbate siloing in the health system, with each service or sector using a different system. A national strategy that articulates agreed priority areas and is underpinned by standards will send a signal to the market of areas of interest to governments and can encourage investment in both the public and private health systems in a common direction. Coupled with standards where stronger direction is required, this will lead to an environment where healthcare providers will be able to access more complete information about a person under their care, irrespective of whether that person received health services in the public, private or community setting.

The ability of different healthcare providers to use shared information with commonly understood meaning is a pre-condition for team-based, coordinated care, continuity of care, efficiency, data analytics, and positive patient experiences.[4] [5] [6] [7] Exchanging high-quality data between multiple health systems, trusting that the meaning will be interpreted in the same way, requires “interoperability”.[8] [9] [10]

Australia was recently ranked number one in the world for its open data policies that create an environment for interoperability, and use of our data assets as a national

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[4] McMorrow D. A Robust Health Data Infrastructure. Virginia, United States of America; 2013.

[5] European Commission. eHealth Stakeholder Group report, Perspectives and Recommendations on Interoperability, Final version, March 2014. Brussels: European Commission; 2014.

[6] Wickramasinghe L, Schattner P, Hibbert M, Enticott J, George M, Russell G. Impact on diabetes management of General Practice Management Plans, Team Care Arrangements and Reviews. Med J Aust. 2013;199(4):261-5.

[7] Liaw ST, Taggart J, Yu H, de Lusignan S, Kuziemsky C, Hayen A. Integrating electronic health record information to support integrated care: practical application of ontologies to improve the accuracy of diabetes disease registers. Journal of Biomedical Informatics. 2014;52:364-72.

[8] McMorrow D. A Robust Health Data Infrastructure. Virginia, United States of America; 2013.

[9] Liaw ST, Taggart J, Yu H, de Lusignan S, Kuziemsky C, Hayen A. Integrating electronic health record information to support integrated care: practical application of ontologies to improve the accuracy of diabetes disease registers. Journal of Biomedical Informatics. 2014;52:364-72.

[10] European Commission. eHealth Stakeholder Group report, Perspectives and Recommendations on Interoperability, Final version, March 2014. Brussels: European Commission; 2014.

resource.[11] In Australia, meaningful progress has been made in establishing foundations for interoperability, including clinical terminologies and standards. However, adoption has been limited[12], and a lack of interoperability remains a significant issue.

The lack of interoperability between systems means healthcare providers often cannot exchange information effectively, which contributes to disjointed care, adverse events, inefficiencies and poor quality data.[13] [14] [15]

Quoted from the National Digital Health Strategy

> *"Although there have been some vendor-based improvements in recent years, the lack of vendor interconnectivity and interoperability remains a major issue."*
>
> **Royal Australian College of General Practitioners submission**
>
> *"Standards exist in some areas, such as diagnostic imaging, however we are far from having genuinely interoperable informatics in health."*
>
> **Royal Australian and New Zealand College of Radiologists submission**

Despite these challenges, there are many reasons to be positive about the future of interoperability in Australia.

Firstly, **the rapid growth in the adoption of the emerging FHIR™ standard**, which aims to take a pragmatic approach to interoperability, balancing semantic consistency with ease of implementation. Early indicators show that this approach is proving highly successful.

More importantly, the highly collaborative, iterative and democratised approach towards standards development taken by the founders of FHIR has resulted in an engaged, proactive and large-scale community, willing to quickly implement and test new concepts without financial incentives.

As is occurring in the United States, many Australian vendors are choosing to adopt FHIR without the need for financial incentives, despite it only being at standard for trial use status and subject to ongoing change.

Further, the practical and iterative approach to conformance testing through regular connectathons has proven popular with vendors to check their progress, with a number of recent connectathon events held by the Agency and HL7 Australia attracting 40+ attendees.

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[11] Global Open Data Index. Tracking the State of Open Government Data: Open Data for Development Network, Open Knowledge International; [Available from: https://index.okfn.org/.

[12] Ingersoll A, Burger M. Evolution of eHealth in Australia: Achievements, lessons, and opportunities. Sydney: National E-Health Transition Authority (NEHTA); 2016.

