Foundations for the future

Priorities for health informatics standardisation in Australia, 2005–2008

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Acronyms

AHMAC	Australian Health Ministers' Advisory Council
AIHW	Australian Institute of Health and Welfare
CDA	Clinical Document Architecture (HL7)
CEFACT	Centre for Facilitation of Practices and Procedures for Administration, Commerce and Transport
CEN	Committee de European Normalisation (European Committee for Standardization)
DoHA	(Australian Government) Department of Health and Ageing
EAN	European Article Number
EbXML	Electronic Business Extensible Markup Language
EDIFACT	Electronic Data Interchange for Administration, Commerce, and Transport
EDSS	Electronic Decision Support System(s)
EHR	Electronic Health Record
EHR SIG	Electronic Health Record Special Interest Group
FEAF	Federal Enterprise Architecture Framework (US)
GP	General Practice/General Practitioner
GPCG	General Practice Computing Group
HDSC	Health Data Standards Committee
HeSA	Health eSignature Authority
HIC	Health Insurance Commission
HL7	Health Level 7
HL7 RIM	Health Level 7 Reference Information Model
ICD	International Classification of Diseases
ICF	International Classification of Functioning
ICTSC	Information, Communication and Technology Standards Committee
IM&ICT	Information Management & Information, Communications and Technology
ISO	International Organization for Standardization
IT-14	Standards Australia International's Health Informatics Technical Committee
NEDST	National Electronic Decision Support Taskforce
NHDC	National Health Data Committee
NHDD	National Health Data Dictionary
NHIG	National Health Information Group
NHISAC	National Health Information Standards Advisory Committee
PKI	Public Key Infrastructure
SAI	Standards Australia International
TGA	Therapeutic Goods Administration

UML	Unified Modelling Language
UN	United Nations
UPI	Unique Patient Identifier
XML	Extensible Markup Language

Executive summary

Standards and the resources that support them (such as registries, repositories and indexes) are the basis of interoperability, connectivity, efficiency and access, whether in the telecommunications system, finance, transport or health. Providers and consumers of health services are vitally concerned with the need for quality information for the provision of those services to the individual. Governments are also concerned with the need for quality information for planning purposes to ensure the conditions necessary for the provision of those services to the population. Developing a national health information infrastructure for Australia that will provide health service connectivity, adaptability, efficiency, safety and quality, and at the same time provide information for health policy planning and programme development depends on widespread adoption of technology and data standards.

Foundations for the future is designed for senior Information Management and Information and Communications Technology (IM&ICT) executives, decision makers in the health and IT sectors, standards developers and other key stakeholders. Its aim is to encourage them to collaborate in the development of a national health information infrastructure that will enable widespread but secure information access, interchange and analysis—one of the necessary preconditions for health sector reform. It describes a systemic national approach to enhancing standardisation of health IM&ICT which can facilitate interoperability and avoid duplication and overlap. It also provides a basis for a strategic approach to the allocation of resources via prioritisation of the national health informatics standards agenda.

There is significant potential for systematic under-investment in the standardisation of health IM&ICT. This is due to factors such as the 'invisibility' of standards, the failure of prevailing business models in health to emphasise coordination and connectivity, difficulties in directly associating business returns with investments in standards, and the 'necessary but not sufficient' nature of standards. However, studies on the uptake of interoperable health IM&ICT are increasingly demonstrating both health and economic benefits.[1]

Standardisation is also a facilitator of, and is primarily about, changes in business operation. As with all significant change processes, many of the barriers to standardisation are not technical. Rather, they involve leadership, collaboration and

[1] For example, the Healthcare Information and Management System Society (HIMSS) estimates net savings in excess of US$87 billion per annum from standardised electronic health data alone (Centre for Information Technology Leadership 2004)

willingness to invest time, effort and resources—especially in building national capacities that extend beyond the boundaries of individual organisations or jurisdictions.

Standardisation is therefore a strategic business improvement process for the health sector, underpinning a raft of reforms in health service delivery.

There has been sound progress in achieving goals established in *Setting the Standards*[2], Australia's first national health information standards plan. However, crucial issues include the continuing need for:

- commitment to work towards agreed national priorities for health information standardisation
- national processes for endorsing and encouraging widespread implementation of standards
- a focus on standards and associated resources to support direct clinical care.

In July 2004, Health Ministers endorsed the establishment of a new national organisation to undertake work in high priority health IM&ICT areas. As an interim measure until June 2005 the National E Health Transition Authority will commence this high priority national work program. Priorities for health IM&ICT to be advanced by the Authority include the development (in some cases continued development) of:

- consent models for e-health
- patient, provider and product identification standards and indexes
- priority clinical data standards, and a national approach to terminologies and classifications
- technical integration standards to allow information to be used and understood across applications (e.g. messaging, communication protocols and middleware)
- a framework and standards for the secure transfer of clinical information among authorised individuals.

This work has provided critical input to this document and forms the basis for the priority areas for standardisation described in chapter 4 of this plan.

Critical factors to achieving progress in the priority areas will include:

- governance, leadership and continued investment in development and implementation of interoperability standards
- increased participation in standardisation by clinicians and consumers

[2] National Health Information Standards Advisory Committee (February 2000) *Setting the Standards: A National Health Information Standards Plan for Australia*. Commonwealth of Australia

- building on existing work wherever possible
- resources to enhance communication and access to information about standards and the development process.

It is also vital that Australia continues to support and facilitate convergence of international interoperability standards to ensure they meet Australia's requirements. Agreed international standards will be crucial to Australia as both an importer and exporter of health information systems and applications and also if health information is to be able to be transferred on an international basis, particularly in times of critical need.

A relevant, modern, effective, efficient and sustainable health system can only be built on sound foundations. *Foundations for the future* provides a structured framework for enhancing the critical underlying information components of our health system.

1 Introduction

Foundations for the future describes strategic priorities for developing health information management and information and communications technology (IM&ICT) standards in Australia. These activities are crucial to the reform of the health sector in an increasingly technology focused environment.

Foundations for the future is designed to encourage key stakeholders—including senior IM&ICT executives, decision makers in the health and IT sectors, and standards developers—to collaborate in developing a national health information infrastructure that will enable widespread but secure information access, interchange and analysis. By releasing this document which contains directions and priorities for health information standardisation it is intended to provide a basis for commitment of resources and energy to the goal of achieving the benefits of an interoperable health system, which is one of several necessary preconditions for reform in the health sector. This report provides a basis for strategic investment in both business benefits (private value) and social capital (public value).

Foundations for the future describes a systemic approach to standardising health IM&ICT (chapter 3), and national priorities for standardisation, meaning the consistent adoption and proliferation of standards (chapter 4). It aligns closely with recommendations made in a recent review commissioned by the Australian Health Information Council and the National Health Information Group to provide input to the priorities for and delivery of a national strategic plan for health IM&ICT.[3] It also builds on the health information goals outlined in earlier national directions documents such as:

- *Health Online—A Health Information Action Plan for Australia*[4]
- *A Health Information Network for Australia*[5]
- *National Action Plan to Facilitate the Take-up of E-Commerce in Australian Hospital Supply Chains*[6]

[3] Boston Consulting Group. National Health Information Management and Information & Communications Technology Strategy Final Report, April 2004.

[4] National Health Information Management Advisory Council, *Health Online—A Health Information Action Plan for Australia, Second Edition*, September 2001.

[5] National Electronic Health Records Task Force, *A Health Information Network for Australia*, July 2000.

[6] National Supply Chain Reform Task Force, *National Action Plan to Facilitate the Take-up of E-Commerce in Australian Hospital Supply Chains*, October 2001.

- *Electronic Decision Support for Australia's Health Sector*[7]
- *Health Information Development Priorities*[8]

Foundations for the future also draws on extensive consultations around Australia, and reviews of relevant reports, literature and international experience. It builds on progress in implementing Australia's first national health information standards plan—*Setting the Standards*.[9] However, it takes a longer-term view, and includes discussion about the associated forms of health infostructure that are required to implement standards.

For further information regarding this plan and the associated framework, please contact:

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MDP 66
GPO Box 9848
Canberra ACT 2601

[7] National Health Information Management Advisory Council, *Electronic Decision Support for Australia's Health Sector,* November 2002.

[8] National Health Information Management Group, *Health Information Development Priorities,* September 2002.

[9] National Health Information Standards Advisory Committee, *Setting the Standards: A National Health Information Standards Plan for Australia*. Commonwealth of Australia, February 2000.

2 Nature and role of standards

Standards Australia International has defined a standard as:

> A published document which sets out specifications and procedures designed to ensure that a material, product, method or service is fit for its purpose and consistently performs the way it was intended to.[10]

For the purposes of this report, standards can be thought of as agreements about how to implement technologies to allow, for example, buyers to choose compatible medical equipment and software from a variety of vendors (thus encouraging both innovation and price competition). The ultimate criterion for a successful standard is the extent to which it is adhered to in practice.

Standards can be classified by the way in which they are created:

- *Proprietary standards* sometimes emerge when a single vendor controls a large share of the market for a particular item (e.g. the Windows operating system for personal computers).
- *Mandated standards* are usually prescribed by government, in federal or state legislation, although most are not legal documents in themselves.
- *Consensus standard*s are developed by committees with representatives from those with a stake in the outcome, who value and have arrived at a general agreement for a consistent approach to a particular process.[11] The committees might include representatives of vendors, health professionals, government and other interested parties who choose to participate in writing and agreeing on standards. Such standards are sometimes called *open standard*s.

Standards committees are accredited by organisations such as Standards Australia International (SAI) or by other national or international organisations such as the International Standards Organization (ISO) or Health Level 7 (HL7).

Purchasers of medical equipment and software can more easily build extensible systems by buying items that store and exchange information according to consensus standards, rather than proprietary standards.

Foundations for the future is concerned with health informatics standards that support the formal collection, transfer and exchange of health information, including access, use and disclosure issues. Therefore it covers:

[10] Standards Australia International Ltd, *Standards and Standardization*, Focus Press, 2000, p2

- *information and data standards*—those concerned primarily with the representation of information as well as with the with the content and meaning of data for clinical systems
- *technical standards*—those concerned with standards required for the development of hardware and software and communication protocols.[12]

It is not intended to cover standards that are normally applied to 'direct' professional recommendations (i.e. professional practices, ethics, and codes of conduct and/or service charters) unless they have a direct informational aspect (e.g. privacy and record keeping).

[11] *Standards and Standardization* (Standards Australia International Ltd), *op. cit*. p10

[12] There is no consistent definition of these terms; these distinctions have been made for this document.

3 A systems approach to standardisation

The key messages for the health information standards agenda in Australia are based on:

- extensive stakeholder consultation[13]
- outcomes of a recent review of national priorities for IM&ICT in Australia commissioned by the Australian Health Information Council (AHIC) and the National Health Information Group (NHIG)[14]
- supplemented by qualitative analysis of health information standards in other countries including the United Kingdom, the United States, Canada and New Zealand.

Messages include:

- National effort should be directed towards high priority areas for standardisation.
- More coordinated and focused action will be required to support the development of an appropriate, efficient and effective infostructure to meet the requirements of service delivery in health care, and of consumers. This is a challenge for all comparable countries.
- There has been sound progress in achieving most of the goals described in *Setting the Standards*—the first standards plan for national health information.
- While there have been visible improvements in processes for developing standards in recent years:
  - there is room for improvement
  - now that a more comprehensive base of standards is emerging, national action is needed to address endorsement and uptake issues
  - communication issues need to be addressed.
- Australia is an international leader in the development of some technical health informatics standards.
- Australia has developed a world-class infrastructure for financial, administrative and statistical reporting, although continued investment is needed to support the increasing demands for comprehensive and rigorous data regarding planning, research, performance measurement, public health and disease management.

[13] National and state based consultation on the directions and priorities for electronic health information and its standardisation during 2003.

[14] Boston Consulting Group. *National Health Information Management and Information and Communications Technology Strategy – Final Report*. April 2004.

A range of systemic issues associated with standardising health information in Australia was also identified through the consultation and review processes. These include:

- *The need for a national approach* including the establishment of priority areas for national standards development and implementation.
- *Levels of investment*. There is significant potential for, and perceived evidence of, systematic under-investment in the standardisation of health information in Australia.[15] [16] This is associated with factors such as:
  - the 'invisibility' of standards compared to computer applications
  - lack of 'demand pull', with prevailing business models in health failing to emphasise coordination and connectivity
  - relatively low investment in IM&ICT within the health sector in comparison to other countries
  - difficulties in associating business returns with investment in standards due to the tendency for business returns to be 'claimed' by the applications they enable, and the 'necessary but not sufficient' nature of standards
  - the primary benefits of standardisation often accrue to jurisdictions and organisations other than those bearing the costs.
- *Use of business models.* Inappropriate business models may have been applied to the development and implementation of health information standards, given the fragmented nature of the health sector and lack of some of the market forces that have accelerated standardisation in other areas of the economy.
- *Application of standards.* There is a degree of separation between the development and implementation of some standards. Australia's world-class performance in health information reporting in the public sector is likely to be partly due to the unbroken chain of development and implementation under the auspices of the National Health Information Agreement.[17] A similar approach needs to be considered for other health information standards.