[13] Lewis J, Ray P, Liaw ST. Recent Worldwide Developments in eHealth and mHealth to more effectively manage Cancer and other Chronic Diseases – A Systematic Review. International Medical Informatics Association (IMIA) Yearbook. 2016(1):93-108.

[14] Nguyen L, Bellucci E, Nguyen LT. Electronic health records implementation: an evaluation of information system impact and contingency factors. International Journal of Medical Informatics. 2014;83(11):779-96.

[15] Dods S, Hansen D, Boyle J, O'Keefe C, Alem L, Celler B, et al. A digitally-enabled health system. Sydney: Commonwealth Scientific and Industrial Research Organisation (CSIRO); 2014.

Second, Australia is currently experiencing a wave of innovation and investment in health IT, with **a number of vendors making significant investments in new generation, cloud-based clinical information systems**. These new systems are making significant improvements in user experience, data capture and data validation.

Third, **Australia punches significantly above its weight in terms of contributions to international health IT standards development**, and this intellectual capital has the potential to be leveraged for significant gain within Australia.

Fourth, **Australia has significant skills in OpenEHR**, which has the potential to be an important component of Australia's approach to conceptual and logical modelling of clinical information requirements.

Finally, **significant progress has been made in driving the adoption of national standard coding systems** such as SNOMED CT-AU and the Australian Medicines Terminology (AMT). The advent of the National Clinical Terminology Service (NCTS) has created a significantly improved distribution mechanism for code system distribution, lowering the barriers to adoption in Australian health IT systems.

2.2 Key environmental factors

Interoperability is a complex challenge, involving a number of interdependent environmental factors that impact upon the ability to deliver the desired outcomes.

In undertaking the review and consultation process in order to develop this report, a number of key environmental factors impacting interoperability have been identified. In order to understand the key barriers to progress outlined in section 2.4, it is necessary to look through the broad lens of the following factors:

- **Vision and leadership** – The extent to which the significance and importance of interoperability has been articulated in Australia, and is on the agenda for healthcare executives, with the links between interoperability, equity and patient safety well understood, and appropriate resources applied.
- **Compliance and regulation** – The way in which Government regulation and its enforcement functions to support the delivery of interoperability outcomes, and Governments are prepared to use regulatory levers (where appropriate) to ensure that vendors meet minimum standards with respect to health data exchange standards.
- **Policy** – The way in which policy levers are used to ensure consistency of approach across health organisations with respect to practice, but also regarding the way in which software systems are acquired, ensuring that Australian and international vendors support the required minimum standards.
- **Communications and awareness** – The extent to which the roles and responsibilities of Government and other health organisations have been clearly communicated, allowing all parties to understand what they need to do to achieve interoperability outcomes, and how Government will act to support and facilitate the market.

- **Trust** – The extent to which health and care providers trust information that has been captured and authored by other providers, and whether clinical cultures create an environment where team-based medicine, founded upon the sharing of information, can be practised, and clinical practice is consistent and reproducible.
- **Adoption** – The extent to which adoption of appropriate interoperability standards and practices have occurred, and the way in which factors such as user experience have impacted adoption and data quality.
- **Standards** – The extent to which the available technical standards to underpin the exchange of health data are current, fit for purpose, clear and implementable.
- **Data quality** – The importance of capturing high quality, structured, coded data in order to support clarity of meaning when sharing information between health and care providers, and the complexity of persuading clinicians to capture data before they see benefits from that data in aggregated forms.
- **Technology and supporting processes** – The way in which the publication of standards is supported by the tools and processes required to create assets that are developed efficiently, are clear and unambiguous and are easily shared.
- **Security and privacy** – The importance of respecting patients' ownership of data, ensuring that data is shared and used in line with patients' expectations and desires, and taking the securing of data seriously by recognising the growing and evolving threats to patient data.

These environmental factors can be thought of as "levers", whose settings should be fine-tuned to the needs of the Australian market, which will differ from other countries due to the scale of our market and unique nature of our health system.

2.3 Key enablers for interoperability

Previous work on *Strategic Service Design* identified ten national capabilities that are part of Australia's digital health foundations. Of these, the following seven play a critical role in facilitating improved interoperability outcomes:

Enabler	Relevance to interoperability
Identity management	Uniquely identifying health consumers, health and care providers and health organisations in the healthcare ecosystem. *'I am who I say I am'.*
	Ensuring appropriate levels of access to a patient's health information. *'As a clinician, I can get access to the information I need to provide care'.* *'As a consumer, I have access to my information and have control over who can access it'.*

Authentication and authorisation	
Integrated electronic health record	Allows health consumers, health and care providers and other participants to access health information, with the consumer at the centre. *'My health information is available to clinicians involved in my care'.*
Unified health directory services	Provide the technology for health consumers and health and care provider to find health services quickly. *'I can easily find the health and care providers I need to communicate with electronically'.*
Information exchange	Developing clinical informatics specifications to facilitate information exchange in alignment with relevant data quality and clinical safety requirements. *'My clinical software communicates with other systems to bring me what I need'.*
National standards	Promoting the definition and adoption of consistent standards to facilitate information exchange and provide conformance and compliance mechanisms. *'Minimum standards are accessible and easy to understand and implement'.*
Security	Common standards, understanding and adhering to required policies to protect the privacy and integrity of information. *'I can rest assured that my information is secure'.*

Table 2 – Key enablers for interoperability

2.4 Key barriers to progress

In developing this Strategic Interoperability Framework, an extensive consultation process was undertaken, including workshops, discussions with senior stakeholders from the United States, and 37 interviews.

Throughout the consultation processes, stakeholders were asked to describe the key barriers to further progress in delivering interoperability outcomes. A number of consistent themes emerged:

- **Interoperability means different things to different people** – It is apparent from extensive consultation that stakeholders have varying definitions of and aspirations for interoperability. Whilst some simply define it as the sharing of health information between systems, others have a greater vision of "semantic interoperability", with full, transparent sharing of structured, coded data using nationally standardised coding systems. Work is required to ensure a shared vision and goals.
- **The significance of interoperability is not well understood** – Many stakeholders interviewed saw interoperability as a largely technical exercise

in information sharing, and not as something that can support improved patient safety, coordination of care, efficiency in healthcare delivery and improved equity. It is critical that work is undertaken to increase the perceived importance of interoperability amongst healthcare executives in Australia.

- **There is currently no mechanism for measuring success in interoperability** – It was noted by multiple stakeholders that appropriate mechanisms for measuring success in interoperability are not currently available, and that simply measuring document volumes into the My Health Record is not sufficient.
- **The process for publishing health IT standards in Australia is no longer clear, and the role of Government, particularly the Agency, in this is not understood** – Following the formation of the Agency, many stakeholders are no longer clear about the process for developing and publishing technical standards that support interoperability, nor the Government's role within it. This is further confused by the fact that Government used to fund this process, and no longer does. Urgent clarification is required in order to give greater certainty to the market.

> *"It is not clear what is the role of the Agency, other government and industry around interoperability."*
>
> ***Interoperability Design Workshop participants, September 12, 2017***
>
> *"The Agency needs to actively participate in and facilitate industry collaboration, without trying to control the outcome."*
>
> ***David Hansen, Australian E-Health Research Centre, CSIRO Health and Biosecurity***

- **Priority scenarios are not clear** – Many stakeholders expressed a desire for Government to provide greater guidance on its priorities for interoperability through the publishing of priority scenarios or use cases. Whilst this has arguably already occurred in the areas of secure messaging and eReferrals, further guidance on priorities is required.
- **Work is needed to address the lack of trust between health and care providers** – In discussion with health and care providers, it is clear that many do not trust information captured and authored by others, and would rather speak with the patient to re-establish the appropriate medical information. Arguably some of this originates from the lack of standardisation of clinical processes, resulting in significantly different outcomes in different contexts.