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[15] The Canadian Health Infoway plans emphasise standards development and have committed C$430m (approximately 20 per cent of the Infoway budget) to the development of architecture and standards over four years. (Canada Health Infoway, Building Momentum –2003/04 Business Plan)

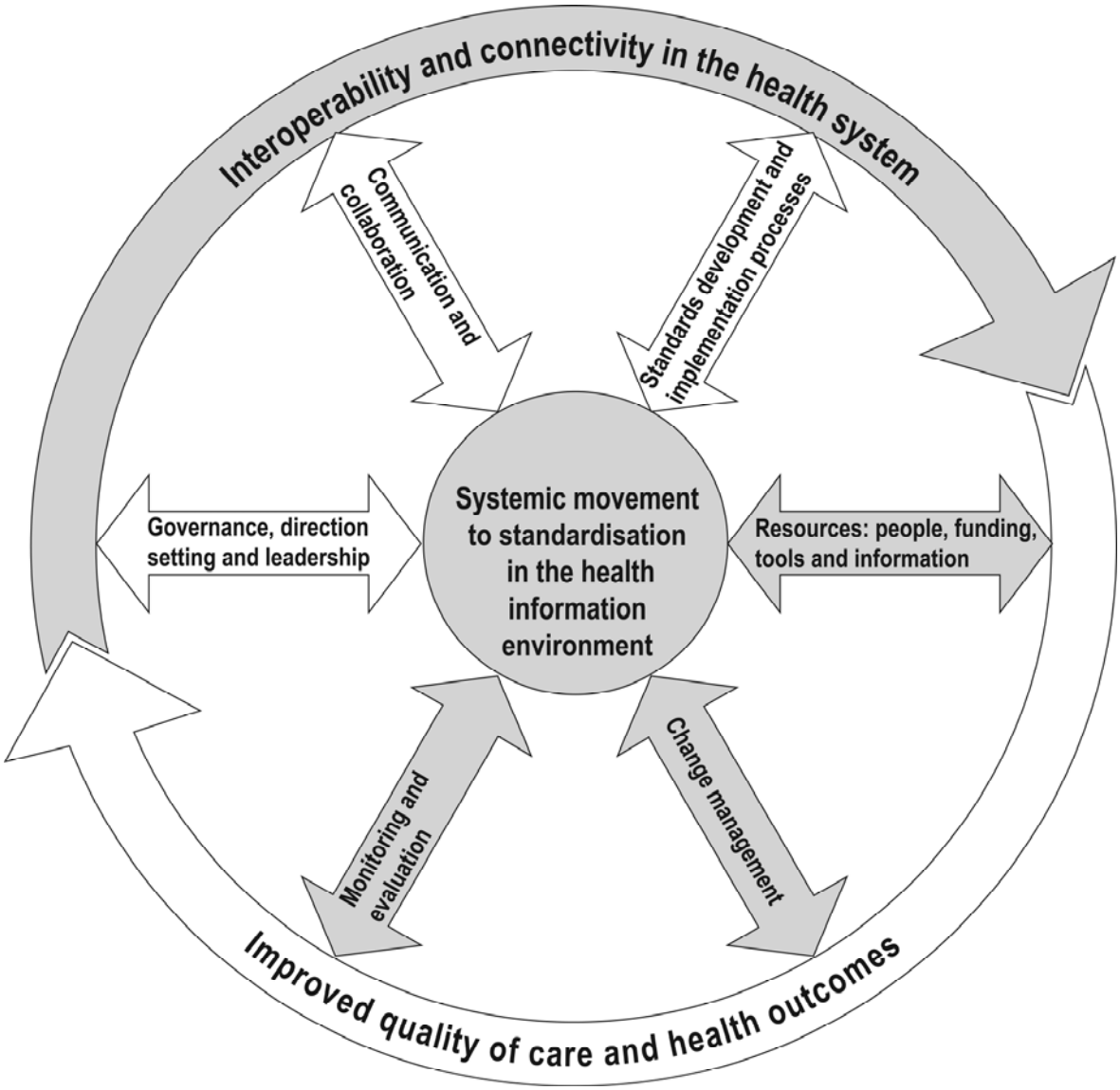
[16] The UK NHS Information Authority has committed $55m to standards, support and health informatics development from an annual budget of approximately A$240m. (NHS National Program for IT, Making it Happen 2003)

[17] The National Health Information Agreement (NHIA) is an agreement between the Australian, state and territory governments. It is the cornerstone of coordinated national health information development in Australia. The NHIA ensures that the collection, compilation and interpretation of nationally relevant health information (mainly centred on the National Minimum Data Sets) is appropriate and carried out efficiently. This requires agreement on definitions, standards and rules of collection of information and on guidelines for the coordination of access, interpretation and publication of national health information. <http://www.aihw.gov.au/committees/health/nhimg/index.html>.

- *Stakeholder representation.* There is systematic under-representation of some types of stakeholders in standards development due to the various opportunity costs of participation, which tends to be on a voluntary basis. This is likely to discriminate against the involvement of clinicians, consumers and small business interests.
- *International activity*. Australia must participate in international standardisation in health informatics because we have world trade obligations to adopt international standards unless there are compelling reasons not to.

Accordingly, a systemic approach—the Systemic Movement to Standards (SMS) model—has been developed to guide the Australian health sector towards the benefits of greater standardisation in IM&ICT. Figure 1 depicts the model, which is based on quality improvement methodologies.

Figure 1: SMS model—a systemic approach to standardisation of health IM&ICT in Australia



The SMS model recognises that standardisation involves much more than the documents that describe technical requirements. Standardisation facilitates changes in business operation to realise business benefits. It is therefore a strategic business process for the health sector, underpinning a raft of reforms in the delivery of health services. Accordingly, the model highlights six dimensions for continuous improvement. In combination with the priority areas for standardisation described in the next chapter, the model provides a comprehensive agenda for systemic movement towards standardisation in the health information environment—a fundamental element in improving service delivery and health outcomes.

3.1 Governance, direction setting and leadership

There has been considerable discussion in Australia about governance and leadership of health information standardisation activities at both the national and international levels. Key issues have included:

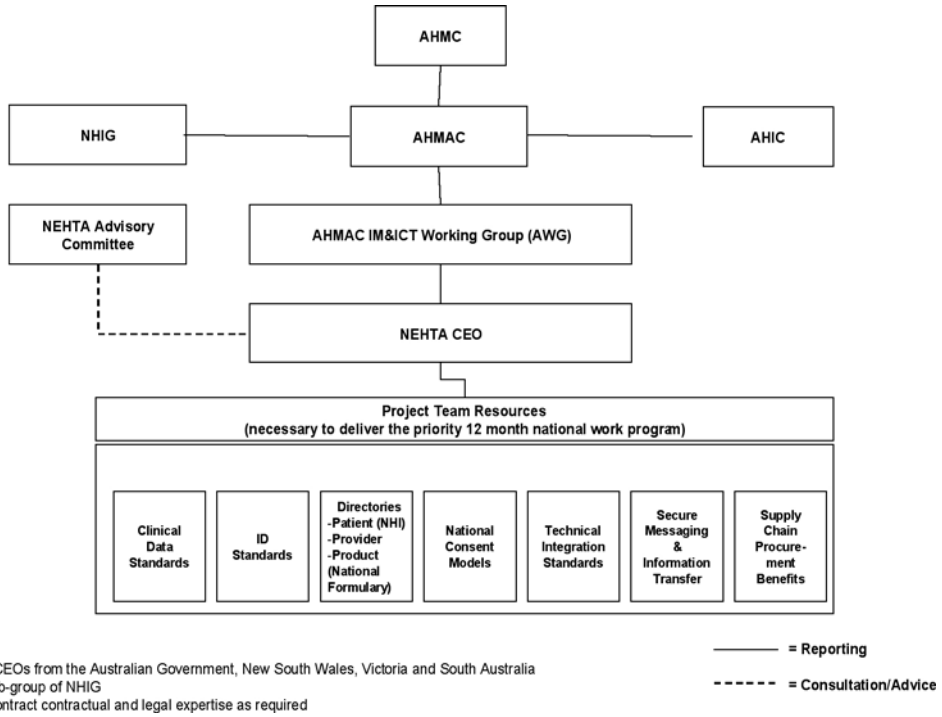
- the need to role delineate and coordinate roles
- the lack of a national framework for endorsement of standards.

Figure 2 shows the current national IM&ICT governance structure which became operational in early 2004. It is anticipated that further development of the current national governance structure for IM&ICT will be undertaken over the next 12 months.

Regardless of the overall structure, organisations involved in national IM&ICT governance must take into account:

- the need for a commitment to national priorities for health information standardisation
- the need for a national health information architecture
- the need to reflect the interests of health information stakeholders if they are to maximise chances that the standards will be adopted successfully
- the need to avoid costly gaps and overlaps by articulating and communicating the roles and responsibilities of all key stakeholders in processes and activities related to standards.

Figure 2: Governance arrangements for National E Health Transition Authority



(1) AHMAC CEOs from the Australian Government, New South Wales, Victoria and South Australia
(2) Expert sub-group of NHIG
(3) Will subcontract contractual and legal expertise as required

Foundations for the future provides the high-level direction for standardising health IM&ICT that is needed to facilitate reform in the health sector. It highlights likely areas of public and private sector investment. However, in practical terms, national health information infrastructure materialises from the collective decisions of large numbers of health IM&ICT decision makers. Thus for standardisation to succeed, in addition to strong leadership and governance, there must be broad-based commitment to the standards framework and a national information architecture.

If we want national electronic health information interchange, it will be necessary to describe current technical and information architectures across the health 'enterprise', how they are used and their interactions. In addition, we will require methods of describing desired architectures and information flows to allow future developments to fit within an overall framework for health information in Australia.

The system and information designs and interactions that feature in most health information systems are complex. This underpins the need for a new approach to system-wide architecture planning to optimise the flow of information across clinical, administrative and financial domains. As system developers and implementers extend applications or adopt new architecture concepts, such as establishing national connections or developing a National Health Information Model, it becomes increasingly important that we have infostructure able to achieve interoperability among technologies and designs and to identify the pathways for effective information

flows. Australia needs to strengthen its skill levels to enable information modelling to be undertaken on a widespread basis.

Foundations for the future includes substantial emphasis on the consistent adoption and proliferation of standards across organisations to support interoperability in the health sector. Strong leadership is needed at various levels to modify existing business processes, norms and systems, particularly where there is likely to be a time lag between the occurrence of immediate costs and benefits, and where benefits are external (i.e. between agencies) rather than internal. To date, anecdotal evidence suggests that standards are often implemented inconsistently even within organisations, to preserve local norms. However, while this practice may reduce short-term cost and effort, and perhaps optimise needs at local levels, it may compromise capacity building in the health sector overall.

3.1.1 Principles

Objective	Health IM&ICT decision makers endorse, commit to and work collaboratively towards standardisation in priority areas that will lead to an effective national health information infrastructure.

The overarching principles that emerged from the consultation and review processes will guide decisions about IM&ICT standardisation in the health sector. The principles are:

- *Planning and coordination*—should be undertaken at the national level to agree national priorities, to ensure high degrees of coherence and consistency and to eliminate duplication and waste.
- *Collaboration and contribution*—while health information infrastructure will be the information and communication foundation for the Australian health system, it must build upon existing infrastructure and add value to it. This will result in a federated Australian infrastructure rather than a centrally designed one. This is possible only through collaboration. It requires a wide range of stakeholders to make a commitment to contribute to the development of national infostructure, sometimes beyond their local needs.
- *Communication*—the range of stakeholders requires wide-ranging commitment to communication.
- *Engagement*—health consumers, providers and system developers and implementers should be engaged at all stages of planning and developing standards.

- *Partnership*—governments should provide leadership, set directions and encourage the private sector, health care providers and consumers to participate fully in the 'new information economy' as it applies to health.
- *Needs driven*—health information infrastructure must support existing needs but also build capacity to enable the 'connected' health care delivery models of the future. It must assist frontline health professionals in their day-to-day work; serve managers and policy makers in health strategy, policy initiatives and business activities; and be a valuable resource for the public and researchers.
- *Internationalisation*— Australia should adopt any relevant ISO standards in full unless there are compelling reasons to vary them.
- *Extensibility*—information needed for research, policy or planning principles should, where possible, be generated as a by-product of operational systems that are designed primarily for other purposes, such as achieving better health outcomes for individuals, groups and communities, or organising payments.
- *Business value*—the costs and benefits of standardisation proposals should be assessed to ensure investment adds to private and public value.

The principle of extensibility is particularly relevant at present. While consistency between operational and aggregative data has always been seen as important, the current growth in need for electronic clinical communication requires substantial discipline to ensure this principle is implemented. This is particularly evident when discussing the relationship between clinical terminologies and classifications.

3.2 Communication and collaboration

Objective	Activities to standardise health information are communicated well and are readily accessible across the sector, and there is evidence of strong collaboration among stakeholders.

Feedback from stakeholders indicates a need for more concerted communication and marketing strategies about health information standards to involve the broader 'community of interest'. Strategies might include online directories of resources and standards, media releases, marketing, examples of implementation, and, if appropriate, workshops for vendors and others to encourage awareness and uptake.

Other important communication activities to be encouraged include:

- development of more inclusive, and in some cases, better targeted communication strategies by standards developers
- closer links and more frequent and systematic feedback between implementers, system vendors and developers
- communication between larger health organisations in particular, to share implementation experiences and resources, thereby enhancing overall national implementation capacity and the potential for feedback (system learning).

These types of communication activities cannot be orchestrated centrally. Rather, they involve broad changes in culture and the development of self-managing networks. For example, the General Practice Computing Group (GPCG) discussion lists and emergence of HL7 Australia[18] have provided sound, user-driven networks for communication and virtual-involvement in standardisation and related activities.

As mentioned above, coordinated action by a wide range of stakeholders is required to standardise the health sector. Collaboration between agencies involves, at a minimum:

- leveraging human, physical, financial and knowledge resources to optimise the whole rather than any particular part
- designing and managing effective operating models
- reaching and maintaining agreement on basic goals and on trade-offs among relevant subgroups
- creating a culture of effective interjurisdictional working relationships
- securing implicit or explicit agreement by the key organisations concerned to a partnership approach.

3.3 Standards development and implementation processes

Objective	Standards development and implementation processes are well integrated, facilitating the widespread adoption of standards.

Widespread consensus, support and commitment are critical success factors for both health data and ICT standards. Developing consensus standards is necessarily process-intensive. Accordingly, there are often substantial lead times associated with

[18] Health Level 7 Australia, a not-for-profit organisation, is the Australian Affiliate of HL7.org, a US-based, internationally active, standards organisation.

developing and implementing standards, particularly where international consensus is required.

Over the past decade, health data standards have focused primarily on statistical reporting needs and to a considerable extent, on the public sector. Many of the resulting data collections rely on 'after the event' coding and capture. However, with the necessary training and support, much greater direct involvement of clinicians in the real-time capture and representation of information can be anticipated in the foreseeable future.

The pace of the development and publication of technical standards in health informatics has accelerated significantly since the first standards plan. However, this momentum must be sustained. Broader representation in some areas of standards development (such as those relating to electronic health records and information modelling) is desirable.

The major systemic issues highlighted during consultation and review, however, relate to endorsement, uptake and at times, inadequate links between development and implementation. Elements of standards development processes that appear to require review and/or strengthening include:

- *Business case development.* This includes definitive agreement on the national standards to be developed and adopted, based on:
  - agreed priorities
  - clear articulation of potential benefits and approaches to benefit marketing and realisation
  - explicit options analysis (framed against the 'do nothing' option)
  - initial analyses of stakeholders, impact and risk mitigation.
- *Representation.* Greater contributions are needed from groups that are currently under-represented. In some cases, this may require the development of strategies (such as sponsorship, extended development models) to reduce the opportunity costs of participation. In particular clinicians need to become more actively engaged in the development of health information standards and infostructure which is aimed directly at supporting clinical care. In addition consumer and small business involvement in the standards development process is required.
- *Outputs.* Consideration of the nature and form of outputs—for example, standards might require implementation guides and accompanying technical reports to increase the chances of consistent implementation. Versioning requires specific attention where there is tension between rapid change in health IM&ICT capabilities and the need for stable standards to enable implementation.

To be effective, standards need to be robust and well tested. To strengthen links between the development and implementation of standards, it is recommended that standards are tested during the development phase and used in large scale trials prior to being endorsed for national implementation.

3.4 Resources

Objective	The importance of standardisation and the potential for underinvestment in it are recognised across the health sector and reflected in the allocation of resources to support high priority standardisation activities.

As for any other business improvement strategy, adequate resources are essential. In the case of standardisation, the key resources are people, finance, tools and information.

3.4.1 People

As indicated above, a wider spectrum of experience is needed in the development of standards and new approaches are likely to be required to achieve this. Other necessary activities include upgrading skills in the health informatics and health professional workforces and, potentially, greater professional acknowledgment of contributions to this often ‘unseen’ activity. Frequently, only a limited circle of stakeholders recognises significant contributions to standards development because the outcomes tend to be invisible to the end users of the applications that depend on the standards. Volunteering and intrinsic (rather than extrinsic) rewards play significant roles in standards development. Greater acknowledgment of people’s contributions, as well as strategies such as sponsorship for participation, are likely to provide benefits.

Educational and information activity has increased markedly in some areas since the first standards plan. Examples include the efforts of HL7 Australia, Standards Australia International, Central Queensland University, and a range of sponsoring organisations in hosting seminars and workshops on topics such as electronic health records, decision support, information modelling and information security standards. Sustained and comprehensive education, information and networking strategies are essential for capacity building.

3.4.2 Finance

The Australian Government Department of Health and Ageing has provided funding for accelerated development of health informatics standards since 1999, and AHMAC has funded the development and implementation of statistical health data standards for many years. Additional funding for other ICT standards relevant to the health sector has been provided by other Australian Government agencies such as the Department of Industry, Tourism and Resources and the former National Office for the Information Economy (NOIE).

The many other sources of funding for standardisation activities include software vendors and other private and public sector organisations. Various individuals also contribute their time.

It is also time to widen the contribution base to other organisations and jurisdictions that benefit from the standards. This includes major projects (e.g. implementation of clinical systems and new product developments) for which standardisation should form an identifiable component. Leveraging a range of physical, financial and other resources to optimise overall social capital is inherent in the collaboration required to advance Australia's health system.

3.4.3 Tools and information

Many stakeholders have noted a lack of commonly available tools and information resources to enhance standardisation. Examples include the availability of:

- message libraries, so that messages designed for specific purposes can be reused, reducing the cost and increasing the consistency of messaging
- automated message development and information modelling tools, to minimise errors and interpret differences when translating technical standards into software
- standards themselves, as some standards are costly or difficult to locate
- information about the status of standardisation projects, or who is doing what in other parts of the sector.

Open source

Open source software is gaining commercial credibility, driven partly by the desire for open systems.

> The open source movement is helping turn significant chunks of the IT infrastructure into commodities by offering free alternatives to proprietary software. The promise

> of the past several years has begun to materialise as one by one the hurdles to open source adoption have dropped away. Major enterprises are running mission critical functions on open source IT. Big vendors have lined up to support it or their applications to it. CIOs who have implemented it report significant reductions in total cost of ownership. Our conclusion? CIOs who don't come to terms with this revolution in 2003 will be paying too much for IT in 2004. (Koch C, *CIO Magazine*, March 15, 2003)

It is worth considering this approach in terms of whether to facilitate open access to standardisation tools and resources of common interest across the health sector.

Intellectual property issues are significant for public sector agencies, and others. However, it is worth examining the potential to optimise the public value of standardisation tools through controlled open source licensing.

3.5 Change management

Objective	To establish recognition of the need for a change management approach to the implementation of standards across all levels of the organisation.

Many of the issues highlighted above are elements of a change management approach. There are many methodologies and resources available to guide change management. Critical issues include:

- the need for senior health executives to recognise standardisation of health IM&ICT as highly strategic changes to business processes that are critical in enabling flexibility (i.e. ability to adapt rapidly to changing business circumstances), economy, safety, reliability and effectiveness to their current and future service delivery—rather than regarding standardisation as technical details
- the need for national agreement on and communication of the standardisation priorities contained in the standards plan, and the use of collaborative/partnership models to advance them
- the need for front-line service delivery staff to recognise that the quality and representation of the data they make available electronically to other providers, either internal or external to their organisation, is inextricably linked to duty of care—and that health information standards are therefore 'core clinical business'
- current perceptions among stakeholders that the implementation of standards at the whole-of-enterprise or inter-enterprise levels is often sub-optimal because organisations are not willing to change local practices.

There is a need for a critical mass of change agents to engage with the standardisation agenda. This is unlikely to occur without strategic and high-level intervention from major health organisations, health training institutions, professional colleges, systems implementers and vendors.

3.6 Monitoring and evaluation

Objective	The costs and benefits of health IM&ICT standardisation are identified via systematic monitoring and evaluation, feeding into a continuous improvement model.

The final element of a systemic approach to health IM&ICT standardisation relates to continuing assessment of the success of this national standards plan and framework, and its amendment where appropriate.

There will be a need to continually evaluate the content of the National Health Information Standards Framework and progress made towards the strategies it recommends.

The most critical success factor at this stage is commitment to systematically review, reassess and re-plan.

4 Key capabilities: priority areas for standardisation and achieving interoperability

The key priority areas identified in this report are those that are critical to supporting interoperability across the health system. They are also the areas identified as most likely to benefit from national coordination in terms of costs and outcomes.

The priority areas for standardisation are as follows:

- privacy and consent models for e-health
- patient, provider and product identification standards
- clinical data standards, terminologies and classifications
- comprehensive standards for electronic health records
- a framework and standards for the secure transfer of clinical information among authorised individuals
- technical integration standards to allow information to be used and understood across applications (e.g. messaging, communication protocols and middleware).

These priority areas have been arrived at after an analysis of:

- stakeholder contributions regarding priority areas of importance for standardisation
- the benefits to be gained by a national approach to progressing development and implementation of standards in the priority area
- the extent to which other important initiatives depend on the priority area
- the feasibility of implementation in the short to medium term.[19]

The directions proposed in this plan build on earlier work setting national directions for IM&ICT in Australia including:

- *National Health Information Management and Information and Communications Technology Strategy* – Boston Consulting Group Final Report[20]
- *Health Online—A Health Information Action Plan for Australia*[21]
- *A Health Information Network for Australia*[22]

[19] Boston Consulting Group. *National Health Information Management and Information and Communications Technology Strategy—Final Report*. April 2004.

[20] ibid

[21] National Health Information Management Advisory Council, *Health Online—A Health Information Action Plan for Australia, Second Edition*, September 2001.

- *National Action Plan to Facilitate the Take-up of E-Commerce in Australian Hospital Supply Chains*[23]
- *Electronic Decision Support for Australia's Health Sector*[24]
- *Health Information Development Priorities*[25]
- *Setting the Standards: A National Health Information Standards Plan for Australia*[26].

The recommendations outlined under each key result area constitute the most important health information standards activities required to build foundations for the future health system in Australia. Note that this chapter concentrates on strategies for delivering against the key capabilities required to deliver health system interoperability. Other areas of standardisation requiring action at a national level are discussed in subsequent chapters.

Achieving interoperability

The US National Committee on Vital and Health Statistics describes three levels of interoperability:[27]

- *Basic interoperability*—allowing a message from one computer to be received by another, but not requiring the receiving computer to be able to interpret the data.
- *Functional interoperability*—an intermediate level defining the format of messages. This ensures messages between computers can be interpreted at the level of data fields, so that data can pass from a structured field in one system to a comparably structured field in another. Neither system, however, has understanding of the meaning of the data within the field(s).
- *Semantic interoperability*—provides common interpretability, that is, information within the data fields can be used intelligently.

The former National Office for the Information Economy (NOIE) published an interoperability framework for the Australian Government. The framework provides a high-level basis for interoperability within government, based on voluntary compliance

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[22] National Electronic Health Records Task Force, *A Health Information Network for Australia*, July 2000.

[23] National Supply Chain Reform Task Force, *National Action Plan to Facilitate the Take-up of E-Commerce in Australian Hospital Supply Chains*, October 2001.

[24] National Health Information Management Advisory Council, *Electronic Decision Support for Australia's Health Sector*, November 2002.

[25] National Health Information Management Group, *Health Information Development Priorities*, September 2002.

[26] National Health Information Standards Advisory Committee, *Setting the Standards: A National Health Information Standards Plan for Australia*. Commonwealth of Australia, February 2000.

[27] National Committee on Vital and Health Statistics, *Uniform Data Standards for Patient Medical Record Information: Report to the Secretary of the US Department of Health and Human Services.* US Department of Health and Human Services, July 2000.

within existing standards, and uses open standards principles. The framework does not specify levels of interoperability for industries or sectors, believing they should be determined by each sector based on required levels of interoperability to ensure effective and efficient operation.