  This raises an interesting question – even if interoperability were able to provide a shared view of all of a patient's health information with a common view of meaning, would such information be utilised by the majority of health and care providers? In addition to the work required to advance the technical underpinnings of interoperability, the issue of trust between health and care providers and its impact on integrated care needs to be addressed.
- **Provenance of data is often unclear** – In an increasingly digital world, information in a patient's health record can originate from GPs, hospital

doctors, allied health professionals, patients and digital devices. In this context, it is important to clearly mark the provenance of data. This allows health and care providers to exercise their professional judgement as to what extent they can trust data. The growth in potential data sources and lack of clearly marked provenance data has not helped issues of trust in data.

- **No national consistency in procurement requirements across health organisations** – When it comes to interoperability requirements for health IT system procurement, each health organisation develops its own approach. It was noted during the consultation that this has led to significant inconsistency in capabilities across Australian health organisations, and has arguably contributed to a number of American health IT vendors being reluctant (or refusing) to implement Australian localisations of international standards.

> *"Procurement in health is fragmented … interoperability requirements are not mandated."*
>
> ***Dr Chris Moy, Australian Medical Association***

- **Poor user experience has impacted adoption and data quality** – Historically, poor user experience in Australian health IT systems has had a significant impact upon adoption and usage, and an even greater impact upon data quality, with the majority of systems not enforcing structured data capture or coding, or undertaking data validation. Whilst this situation is now improving, the legacy of poor data has impacted the ability to deliver upon required interoperability outcomes.
- **CDA standards have been difficult to implement** – Many stakeholders shared that the complexity of CDA documents has had a significant impact upon their ability to implement with confidence. In particular, lengthy, non-computable specifications have contributed to slow implementation and the high cost of conformance.
- **A lack of guidance on what standards to implement** – Understanding the complex and ever-changing world of standards has proven difficult for many stakeholders. A number requested further guidance on key standards to be implemented.
- **Government has not done a good job of harnessing the intellectual capital in the Australian standards community and standards development organisations (SDOs)** – Australia punches significantly above its weight in its contributions to international health IT standards development, and has a strong community of active participants in national and international standards work, as well as local SDOs such as HL7 Australia and IHE Australia. Historically, Government has not worked closely and collaboratively with these groups and individuals. There is much to be gained, however, through closer cooperation.

2.5 Interoperability in the United States

As part of developing the Strategic Interoperability Framework, research was undertaken into the approach to interoperability in a number of other countries. Of particular interest and relevance to Australia is the approach to interoperability in the United States.

Following growing frustration at the lack of interoperability and information sharing within healthcare in the United States, the final report of the JASON Task Force[16] concluded that the *foundation of interoperability should be an orchestrated architecture based on public APIs*. This resulted in the establishment of Project Argonaut[17], a vendor-led, market-driven approach to improving interoperability.

The conditions for this market-driven approach were created by the US Federal Government, using the lever of the Meaningful Use provisions of the Affordable Care Act, combined with a threat of further regulation if greater interoperability was not forthcoming.

> *"… the real adoption driver … is reframing what the value is for clinicians to share information when the receiver of that information may not be known."*
>
> ***Aneesh Chopra, former CTO of the US Whitehouse under Barack Obama***

In response, Project Argonaut has achieved significant progress, using FHIR as the technology foundation to define standard APIs for a number of key interoperability use cases. These standardised APIs are starting to be made available in EMR and EHR systems in the US, and will soon become available in Australian systems provided by US vendors in the Project Argonaut consortium.

A number of parties (including individuals, Australian vendors and US vendors) are considering launching an Australian version of Project Argonaut, seeking to localise Argonaut artefacts into an Australian context.

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[16] JASON Task Force Final Report, https://www.healthit.gov/hitac/sites/faca/files/Joint_HIT_JTF_JTF%20HITPC%20Final%20Report%20Presentation%20v3_2014-10-15.pdf, 15 October 2014.

[17] Project Argonaut, http://argonautwiki.hl7.org/index.php?title=Main_Page

3 Where to next?

3.1 Measuring success

The ability to measure what success looks like is key to further progress in interoperability. It is worth noting, however, that the way in which success is measured will evolve depending on where an organisation is at in their interoperability maturity journey.