It is likely, however, that significant areas of electronic health information interchange, especially relating to clinical communication, will require semantic interoperability, or common interpretability. That is, they will require that information moving between systems carries sufficient data content *and* context, and is sufficiently standardised, so as to be reliably interpretable between systems and users. Another key attribute of interoperability relates to the need for health information to be shared between and/or be viewed by different systems, using different technologies, software, hardware and database platforms, while still being handled and understood consistently.

The priority areas for standardisation and implementation discussed in this chapter form the basis for interoperability within our health system.

It should be noted that the range of health informatics standards relevant to Australia is also being developed within the separate but related CEN, ISO and HL7 arenas.

There are economic advantages in ensuring that core interoperability standards meet Australia's requirements, and are compatible and consistent, because:

- Australia is a significant importer of health software, particularly in the larger, more complex and expensive hospital and clinical systems areas. The expense of adapting these systems to meet local requirements and to integrate with other existing and planned systems often dwarfs the licensing costs. The systems that embody international standards will require less modification if the standards already encompass Australia's needs.
- Compatibility between European and US standards and the systems based on them increases the prospects of transatlantic competition, with potentially advantageous price implications for Australia.
- Cost disadvantages to Australian software developers are reduced when a single set of standards needs to be supported to compete in the Australian, United States and European markets.
- Australia's world trade obligations include the direct adoption of international standards unless there are compelling reasons to deviate from them.

In the longer term, the ability to share and exchange personal health information across national boundaries will also assist the flow of human capital and support management of global public health issues, such as the recent outbreaks of Severe Acute Respiratory Syndrome (SARS).

In recent years, Australia has been able to demonstrate world-class expertise within health informatics standards arenas and has had significant influence in the development of international standards. As a relatively small but well-positioned player in world terms, Australia has the motive, means and opportunity to lobby strongly for and work towards harmonisation and, where possible, the convergence of standards and other infostructure resources between disparate standards organisations, it is essential therefore that we continue to be involved in international harmonisation efforts.

4.1 Privacy and consent

Privacy is one of the principles underpinning quality health care. Currently, consumers have a high level of trust in the way that their sensitive personal health information is handled within the health care sector. With the adoption of new technologies, such as electronic health records, it will be very important to maintain this trust so that consumers can reap the benefits of improved information flow at the point of care, knowing that their privacy will continue to be protected.

Lack of consistent privacy regulation is a problem because the boundaries between the public and private sectors are blurring and treatment regimes are becoming more complex. Increasingly, episodes of care involve multiple health care providers (such as general practitioners, diagnostic services and specialists) who may work in both the public and private sectors. It can become unclear which privacy regime applies to any single practitioner, or any single episode of care.

The Australian Health Ministers' National Health Privacy Working Group is addressing these issues by the development of a National Health Privacy Code. Finalisation of this code and progress towards its implementation are high priorities for the national e-health agenda.

Consent is a key mechanism for upholding the privacy of an individual's personal health information. Work on national consent models is being undertaken by the National E-Health Transition Authority. The Department of Health and Ageing and a number of jurisdictions have also undertaken baseline work on e-consent models.

Current status

At present there is a range of legislative and administrative mechanisms in place across jurisdictions to protect health information privacy, including:

- The *Commonwealth Privacy Act 1988* and the *Privacy Amendment (Private Sector) Act 2000*, which provide for the protection of health information in the federal public sector and the private sector nationally.
- Victoria's *Health Records Act 2001*, which applies to the handling of health information held by any organisation in both public and private sectors from 1 July 2002.
- ACT's *Health Records (Privacy and Access) Act 1997*, which applies to records kept by any health service or other organisation, including public and private sector services.
- The *NSW Privacy and Personal Information Protection Act 1998*, which has regulated the privacy of personal information—including health information—held by the public sector since July 2000. In addition, in September 2002 the NSW Parliament passed the 'Health Records and Information Privacy Bill 2002'. The new bill covers any public or private sector organisations that hold 'health information' as well as individual health service providers.
- The Northern Territory is developing health-specific privacy legislation, to cover both the public and private sectors, and which can be the vehicle to implement the national code. A discussion paper was released and comments were due at the end of June 2002.
- Western Australia has announced that it intends to develop privacy legislation, including health privacy, for its public sector.
- While Tasmania does not have privacy legislation for the public sector, it has the document *Guidelines for Agencies* produced by the Tasmanian Government's Information Strategy Unit in August 1997. Those guidelines apply the Information Privacy Principles to all government agencies. In November 2001 the eServices Group in the Tasmanian Department of Premier and Cabinet produced an Issues Paper titled *Tasmanian Information Privacy Legislation* for discussion and consultation.

Some other states and territories have policy and procedural documents that provide advice on the handling of health information within that jurisdiction. For example:

- In September 2001, the Queensland Government approved a privacy regime for Queensland Health. Queensland Health is bound by ten National Privacy Principles contained in *Queensland Government Information Standard 42A (IS42A).*
- In South Australia, the Department of Human Services and its funded service providers are bound by a Code of Fair Information practice. While not specific to health, the code is based on the National Privacy Principles and ensures a consistent approach to the handling of personal information.

A range of models and discussion papers has been produced in relation to consent, including:

- *Consent and Electronic Health Records—a discussion paper.* This paper, produced by the Health*Connect* Program Office, explores issues of consent and access control to

information held on Health*Connect*. It is available at: <http://www.health.gov.au/healthconnect/publications/publications.html#consent>.

- *National Consent Workshop.* Held in May 2002, it involved approximately 30 participants drawn from organisations representing health consumers, providers, administrators and commonwealth, state and territory governments. The aim of the workshop was to advance discussion about consent and access control for Health*Connect*. Participants also developed three possible consent models for testing in the Health*Connect* trials.
- *Consent in the Health*Connect *Trials: Outcomes of the National Consent Workshop.* This publication documents the outcomes from the consent workshop. It is available at: <http://www.health.gov.au/healthconnect/publications/publications.html#consent>.
- *Consent models for the Health*Connect *trials.* Consent arrangements are being tested in Health*Connect* trial sites in Tasmania and the Northern Territory. The models were developed by the Health*Connect* Program Office in conjunction with the Trial Management Committees in Tasmania and the Northern Territory. The models were based on the background paper and the outcomes of the consent workshop. The fast-track trial consent models are available on the Health*Connect* website: <http://www.healthconnect.gov.au>.
- *Electronic Consent Research and Development Project.* The Department of Health and Ageing commissioned four research and development projects to identify a range of e-consent mechanisms by which consumers can record the conditions under which their information is transmitted from one person to another on an event-by-event basis. A two-day symposium was also held in July 2002. The final report is available at: <http://www.health.gov.au/hsdd/primcare/it/econsent.htm>.

Future requirements

As the national privacy and consent frameworks are clarified and harmonised, the ways in which these policies are handled within and between health information systems will need to be standardised, that is, they will need to flow into technical standards.

4.2 Patient, provider and product identification standards and directories

4.2.1 Identification of key parties

Developments in the health care system and the emergence of health networks have revealed the importance of sharing and exchanging information and knowledge

between different information systems and health care providers. This includes data concerning individual patients.

More effective communication between health care professionals is critical in securing closer cooperation; improving the management of patients in terms of quality, continuity of care and prevention; and promoting health system efficiency.

To ensure that health care professionals have access to information about any given patient, it is vital that the individuals and/or organisations concerned can be identified reliably within health care information systems. At present, an individual client or provider might have multiple identifiers corresponding to different geographical locations, different health care establishments or different specialities. Allocating multiple identifiers and the related processes increase the risk of errors and as a result, complicates the compilation of integrated information and knowledge that is physically distributed across many systems.

Current status

Currently, most health organisations and jurisdictions have multiple client and provider directories that are used with varying degrees of quality for multiple purposes. There is now a national 'push' to reduce the high maintenance costs associated with multiple databases, different data definitions and identifiers, and their associated business processes.

As a result, the use of provider identifying data in Australia is seriously limited, to the extent that a range of current and expected future information needs are either not being satisfied or are being satisfied to some extent and at significant cost. For this reason, most major jurisdictions and the Health Insurance Commission are investigating, planning, developing or implementing improvement strategies.

In 2003, *AS 4846—Health Care Provider Identification* was published. In addition, the feasibility of a national master index of health care providers is being investigated by the National E-Health Transition Authority. The index would be designed to supplement existing infrastructure and services by improving their data coverage and quality in an economic way. The index would be accessible to authorised directories.

In 2002, Standards Australia International published *AS5017-2002—Health Care Client Identification* to provide a basis for improved association of clients and their data within and between organisations. Matching data supplied by individuals against data the service holds about them is a routine operational requirement for health services.

Standardised datasets that are recorded, stored and used consistently are critical enablers for e-health.

Standards Australia International is also working on developing an implementation guide for the health care client and provider identification standards.

4.2.2 Product identification

A central medicines catalogue will provide a critical piece of e-health infostructure. As an authoritative source of core data on medicines it will include the use of a unique code for each product, alignment with TGA codes for a number of fields including dosage, form, strength and ingredients, the allocation of products to virtual medicine groups (based on active ingredient, form and strength), and the allocation of the appropriate ATC code to each product.

Product details from the catalogue will eventually be made available to all appropriate bodies in the health sector, including researchers, software vendors for incorporation into prescription writing and dispensing systems, and wholesalers.

Future requirements

While the development of relevant identification standards is well advanced, their implementation will require substantial coordinated action.

It is planned to continue to develop the client and provider identification standards, to make them international via ISO, and to develop associated implementation guides.

Additional investigation of the feasibility and desirability of national directories of providers and patients is required.

Possible implementation of an expanded product/service (including medical appliances and devices) directory also requires evaluation.

4.3 Clinical data

4.3.1 Clinical information framework

The past decade has seen major progress in standardising data for statistical collections and financial transactions as discussed in section 4.9. However, the standardisation of clinical information has lagged. This will be critical in enabling national systems of electronic health records and other e-health initiatives.

> There is a fine granularity of clinical information…through which the meaning and context of events described are communicated in records and other communications. Such information may prove crucial in understanding and seeking to avoid critical incidents. It may not be possible to summarise or abstract this through codes or classifications, while still retaining the clinical context and meaning. A key issue is the extent to which electronic records must be capable of capturing this rich detail, to inform events or analysis elsewhere in the overall health care delivery system.
>
> The clinical information infrastructure … must also support the requirements for audit and governance, management and population health analysis, by simplifying and aggregating information more coarsely … (Balas A. Centre for Health Care Quality, University of Missouri, and Ingram D, Centre for Health Informatics, University College, London, unpublished)

There are many 'islands' of standardised clinical data. There are also many gaps, overlaps and alternatives—often supported by specific groups of clinical and/or commercial interests. Clinical data are complex and evolving rapidly, reflecting the complexity of human biology and rapid advances in clinical knowledge. In addition, the exchange of clinical data is further complicated by the need to associate context with content for each piece of information exchanged. For example,

- Was a diagnosis the presenting diagnosis, a provisional diagnosis or a diagnosis at discharge?
- If more than one diagnosis is given, which one applied when and who gave it?
- Was a drug dosage the one prescribed, the one dispensed, or the one taken by the patient?

While these concepts can be questioned and clarified during human communication, the desire for computable clinical concepts to underpin applications such as electronic decision support requires enormous rigour in the standardisation of clinical data.

Current status

Some of these issues are being addressed via the development of standards for EHRs and health concept representation (see sections 4.4 and 4.3.2 below).

The Clinical Information Project was established as a joint initiative between the Australian Government Department of Health and Ageing and the South Australian Department of Human Services in October 2002. The Phase 1 report was completed in February 2004 and incorporated the key deliverables:

- a policy framework for Health*Connect* 'health event summaries'
- partial technical design of high priority health event summaries, primarily targeting the needs of general practitioners
- full technical design of standardised hospital to GP discharge summaries.

Phase 2 of the Clinical Information Project was completed on 30 June 2004. The deliverables included detailed technical specification of a set of five priority health event summaries and development of priority EHR lists and EHR views. The priorities were determined through extensive stakeholder consultation as essential for initiating the Health*Connect* EHR and capturing information that focuses on key frequently used services where most benefit will be gained through information sharing, i.e. GP visits, hospitalisation, pathology and diagnostic imaging.

These outputs, apart from serving the needs of Health*Connect*, also serve the broader agenda for clinical information in Australia. It is intended that the data and standards developed be approved by the Health Data Standards Committee for incorporation in the AIHW Knowledgebase, as the authoritative national source of health data standards.

There is an ongoing core role for the Clinical Information Project to respond to the needs of the Health*Connect* implementations and the broader clinical information agenda, in the continued development of high priority datasets through the Clinical Information Program.

Clinical Information Program (CIP3)

The decision to move to an implementation phase from July 2004 has highlighted the need to urgently address a number of issues. In particular there is critical work required to transform the priority health event summaries, EHR lists and EHR views to a product for implementation with ongoing interoperability. This includes the need to address issues of terminologies and standards, messaging, implementation practicalities and ongoing governance for the review and development of data elements included in

the current set of priorities and others developed to meet the needs of the Health*Connect* Trials and State Rollouts.

CIP Phase 3 is now addressing these issues and filling the knowledge gap. Several existing bodies have a role to play for some of the requirements but are not looking at them from a strategic or high-level (National) perspective. The expanded Clinical Information Program is proposed to address these issues and fill the knowledge gap.

The purpose of the Clinical Information Program is to:

- produce safe, reliable, high quality, clinical information which is commonly interpretable across the health system (by authorised parties)—this requires development of standardised clinical datasets and their means of representation
- develop informational and management frameworks for clinical information interchange
- obtain agreement with Health*Connect* including trial sites and the proposed state implementations (in South Australia and Tasmania) regarding representations of specific clinical information (health event summaries, EHR views and EHR lists)
- obtain national endorsement of a standardised discharge referral
- obtain national endorsement of the priority health event summaries, EHR lists and EHR views and the data elements within these
- provide consulting services for the development of clinical information requirements beyond the needs of Health*Connect*.

Future requirements

The Clinical Information Program will be implemented progressively during 2004–2005 under the management of the National E-Health Transition Authority. This will require the involvement of the Health Data Standards Committee and NHIG. National processes and structures for clinical information governance will need to be articulated and agreed to as a priority to ensure that clinical data frameworks reflect contemporary models and the needs of health service delivery.

In addition, the concepts of archetypes and templates, which are currently gaining considerable momentum within both the European and US health informatics standards arenas, will be of relevance to work being undertaken by the CIP. These are discussed more fully under section 4.4

4.3.2 Health concept representation (including terminologies and classification)

Health care is a data, information and knowledge-intensive industry. Safe, effective and efficient health care depends on accurate and detailed clinical information being reliably communicated, unambiguously interpreted and accurately transformed into data and knowledge systems. However, clinical information is very complex. Its electronic communication requires disciplined approaches to capture, store, deliver and manipulate—including agreement on the ways it will be represented.

> Any meaningful exchange of utterances depends on the prior existence of an agreed set of semantic and syntactic rules. [*ISO TR 9007:1987 Information processing systems—Concepts and terminology for the conceptual schema and the information base*]

Terminologies and classifications form the 'language' of health care, and are fundamental enablers of health information interchange and aggregation. Standard terminology is a pre-requisite to connecting care across settings, professions, jurisdictions and other potential barriers, and to the assimilation of data, information and knowledge around individual patients and clients.

Health terminology refers to the whole sphere of language used in the health system—reference terminologies, clinical terminologies, interface terminologies, controlled vocabularies, term lists and classifications. Health concept representation is a wider field, of which terminology is a component. Health concept representation includes rules and relationships that are used to interpret clinical terms within confined contexts. For example, the context in which an item of clinical information is represented can dramatically affect its meaning or semantic value.

Standardised health terminology is required across the spectrum of information types. These may be defined in a variety of ways, but will include personal health, process of care, and outcomes.

A coherent approach to terminology has the potential to underpin a range of benefits including:

- *Systematic approaches* to managing disparate 'languages' within longitudinal, consolidated records, to realise the benefits of electronic health records (EHRs).
- *Meaningful interpretation of terms from one system by another*, thus avoiding collection of data multiple times for multiple purposes, which is inefficient, costly and risky.

- *Enabling the creation and application of clinical queries and rules*, supporting clinical decision support. Clinical rules can only be applied, in particular by automated systems, if the rules are expressed as concept terms that will have meaning in the way patient data are captured and stored. The benefits of guidelines and other decision support tools will depend on the use of common terms and concepts in both patient records and knowledge support resources.
- *Standardised encoding of information at the point of care*—an integrated approach linking terminologies with classifications that opens the door to greater automation, with the potential to improve both efficiency and data quality.
- *Using consistent terminology* can help to improve clinical outcomes by facilitating patient care processes and by enabling measurement at a variety of levels.
- *Development of intelligent privacy, confidentiality and security systems*. In an environment in which certain data might be masked for certain purposes, protecting consumer privacy can be expected to present significant technical problems. Automated support can be enhanced by applying sophisticated rules, but this depends on a high degree of coherence between the concepts embodied in rules, and those represented in patient data.
- *International trade*—Australia's health software imports and exports should embody internationally standardised health terminology to reduce the costs of customising software.

Current status

Over the past decade, Australia has made substantial and systematic investments in standardising classifications, primarily for statistical and administrative purposes. The deployment of ICD10-AM is a major example. This has been a successful strategy leading to the development of a world-class health and welfare statistics system in Australia. A similar approach is required for clinical terminology.

During 2002, the NHIMG endorsed a Family of Health Classifications for use in Australia.[28] This provides a 'roadmap' for the application of national classifications in Australia.

In contrast, clinical terminology activities are piecemeal, funded from different sources and overlapping in content. There are currently large numbers of clinically-related classification systems, data dictionaries, terminologies, vocabulary lists and code sets.[29]

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[28] The Australian Family of Health and Related Classifications paper and web-based matrix tool are available on the Australian Institute of Health and Welfare website: <http://www.aihw.gov.au/committees/health/nhimg/index.html>.

[29] For example, HL7 has identified over 400 different coding systems currently associated with its messaging standards.

The existence of multiple terminologies and maintenance of maps between them is a burden. Concerted national efforts have been made to develop a national approach.

Standards Australia International is also working towards a standard on the Language of Health Concept Representation.

Future requirements

Ongoing development and implementation of the Family of Health Classifications will require sustained effort. In particular, use of the International Classification of Functioning, Disability and Health (ICF) in Australia needs to be considered.

The ICF has been recognised by the World Health Organization as a reference member of the international family of health classifications, complementary to the International Classification of Diseases (ICD), which focuses on diseases and health conditions. The use of both classifications together is believed to provide a more meaningful and complete picture of the health needs of people and populations.

Health concepts and information must focus on functioning and quality of life, as well as disease, clinical treatment and causes of death.

The ICF has the potential to improve and standardise functional information captured in health records. Such standardised functional information could support the provision of care to individuals, provide a basis for better information-sharing among professionals, and thus underpin evidence-based care, inform service and program planning, and feed into national-level health policy.

The current and impending rapid escalation of electronic interchange is an urgent driver for standardising terminologies. However, the issues are many and complex and the solutions potentially costly. A national strategy must be coordinated and well-researched. Linkages between terminologies and classifications are also important. Transferring information from clinical information systems to its classification is complex and purpose-specific. In many cases it will not result in a simple ‘one-to-one’ mapping, because complex classification rules are applied. However, links between clinical terminologies and classifications potentially have great value and need to be developed and maintained.

The standardisation of coding for allergies and alerts for core clinical systems is an urgent task. Clinical information and electronic health record systems are currently grappling with the complex issues associated with these areas, and there is now a significant window of opportunity for national standardisation.

It is urgent that key stakeholders are engaged and educated about the crucial role of terminology in supporting a wide range of information system functionality. Australia's interests and directions need to be represented in the development of international standards on clinical terminology. The benefits of representation have been demonstrated in the classification arena and in HL7 messaging, where Australia's contribution is well recognised.

In addition, other issues are arising in the realm of health concept representation. For example, standardisation of the way in which clinical data are portrayed and visually presented may have implications for quality, safety and workforce. Also, ensuring that knowledge representation (e.g. in decision-support systems) supports the integration of personal information and knowledge is crucial in realising business value from EHRs and Electronic Decision Support Systems.

4.4 Standards for electronic health records

At present, there are relatively few examples of electronic health records (EHRs) operating on a large scale, let alone nationally, anywhere in the world. However, EHRs are a significant feature in the plans of many health jurisdictions because of their potential to allow 'connected care'.

Over the next five years, Australian and international investment in and deployment of EHRs is expected to increase substantially from the present narrow base. Therefore there is only a limited opportunity to develop and deploy consistent standards to promote interoperability of EHRs.

Regardless of the existence of 'core' EHR services such as Health*Connect*, in the longer term there are likely to be many different EHR systems and services interacting and being accessed at different times for the same client to facilitate continuity of care. As for e-business, these interactions will not necessarily be pre-defined, that is, discovery, recognition and secure transaction capabilities within a highly distributed system will be required. ISO's Reference Model for Open Distributed Processing[30] states that:

> Building (distributed systems) systems … requires an architecture and, because a single engineering solution will not meet all requirements, it must be a flexible architecture. Moreover, since a single vendor will not have all of the answers, it is essential that the architecture, and any functions necessary to implement the

[30] *ISO/IEC 10746-1:1988 Information Technology—Open Distributed Processing—Reference Model Overview*

architecture, be defined in a set of standards, so that multiple vendors can collaborate in the provision of distributed systems. Such standards will enable systems to be built that:

- are open—providing both portability…and interworking…
- are integrated—incorporating various systems and resources into a whole without costly ad-hoc developments…
- are flexible—capable of both evolving and of accommodating the existence and continued operation of legacy systems…
- are modular—allowing parts of a system to be autonomous, but interrelated…
- can be federated—allowing a system to be combined with systems from different administrative or technical domains to achieve a single objective.
- are manageable…
- meet quality of service needs…
- are secure…
- offer transparency—masking from applications the details and the differences in mechanisms used to overcome problems caused by distribution.

In particular, standards will be required to ensure that EHR extracts (record subsets) can be handled in a reliable, meaningful and safe way by source and destination systems, including Electronic Decision Support Systems (EDSS), and that their content can be interpreted uniformly and reliably across traditional health care boundaries.

Strategically, development of Australian EHR standards is leveraging heavily from international activities. This is because at present there are few people in Australia and other countries with practical and especially commercial experience in EHRs, yet standards must be robust and well proven before they are used to underpin the operation of the health system. Therefore collaboration must involve a wider pool of knowledge, skills and experience, even if that requires international travel and other relatively high-cost connections. In fact, Australia is providing strong international leadership in this area as demonstrated in Table 1 below.

Current status

Nationally, the Australian Government Department of Health and Ageing, in conjunction with Standards Australia International, HL7 Australia and the General Practice Computing Group, has undertaken a concerted program to accelerate development of key standards for electronic health records. Considerable progress has been made towards this goal, and towards securing compatibility between the standards offered by different international standards organisations.

At this stage, the only current, published and comprehensive EHR standard is the four-part pre-standard of the European Committee for Standardisation (CEN)—CEN ENV 13606 EHR. It covers extended architecture, domain termlists, distribution rules and messages for the exchange of information.

This pre-standard is being revised to make it more complete and rigorous, to accommodate new requirements, to inter-operate with new specifications such as HL7, and to incorporate a robust means of applying the generic models to individual clinical domains. The overall aim is to produce a durable information architecture for representing the EHR, in order to support the interoperability of systems and components that need to interact with EHR services:

- as discrete systems or as middleware components
- to access, transfer, add or modify health record entries
- via electronic messages or distributed objects
- while preserving the original clinical meaning intended by the author
- while reflecting the confidentiality of that data as intended by the author and patient.

ISO Technical Specification 18308, *Requirements for an Electronic Health Record Architecture*, is a recently published international standard that is expected to be published as an Australian standard (AS ISO 18308-2004). It describes the informational characteristics with which electronic health records should conform. Australia has led international development of the standard.

In addition, the concepts of archetypes and templates are currently gaining considerable momentum within both European and US health informatics standards arenas.

> Archetypes are expressions of clinical and other domain-specific knowledge (e.g. demographics, guidelines) around the complex groups of data that are closely related in an EHR. These formal knowledge artefacts can be used directly by computational systems and used across different information models such as messaging, demographics and the variety of early EHR systems in place. They are written in terms of constraints on allowable configurations of data defined according to the base information models.
>
> Templates are relatively simple knowledge objects which can be used to…:
>
> - specify which archetypes go together for a local or specialist purpose, often corresponding to forms…
> - narrow constraints expressed in archetypes, e.g. reducing allowable term value sets, optionality and so on. (Heard S and Beale T, unpublished)

Australians are at the forefront of the development of archetypes. While relatively new, the archetype concept is expected to underpin new European EHR standards. It has

attracted significant interest within HL7. Further development of these concepts is warranted, as they could be a way of managing complexity and context in clinical data.

Work in progress

The following table provides an overview of EHR standards development internationally. It includes Australian involvement.