The following table, drawing on success measures defined by the Office of the National Coordinator for Health IT (ONC) in the United States, and aligned to the interoperability maturity stage, outlines some key measures:

	Stage 1: Basic sharing of information	**Stage 2: Semantic interoperability between systems**	**Stage 3: Clinical interoperability between people**
Description	• Transactional data – including exchange activity, volume, penetration • Availability of electronic health information • Standards used by end user and transactions number • Level of conformance to standards	• Matching/linking data to provide context to multiple transactions • Data by information type • Geographic reach • Organisation/system boundaries • Level of maturity to conformance of standards	• Outcome data to support care of patients and populations • Person-centric
Examples	• Number of electronic capable providers by local area • Number of eReferrals point to point messages • Number of Shared Health Summaries uploaded, viewed, downloaded	• Number of speciality specific event summaries provided to GP • Geographic analysis of rural and remote patients with care across multiple healthcare providers and access to shared information through My Health Record or point to point message	• Number of longitudinal care plans that both patients and clinicians have access to and use to deliver care

Table 3 – Measuring success

3.2 Further questions to be addressed

During the consultation process supporting the development of the Strategic Interoperability Framework, many important questions were raised by key stakeholders. A selection of these questions are shown in the following table:

Environmental factor	Questions
Vision and leadership	• Should standards development and publishing in Australia be based on a market-driven approach? • What should Government's role be in interoperability and the development and publishing of standards?
Compliance and regulation	• Should there be legislation / regulation to enforce adoption of certain minimum standards, or is this better enforced using policy levers? • When should Government intervene in markets that are not delivering the required interoperability outcomes? • How can health consumers and providers have confidence in the quality of mobile health apps?
Policy	• How can Government support health organisations in developing a more unified approach to the using consistent interoperability requirements in procurement processes? • How can funding models encourage integrated and coordinated care?
Communications and awareness	• How can the strategic importance of interoperability, and its linkage to issues of patient safety, coordination of care and equity, be better articulated to health executives?
Trust	• How should fundamental issues of lack of trust between health and care providers be addressed? • How can Governments assure health consumers that any secondary use of data will not violate their privacy?
Adoption	• What are the highest priority scenarios / use cases for interoperability? • What clarity is required by industry to drive adherence to standards? • How can user experience be used to improve adoption and data quality in clinical information systems?
Standards	• What technical standards need to be improved, refreshed or retired? • What technical standards are missing? • What should Government's role be in developing national extensions and profiles for FHIR? • Is there a role for Government in publishing an annual standards catalogue?
Data Quality	• How can the health sector drive improvement of data quality over time? • What mechanisms can be used to reward high quality data?
Technology and supporting processes	• How can improved (computational) formats for technical specifications be developed to make implementation easier?
Security and privacy	• What do health providers need to do to ensure that patient health information is secured appropriately? • How can health organisations take a consistent approach to informed consent?

Table 4 – Key questions captured during consultation process

3.3 Next steps

Delivering improved interoperability outcomes is a multi-year initiative with complex interdependencies. Each of the outcomes to be delivered are ultimately dependent on the foundation of robust, co-developed next steps and potential options, based on an agreed vision. The following diagram shows a high-level view of proposed activity across the next 5 years:

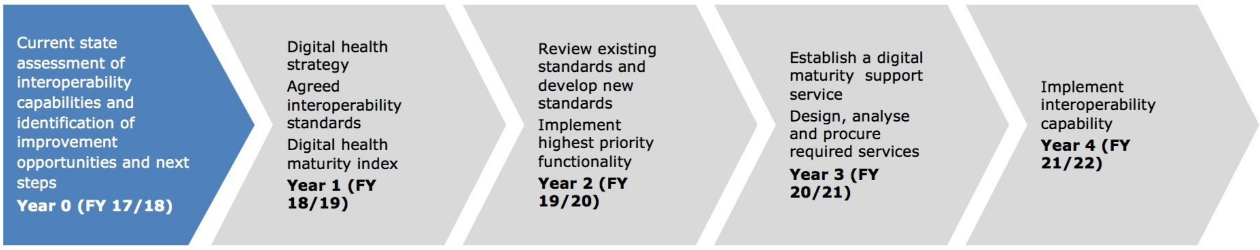

Figure 3 – High-level view of proposed interoperability activity