Table 1: EHR standardisation program overview

Area	Relevant standards	Status	Implications	Australian Input
What are EHRs?	ISO—Definition, Scope and Context of EHRs.	Under development—scheduled for publication in 2004.	Crucial to defining which health information systems should conform to EHR standards.	Project manager and co-leader (with Japan).
Requirements of EHRs	ISO—Requirements for EHR Architecture.	Published in 2003	Describes the informational characteristics that should be provided within electronic records—facilitating interoperability.	Project manager and primary authors.
	ISO—Architectural Requirements for EHR Systems	Development about to commence, led by USA.	Will describe the technical parameters that should be provided by electronic record systems—facilitating interoperability.	Work already done by in Australia will provide early input. Australian experts expected to be centrally involved in authoring
	HL7—EHR System Functional Model and standard	Balloted as a draft standard for trial. Expected to be full standard by 2006.	Will describe the overall functionality that must be supported by EHR systems authorised by US Medicare/Medicaid services for claim reimbursement purposes—can be adapted for use in Australia for HIC and Health/Medi*Connect* purposes and for GPCG.	Australia co-chairs the HL7 EHR SIG and has provided significant content input.
EHR architecture	CEN—13606 (new five-part standard)	First drafts of first two parts completed. Others under development. Ready for reference implementations.	Planned to progress to ISO standard. Provides technical models upon which to implement interoperable EHRs.	Australia collaborating by invitation. New CEN standard will be based on concepts developed within Australia. Can be tested in HealthConnect.
	HL7 RIM, CDA, Templates	At various stages of adoption as US and international standards.	Implementation of HL7 standards is widespread among major health software vendor, therefore market penetration is relatively high.	Australian experts providing targeted input into strategically important areas of development.
EHR data content	ISO—Emergency Data Set Framework; Health Indicators—Attributes etc.; Clinical data for Health Cards CEN—Archetype Model ASTM—Discharge Referral HL7—Discharge Referral	At various stages of development and adoption. Clinical dataset projects in a range of countries including Australia (e.g. National Health Data Dictionary and Health*Connect* Clinical Information Project) will feed standards development.	Common standards for clinical data, their accompanying context and their representation are crucial to safe communication across the care chain.	Australia leading HL7 discharge referral work and international development of archetype methodologies.
Identification of Key Parties	SAI—Health Care Client Identification ISO—Identification of Subjects of Care	Australian Standard published—to provide basis for development of ISO standard.	Unambiguous identification of key parties required for safe, secure health care delivery.	International project manager
	SAI—Health Care Provider Identification	Australian Standard published in 2004—to provide basis for ISO standard.	Unambiguous identification of key parties required for safe, secure health care delivery.	
Transfer/ interchange of EHR Data	HL7 XML	Published standards available but their application to EHR extracts still being tested/developed	Standards required to protect integrity/accessibility of communicated data.	Australian experts providing targeted input into strategically important areas of development.
Access control	SAI, CEN and ISO—Access Control	Standards in early stages of development	Standards required not only to implement privacy protocols but also to ensure records can be accessed with the correct authorities across disparate systems.	

4.5 Technical integration standards

Uniformity in messaging and communication standards and protocols, and consistent interpretation of these standards across the health sector, are vital to electronic health information interchange. Integration of best-of-breed packages, and messaging between them, will occur in organisations (particularly large ones) for the foreseeable future. Standards are essential for effective messaging, to avoid miscommunication that might lead to adverse health events involving patients, to ease interfacing between applications, and to minimise the costs of developing and supporting interfaces. These issues are magnified between organisations, as the level of 'control' of the Information Management and Information and Communications Technology environment diminishes.

Australia will be operating in a message-based paradigm for the foreseeable future. Although there is a substantial work program in place to continue to develop relevant standards, their consistent implementation needs more attention.

Current status

There are currently two dominant sets of messaging standards in the Australian health sector—UN/EDIFACT for financial applications and Health Level 7 (HL7) for more clinically-related applications. Other standards such as DICOM (Digital Imaging and Communications in Medicine) are particularly applicable to discrete applications such as diagnostic imaging. Standards Australia International is currently developing a Message Usage Handbook that provides recommended applications of the messaging standards. Further development of this message usage model is anticipated in the short to medium term.

HL7 is an ANSI standard used internationally for health care messaging. Australia has made a substantial investment in the development and implementation of HL7 for clinical information and the National Health Information Group has endorsed HL7 as the health messaging standard for clinical purposes. HL7.org provides international standards for inter-system and inter-organisation messaging[31], for decision support[32],

[31] HL7 V2.x and HL7 V3

[32] Arden Syntax and the Guideline Interchange Format (GLIF)

clinical text document mark-up[33], user interface integration[34] as well as a health data model[35] and message development methodology.[36]

The HL7 Version 2 standards are widely implemented in Australia. It is anticipated that successive releases (incorporating higher functionality) will continue at least for the term of this standards framework and probably well beyond. One of the strengths and limitations of HL7 V2 is the number of options it provides. This allows different organisations to implement the standards in different ways, leading to widespread implementation within health care organisations. However, this flexibility also limits the consistency of messaging between them.

HL 7 Version 3 is a new generation, model-based approach to health care systems communications. It includes a universal health care systems and interaction model—the HL7 Reference Information Model (RIM). This singular abstract model may be configured to many specific models that are the basis of message generation. Advanced information modelling tools, a specialised data management tool and XML are the core technologies supporting the implementation of this approach.

There is strong world-wide support for this approach, which is designed to support inter-organisational message consistency (indeed the Message Development framework has become a global ISO standard). However, the actual detailing of the group of V3 standards and the implementations still pose substantial challenges for health care system implementers. Widespread implementation of HL7 V3 in Australia is not anticipated within the term of this standards framework.

Nevertheless, Australia is well placed to influence further development of HL7 V3, particularly in terms of its application to specific domains in which V2 has limitations, such as discharge/referral messaging.

Future requirements

Development

At a national level work needs to be undertaken to determine priority messaging standards required and to set a work program for their development.

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[33] HL7 Clinical Document Architecture (CDA)

[34] Visual Integration Standard (CCOW)

[35] HL7 Reference Information Model (RIM)

[36] Message Development Framework (now ISO Standard 17113)

Implementation

Significant effort is required to encourage greater consistency of HL7 messaging between disparate organisations to facilitate health sector interoperability. In particular, we need greater commitment to the consistent interpretation of messaging protocols between major organisations in those areas where communication between agencies is particularly relevant, such as discharge/referral, orders and results and chronic disease management.

More consistent implementation of messaging and communication standards can be supported by widening and/or easing access to existing standards and protocols, implementation guidelines and expertise and, potentially, through the development of a testing, compliance and certification model.

4.6 Secure information transfer

Agreed standards and infrastrucutre are required to ensure the secure paperless transfer of clinical and administrative information between authorised users. When information is stored, used, transferred and retrieved in such a way that there is confidence that it has not been tampered with or modified other than as authorised, its integrity can be assured.

Appropriate security measures must be implemented wherever health information is collected and stored. Similarly, authentication and non-repudiation measures must also be instituted when information is accessed, transferred or exchanged, to ensure that information is sent to the appropriate person at the correct destination, and that its receipt can be validated (see section 4.7 Authentication and access control).

Current status

National work on standards and infrastructure to enable secure messaging and information transfer is well advanced. However further work is required in relation to their implementation.

Major activities at the national level include the Government Gatekeeper Project, which provides a framework for the use of Public Key Infrastructure (PKI) policies and technology within the Australian Government.

Widespread use of PKI in the health sector was enabled early in 2001 by giving Gatekeeper accreditation to the Health e-Signature Authority (HeSA), an independent

subsidiary of the HIC. HeSA can now issue digital certificates to health care authorities to allow secure communication with other organisations or individuals using PKI.[37] HeSA also conducts essential user identity checks before issuing the digital certificates needed for use in PKI-enabled services.

Programs currently utilising PKI include the Health*Connect* trials, HIC Online Medicare Claiming, Pharmaceutical Benefits Scheme Online, Medi*Connect* and the Coordinated Care Trials. PKI certificates are also being implement to support a number of state-based applications.

Australia has led the development of ISO standards for PKI management. Relevant standards in Australia, include:

- *AS/NZS 7799.2: 2000 Information Security Management.*
- *AS/NZS 17799: 2001 Information Technology—Code of Practice for Information Security Management.*
- *AS4360: 1999 Australian/New Zealand Standard, Risk Management.*
- *HB 228: 2001Guidelines for managing risk in the health care sector.*
- General Practice Computing Group: *IT Security Guidelines for General Practitioners*, April 2001; and *IT Security Guidelines for IT Support Officers*, April 2001.
- *ACSI 33: 2000 Defence Signals Directorate, Risk Management, Handbook 3*, Australian Communications Electronic Security Instruction 33, version 1.0: <http://www.dsd.gov.ay/infosec/acsi33/HB3.pdf>.
- The Protective Security Manual, Attorney-General's Department, Commonwealth of Australia.
- Standards Australia International has recently published *Security Implementation: HB 174-2003—Implementation Guide for Information Security in the Health Sector*. This handbook aims to assist small to medium-sized health care organisations in updating their security guidelines. It includes information about the implementation of security policies, use of risk assessment tools, and physical, personnel, data protection and access control measures.

Standards Australia International has also developed a workplan incorporating standards required for secure radiology, pathology, hospital discharge summaries, medication and immunisation messaging.

[37] Department of Health and Ageing, *Health Online* 2nd Edition, September 2001, p 29

Future requirements

Recommendations for a model of secure messaging and health information transfer across the health sector, including assessment of current standards and infrastructure, should be undertaken.

A communications and information dissemination program is required to raise awareness about security issues and the standards and resources available to address them.

4.7 Authentication and access control

Authentication and access control measures manage access to systems' resources based on information about the user. The principles that underlie these measures include confidentiality, that is information should only be accessible and available to those that have authorised access, and availability, that is information is accessible to authorised individuals when and where required.

Prerequisites for successful authentication and access control measures include patient and provider identification standards and directories, privacy and consent frameworks and standards for secure information transfer. Therefore implementation of a national level authentication structure will not be feasible until progress has been made in these areas. However, given the considerable complexities involved in establishing authentication and access control measures as well as the relatively untested nature of the technology (for example smartcards and biometrics) it is recommended that work in this area be commenced.

Future requirements

Work needs to be undertaken in the near future to:

- Develop standards including national business rules, roles-based levels of authorisation, requirements for access to and screening out of health information and physical validation techniques

4.8 Data for research and administration

At every level of the health system, consumers, practitioners, managers, policy makers, academics and the general public are seeking more information about health and health services for better decision making and, increasingly, for greater accountability. These pressures result in significant demands to collect, collate and analyse vast quantities of health data.

This plan does not address the issues related to the content of statistical collections as the management of these is well looked after via existing governance arrangements. *Health Information Development Priorities*, published by the National Health Information Management Group in September 2002, provides clear direction for the further development of Australia's statistical information base.

Australian governments at national and state/territory levels already invest heavily in health information and the associated infrastructure. However, additional requirements and opportunities are constantly arising. Most importantly, the move towards electronic health records has significant implications for the use of the associated data for policy, planning, research and administrative uses. If secondary data from disparate sources are to be collected and analysed to better inform decisions regarding the health system, standards are required for representing and using them.

If data required for secondary information purposes is not derivable from electronic health records and other e-health initiatives there will be significant additional costs associated with establishing parallel data collection systems and resulting products that may not be integratable.

Current status

Health information management

The National Health Information Agreement (NHIA) is the cornerstone of coordinated national health information development in Australia. The NHIA ensures that the collection, compilation and interpretation of nationally relevant health information (mainly centred on the National Minimum Data Sets) is appropriate and carried out efficiently. This requires agreement on definitions, standards and rules of collection of information and on guidelines for the coordination of access, interpretation and publication of national health information.[38]

[38] Australian Institute of Health and Welfare (2003) 'National Health Information Management Group', viewed 29 July 2003, <http://www.aihw.gov.au/committees/health/nhimg/index.html>.

Since its introduction in 1993, the NHIA has been an integral component of the development of a high-quality, broad-ranging national collection of health statistics. A range of publications based on the comprehensive statistical collection is available from the Australian Institute of Health and Welfare (AIHW).[39]

The *National Health Data Dictionary* is the authoritative source of national health data definitions. It contains definitions of data elements (or discrete items of information) that have been described according to standard rules, and endorsed as the national standard to apply whenever this information is collected in the health field. In recognition of the dictionary's potential to provide a repository for a broader range of definitions, efforts have been made to include data definitions relevant to electronic health records databases and messaging systems. Clinical datasets have been added including cardiovascular clinical data, cancer registries data, diabetes clinical data and others are currently under consideration.

Secondary uses of data and data linkage

Consideration is being given at the national level to developing policy regarding secondary uses of data that become available through e-health initiatives. The Department of Health and Ageing is considering processes that would allow it to work with interested and affected stakeholders to develop national policy approaches that would guide the public and private sector in the acceptable, lawful and best-practice uses of secondary health data. The project aims to develop policy that would allow the use of secondary data to enhance the quality, coordination and planning of health services while maintaining privacy interests and public confidence.[40]

Data linkage is potentially a powerful tool for maximising the public value of data, but is clearly a sensitive issue. The Statistical Information Management Committee has responsibility for issues in health and statistical dataset management raised by unique patient identification, as well as principles for using identifiers for linkage between statistical collections. A recent policy paper recommends that agencies managing or acting as custodians for statistical collections that include unique identifiers adopt business rules and technical barriers that restrict the capacity of users to match the identifier to the individual's name.[41] Precise business rules may differ from collection to collection.

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[39] Australian Institute of Health and Welfare 'Publications', 2003, viewed 14 August 2003, <http://www.aihw.gov.au/publications/index.cfm>.

[40] DoHA, Secondary Uses of Data: Options Paper, 2003 (unpublished).

[41] National Health Information Management Group, *Issues for the use of unique patient identifiers in statistical collections*, September 2001 <http://www.aihw.gov.au/committees/health/nhimg/index.html>.

Future requirements

Existing governance processes for statistical data collection and development programs are well established and have a history of success.

However, reducing the current need to collect and collate information specifically for reporting purposes poses an important challenge. Strategies are required to enable vital statistical information to be derived from data collected routinely through administrative and clinical information systems. This will require coordinated information management based on both the strong discipline of data developers and their broad vision.

As a starting point, it needs to be agreed how information held in administrative and clinical information systems will be collected for statistical and policy purposes. Standards relating to the privacy and security aspects of using that data are also required.

Other matters to be considered are ownership of ownership, guidelines for 'data sharing', and rationalising and harmonising current datasets nationally.

Further work is required to develop a model code of practice for custodians of health data collections.

4.8.1 Metadata management

Metadata may be defined as 'data that define and describe other data or processes'.[42] For systems to be truly open, data must be portable and able to be shared within and among these systems, which may span localised and distributed networks. If data are to be shared, both users and owners must have a common understanding of their meaning, representation, and identification. To understand the meaning of any data, the descriptions of the data—the metadata—must be comprehensive and available to the users.

Australia's major and best-known health metadata repositories are the National Health Data Dictionary (NHDD) and AIHW Knowledgebase. The current national metadata structures for health, community services and housing assistance are implemented in the AIHW Knowledgebase, and published through the national data dictionaries.[43]

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[42] ISO/IEC 11179 *Information technology—Specification and standardization of data elements*

[43]National Health Data Committee, *National Health Data Dictionary*, Version 12, 2003, AIHW Cat. No. HWI 43
Australian Institute of Health and Welfare, *National Community Services Data Dictionary*, Version 2, 2000 AIHW Cat. No. HWI 27
Australian Institute of Health and Welfare, *National Housing Assistance Data Dictionary*, Version 2, 2003, AIHW Cat. No. HOU 89.

Developments in the past few years, particularly in the health sector, have begun to expand the boundaries of the national data dictionaries. In 2002, the Australian Health Ministers' Advisory Council endorsed the dictionary as the authoritative source of national standard definitions for use in clinical care delivery. Matters such as the definition of data for electronic health records, the national Health*Connect* project, and the definition of clinical care datasets for specific purposes, are expanding the scope of the national data dictionaries beyond their initial focus on national statistical reporting, although this remains a key focus.

However, there are other metadata repositories, for example:

- HL7 has repositories of metadata for its templates, claims attachments (specifications of clinical summaries) and other aspects of health communication
- the open EHR Foundation (a not-for-profit foundation seeking to advance electronic health record interoperability) has a metadata repository for its archetypes[44]
- metadata for a range of other clinical and administrative information purposes can be accessed online, including the national data dictionaries for other countries.

It is therefore relatively easy for system developers to 'shop around' for metadata to fit their purpose, although this has the potential to compromise national interoperability.

The primary Australian requirement for health, community services and housing metadata is to be able to define data elements and their use within specific datasets or collections. This requires national consistency and accuracy of communication and interpretation, in either a service provision setting (such as clinical care) or for statistical analysis and reporting.

Current status

The AIHW Knowledgebase is currently being redesigned. Changes may be significant, but should be seen as a progression, rather than a significant departure, from the previous directions. Greater formalisation may be needed than has previously been the case, to cater for the emerging needs of the next decade. Current metadata structures are based on a 1997 design that was derived largely from the 1993 version of the ISO/IEC 11179 international standard for the specification and standardisation of data elements. The Knowledgebase redevelopment project coincides with the availability of a 2003 version of the ISO/IEC 11179 standard (now a standard for metadata registries), and provides the opportunity to enhance the underlying structures of Australia's national metadata for health, community services and housing assistance.

[44] See Section 4.5.1 for information about templates and archetypes.

Current metadata are developed by nationally recognised groups with an interest in specific application areas and considered by national data committees[45] with responsibilities for national data standards. Decisions need to be made whether to include the new metadata, merge the proposed new item with the existing one, or create a new data element based on the new material. Aspects of these issues may include definitions, data domains (valid values), layouts or formats for exchange, or data collection methods.

However, there are very large and increasing numbers of 'local' clinical systems, often designed by clinicians themselves using locally developed metadata. Without standardisation of data representation, these systems, which may end up as integral to patient care, cannot economically interoperate with systems supplying to other providers in the service delivery business chain.

Future requirements

Greater guidance for system developers and users, including clinicians, on the requirements for effective specification of data elements and other metadata is required. This includes not only underlying standards (currently being developed by Standards Australia International in partnership with AIHW), but also information and education programs. It also requires:

- a clinical metadata governance program, endorsed and supported by the professions
- easier access to existing, authoritative metadata
- appropriately qualified linkages to complementary metadata as needed.

[45] National Health Data Committee (NHDC), National Community Services Data Committee (NCSDC) and National Housing Assistance Data Committee (NHADC)

5 Support for clinical care

The key drivers of changes to clinical practice are:

- increasing emphasis on safety, quality and evidence bases
- rapid advancement of clinical technologies
- rising consumer awareness and expectations
- current and anticipated workforce shortages
- demands for more integrated or ‘connected’ care.

These directions are manifest across the Australian health sector via the acquisition and implementation of more modern patient administration systems, point-of-care clinical information systems, and the rapidly increasing use of clinical software on medical desktops. Advances in web services and other approaches to reusable technology, and the increasing availability of broadband, hold potential for the rapid development and diffusion of clinical technologies. However, the greatest potential for systemic enhancement in clinical practice is likely to lie in the capacity to integrate and analyse data, information and knowledge from disparate sources and systems in a safe, reliable and economical way.

Development of standards and systems to support clinical care is inextricably linked with the practice and norms of clinical care itself. Improved safety and quality in health care is likely to require significantly greater standardisation in the delivery of health care service. This will drive the standardisation of health information. Clinical leadership in developing clinical infostructure is therefore a critical success factor.

Priorities for the development of health infostructure to support clinical practice include:

- clinical governance and leadership
- safety and quality of clinical systems
- standards for electronic decision support systems
- e-medication management
- standards for electronic communication and interfacing.

5.1 Clinical governance and leadership

There is only limited representation of clinicians in standard setting activities. Although the General Practice Computing Group (GPCG) has made standardisation a priority and supported the involvement of general practitioners in core activities, the contribution of medical specialists, nurses and allied health professionals has tended to be noticeably lower. This is likely to become a problem as standardisation extends into clinical IM&ICT—while data and technical standards might appear to be abstractions, in reality they are inextricably linked with clinical processes and the duty of care of health professionals.

Standardisation will both influence and be affected by changes in clinical workflows. The number and importance of clinically relevant information standards are increasing, commensurate with greater investment in clinical systems. Unless clinicians are engaged in standardisation, the prospects of implementing standards successfully will be threatened.

Clinical representation is critical to the entire health information standardisation agenda, for example in privacy and confidentiality, identification of major parties, development and implementation of a framework for managing clinical data for service delivery purposes and the setting of national directions for clinical terminologies. Each of the following national standardisation strategies requires substantial clinical input:

- standards for electronic decision support systems will be a determinant of the way clinical knowledge is represented and presented in clinical contexts
- the development of safety standards for clinical systems must be guided by clinical assessments of risk, clinical practice protocols and clinical workflow
- safe clinical practice and clinical mobility, the primary motivators for standards for electronic communication and interfacing, are best directed by clinicians.

Potential strategies for clinician engagement include:

- engaging professional colleges in key standardisation activities
- using clinical networks established for other related purposes
- workshops that target clinicians, possibly appended to or embedded in events that clinicians would be attending anyway
- engaging with clinical training schools
- where possible, removing barriers to participation.

5.2 Standards for electronic decision support systems

The National Electronic Decision Support Task Force (NEDST) Report, published in January 2003, noted that there is increasing evidence that electronic decision support systems can improve the quality, safety and efficiency of health care. The report made recommendations aimed at developing a national approach to electronic decision support in Australia.[46] These included the need to establish a comprehensive standards framework to enable the widespread adoption of electronic decision support systems (EDSS) to assist with best practice decision making at the point of care.

Current status

Following the release of the taskforce's report, a high-level Electronic Decision Support Strategy meeting was held in July 2003 to progress the taskforce's recommendations by developing an agreed national program of work. This work program is now being progressed by various organisations and coordinated through the National Electronic Decision Support Steering Committee. The committee aims to bring a national focus to Electronic Decision Support (EDS) issues by providing overall direction and coordination of policy and projects to ensure that, ultimately, systems make a difference to the quality of health care.

The steering committee is responsible for:

- providing advice and guidance regarding the further development of electronic decision support policy and project work
- maintaining close working relationships with other related working groups or organizations that are progressing specific areas of EDS work
- disseminating information about EDS policy and project work.

The steering committee is working closely with groups developing EDS standards and related tools to ensure a nationally consistent approach. Within Australia, standards developments in relation to EDS have included:

- work by HL7 Australia to progress the EDSS agenda, including a national summit focusing on decision support
- the establishment by the General Practice Computing Group (GPCG) of an Interoperability and Decision Support Working Group, which is undertaking and sponsoring action research.

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[46] National Electronic Decision Support Taskforce, *NEDST Report*, Commonwealth of Australia. January 2003, p34–5.

Internationally, HL7 is also active in some aspects of electronic decision support standards, as is the National Health Service in the United Kingdom.

A number of knowledge representation tools and standards have been developed internationally. These include:

- Guideline Interchange Format (GLIF incorporating Arden Syntax)
- Guideline Elements Model (GEM)
- PROforma
- Prodigy
- Asbru: a global ontology for guideline-application tasks

Future requirements

The widespread deployment of sophisticated EDSS is expected to be slower than that of EHRs. The window of opportunity for EDSS standards is therefore likely to be longer overall than for EHRs (although inevitably, there will be specific areas where this is not the case).

The major specific standards requirement for EDSS is for knowledge representation standards. The representation of clinical practice guidelines, rules, protocols and reference materials in standardised ways will allow the development and sharing of knowledge in computable formats. The lack of knowledge currently available in a format that allows direct integration into software is a major barrier to the development of electronic decision support tools in health.

Some of the standards required for electronic decision support systems are also fundamental to other e-health initiatives. For example, standardised reference terminologies are required, such as those for drug information to enable the development of drug-disease interaction systems (see section 4.3.2 ‘Health concept representation’).

Work is also required to establish user requirements for EDSS to inform the development of associated technical standards.

5.3 Safety and quality of clinical systems

There has been considerable work, internationally and domestically, to develop standards for computer-controlled safety-related systems. However, these standards have not yet specifically addressed the needs of clinical information systems, including those incorporating decision support.

The National Electronic Decision Support Taskforce identified safety and quality concerns around standardisation and compatibility of electronic decision support systems as a significant barrier to their widespread use.

> Few electronic decision support systems in operation in Australia use standard quality processes or quality testing to ensure that the systems perform correctly. Consequently, there is a general lack of testing of the content, internal processing, content delivery and production processes of the systems. End to end testing and evaluation is required to ensure the quality and safety of the systems.[47]

As information flow and electronic decision support are integrated with clinical workflow, it will become increasingly difficult to separate the delivery of health care from the information and knowledge accessed through clinical information systems. As people place greater responsibilities and trust in our health information systems, the systems themselves must be regarded as part of the overall safety and quality analysis of the health care systems adopted. Safety and quality standards provide guidance on reducing exposures to risk to acceptable levels.

A goal of electronic decision support and other clinical information systems should therefore be to *do no harm*—a basic tenet of health care.

Current status

A range of international and Australian standards exists for safety systems, electronic medical requirements, paper-based records, record management and software development. For example, safety standards exist for:

- electrotechnical computer based safety-related systems
- software in defence systems
- digital computers for nuclear power generating stations
- mass transport systems such as aeronautical, trains and shipping
- guide for software quality assurance planning

[47] National Electronic Decision Support Taskforce *Electronic Decision Support for Australia's Health Sector*. Commonwealth of Australia. 2003, p.58

- standard software unit testing, verification and validation plans
- occupational health and safety management systems
- medical electrical equipment
- software development.

However, it appears that the specific safety and software quality aspects of clinical information systems have not yet been rigorously analysed.

5.4 e-Medication management

The therapeutic (medication) chain consists of three main components: electronic prescribing and dispensing (both of which are intrinsically linked to decision support), and medication administration.

Better medication management is likely to deliver significant early returns on health IM&ICT investment, both in efficiency (pharmacy supply chain management) and effectiveness (medication outcomes). Development of e-pharmacy standards are a high priority internationally, and this should be reflected in Australia's efforts.

Current status

The many medication-related initiatives at local and national levels in Australia reflect the importance of this aspect of e-health to clinical safety and in financial terms.

The planned development of a central medicines data repository is a critical piece of e-health infostructure. It will provide an authoritative, central source of core data on medicines and provide an important building block for the effective implementation of major government-funded health projects, including Health*Connect*. This initiative is discussed further in section 4.2.2.

An e-Pharmacy working group is being initiated within ISO, reflecting current international interest in this health sub-sector. A conceptual model for e-pharmacy is to be developed, led by the United Kingdom. This will provide a framework for e-pharmacy standards, and enable an inventory of these to be compiled.

Future requirements

Significant safety, quality and efficiency improvements across the health sector are possible through the eventual introduction of a fully electronic medication management cycle.

To support this a comprehensive work program to develop, revise and implement national standards for e-medication management is required. It will be useful to develop and adopt national electronic prescribing standards because inconsistent standards are currently being used, for example, in point-of-care clinical systems.

E-prescribing is intrinsically linked to electronic decision support. Standards for decision support systems (discussed in section 5.4) are therefore also relevant.

5.5 Standards for electronic communication and interfacing

Delivering health care services is a complex and multi-faceted business. It relies on many different communications among health care providers and with clients, across a variety of settings. For example, depending on the situation, communications between health care providers and clients might be verbal or via email, and might involve mobile computing and/or monitoring devices, and/or video consultations. There is evidence that communication errors are a significant cause of adverse events in our health system.[48] As the range and methods of communicating health information increase, so does the potential for error. Therefore, it is desirable to standardise the content and presentation of communication regarding health information.

While the effectiveness and efficiency of interfaces between humans and machines are critical to clinical workflows, this area of health informatics is likely to involve a series of targeted projects closely linked to system implementations, rather than a concerted program. The initial emphasis should be on evaluation and learning.

Current status

While standards for communication and interfacing are in the early stages of development, some specific developments are worth mentioning.

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[48] R Wilson, W Runciman, R Gibberd et al. The Quality in Australian Health Care Study, *Medical Journal of Australia* 163; 458–471.

Email

Individual organisations, both nationally and internationally, are developing policies for using email in provider-to-provider and provider-to-patient communication.

The American Society for Testing and Materials has published a standard on Personal (Consumer) Health Record—Specification for the Relationship between a Person and a Supplier of Electronic Personal Health Record. The American Medical Informatics Association has undertaken development of guidelines (including advice on developing site specific guidelines) for the use of clinic–patient email. A number of other research projects have also addressed this issue.[49,50,51]

Mobile computing

A range of mobile and wireless computing devices is being used on a trial or permanent basis across the health system. For example, mobile laptop computers or terminals connected to central information systems are being used in hospitals to keep patient records, in some cases completely replacing paper records. Medical files and test results are being communicated on hand-held computing devices, and clinical staff are communicating via voice transfer devices fixed to their lapels.

An ISO ad-hoc group on mobile/wireless computing devices has worked on technical papers relating to the use of these devices and their connection to centralised information systems, and the related standards issues.

Future requirements

The following areas have been identified as needing greater standardisation:

- *Email communication.* This is widely used in the health sector, including for transferring clinical information. Standardising this information should be considered, particularly in the context of incorporating it into medical records, including electronic health records (EHRs).[52]
- *Human–computer interface.* The interface between humans and computers is an important element in determining the usability and utility of health information systems. Computer interfaces therefore need to be standardised to allow health care

[49] B Kane & DZ Sands, 'Guidelines for the clinical use of electronic mail with patients', *Journal of the AMIA*, 5:1, 1998, 104–111.

[50] Prady et al. 'Expanding the guidelines for electronic communications with patients: Application to a specific tool', *Journal of the AMIA* 8:4, 2001, 344–348.

[51] IN Sarkar & J Starren, 'Desiderata for Personal Electronic Communication in Clinical Systems', *Journal of the AMIA* 9:3 2002, 209–216.

[52] E Hovenga, IT/14 *Email Communication Project: Discussion Paper*, June 2003, (unpublished)

providers to access, use and understand any information system, easily and without specific training. Work should be undertaken to determine and develop standardised approaches.

- *Interoperability.* Additional work is needed nationally on determining the range of mobile and wireless computing devices and the standards required to facilitate their interoperability with other information systems.
- *Natural language interfaces.* In the future, it may be necessary to create software with knowledge of human language to further improve human–machine interaction. Natural language interfaces, using either written or verbal input, would enable users to communicate with the computer using simple English commands, for example, to query databases and to retrieve and input other types of information. These types of interfaces would have a significant impact on system acceptability and useability.

6 Empowering consumers and communities

Information technology and consumer health informatics are becoming integral to the modern concept of public health and national health care policies. Technology has increased the amount of health information available to the public, allowing consumers to become better educated and more involved in their own health care. Technology has also enabled new access pathways for consumers, for example, through call centres.

> The increasing availability of interactive information that is accessible to consumers, most notably through the internet and related technologies such as digital television and web television, coincides with the desire of most consumers to assume more responsibility for their health and the pressures of costs on health systems, the emphasis on the health of populations and on prevention, and the growing desire of health professionals to realise the potential of patients and their families. Information technology and consumerism are synergistic forces that promote an 'information age healthcare system' in which consumers can, ideally, use information technology to gain access to information and control their own health care, thereby utilising healthcare resources more efficiently. Today's 'cyberdocs' on the internet may tomorrow turn into more trustworthy 'cyberlicensed' professionals (who are specially trained and whose practice is monitored for quality) counselling patients online; … Additionally, intelligent informatics applications can channel the floods of health information reaching consumers, can help patients attain a healthy balance between self reliance and seeking professional help, and can also help balance responsiveness to consumers and the management of demand, and virtual and face to face interaction. (G Eysenbach *BMJ* 320, 2000, 1713–1716)

Privacy and consent issues are very important to health consumers and are discussed in detail in chapter 4. *Health Online* also identifies the following key themes for national IM&ICT development to support the empowerment of consumers in health care:

- consumer access to health information
- consumer access to online services
- accreditation of consumer information.

In addition, as for clinical care, development of standards and systems to provide this support are inextricably linked with the practice and norms of health service delivery. Engaging consumers in the development of infostructure is therefore critical to success.

Priorities for the development of health infostructure in order to support clinical practice include:

- engaging consumers in standard setting
- addressing privacy and confidentiality issues (chapter 4)
- accrediting health information resources
- providing consumer-oriented online services.

6.1 Consumer engagement in standard setting

While the intent to communicate with, involve and engage consumers in standards development is not in dispute, the reality is that the mechanisms, networks and processes employed have had limited success in eliciting the points of view of health consumers. Other than the consumer involvement in major consultation processes, such as the consultation undertaken by the Australian Department of Health and Ageing regarding privacy, filling specific roles for consumer representatives has fallen to a few individuals. To date, consumers have not been formally represented on some peak standards bodies.

Provider/consumer partnerships and health self-management are dominant themes in strategic planning for health services. Health information is a fundamental enabler of such strategies, yet processes to standardise health information tend to focus on providers. Given the lead times required to develop and implement standards, greater input by consumers is both urgent and important.

New approaches must be considered to ensure that the means of achieving improvements in the health system are consistent with broad-based consumer values and points of view. Such approaches may include:

- accessing and building skills within state and territory networks of health consumers
- accessing the views of non-government organisations working closely with defined health consumer groups
- actively seeking people with health informatics skills and knowledge who are not currently working (including students), or informatics professionals from other professions who may be willing to comment on health-related issues
- specifically targeting consumer-oriented groups via consultation processes, as many of these processes are more likely to elicit industry and provider responses, given the communication channels employed.

6.2 Accreditation of health information resources

Health Online states that:

> The importance of accurate, reliable health information for consumers is well recognised. The NHMRC Guidelines … and Health*Insite* projects are each designed to support the development of such material. A clear accreditation process for consumer material would be invaluable for health information providers. (*Health Online*, p.75)

The range of health and disease-specific information available on the Internet and from other public sources has the potential to confuse consumers and to limit the value of the information provided. The development of processes, governance structures and mechanisms to support the accreditation of consumer health information would be valuable for both the information providers and for consumers.

Current status

The National Health and Medical Research Council has published the guide *How to present the evidence for consumers: Preparation of consumer publications*, for use in preparing clinical guidelines.

The Australian Government's Health*Insite* project, South Australia's HealthySA and Victoria's Better Health Channel have provided authoritative sources of health information online to benefit consumers.

Internationally, the United Kingdom has established the NHS Online Direct service and in the United States, the National Institutes of Health and National Library of Medicine jointly administer Medline Plus, a peer-reviewed and recommended source of health information for consumers. The United States has also established the healthfinder-registered website, which incorporates both reliable sources of health information and services to locate health service providers.[53]

The American Accreditation HealthCare Commission, Inc. (URAC) has published standards for the accreditation of information available on health websites. The standards relate to the disclosures required by publishers, the quality and source of the health information provided, sponsorship and the collection of personal health information.[54]

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[53] <http://www.nlm.nih.gov/medlineplus>.

[54] American Accreditation HealthCare Commission, Health Web Site Standards Version 1.0. 2001.

MedCIRCLE is a collaboration of European health subject gateways or rating services for health information on the Internet. Its objective is to develop and promote technologies able to guide consumers to reliable health information on the Internet, to establish a global web of trust for networked health information, and to empower consumers to 'filter' or positively select high quality health information on the web.[55]

6.3 Consumer-oriented online services

The widespread availability of health-related information is empowering consumers in terms of their own health. However, there is work to be done on standardisation related to interactive sources of information for consumers about health services and issues.

For example, the introduction of electronic health records (EHRs) will provide consumers with the opportunity to access their own health information and to interact with the health record. There will also be potential to link online records with health resources tailored to a patient's condition or diagnoses.

In addition, service locators and health call centres to service consumers are growing in popularity and use, and it is likely they will to continue to do so. Health call centres have the potential to provide quality health service delivery, primarily by addressing access and equity issues.

While monitoring and decision support tools have traditionally been used to aid clinicians in decision making, there is a growing trend for consumers to use such tools in self diagnosis or to answer questions about the management of their own health. For example, given the symptoms they are experiencing, should they consult a clinician?

Another consumer-related development is the use of decision aids to assist in clinical decision making based on consumer preferences, values and choices. For example, one treatment option may be chosen over another, based on a consumer preference for a particular outcome.

Current status

Australia is currently considering the development of standards relating to health call centres, including information and informatics standards. Funding has been provided to facilitate collaborative arrangements between states and territories and the Australian

[55] About MedCIRCLE, viewed at <http://www.medcircle.org>, August 2003.

Government to identify best-practice models and develop national standards and protocols for areas including:

- best practice models and service delivery
- a national system of quality-based accreditation
- a national evaluation framework
- examining viability of a national telephone access line
- developing infrastructure
- stakeholder and consumer involvement.

Some Australian states have established health finders that incorporate facilities to search for a health care provider by location, specialty or health condition.

Future requirements

As consumers are increasingly encouraged to rely on service locaters or call centres for information, standards will be required to ensure that the services and information provided are accurate, up-to-date, and interoperable with other systems.

Standards for other interactive, health information resources for consumers should also be considered, particularly as they relate to consumer access to EHRs.

7 Health system efficiency and sustainability

Challenges such as accelerating costs associated with new clinical technologies, increasing specialisation, rising community expectations, the ageing population and the commensurate increasing incidence of chronic illness, and health workforce shortages, can be expected to continue pressures on resources in the Australian health system for the foreseeable future.

Priorities for the development of health infostructure to support a more efficient and sustainable health system include:

- national health information architecture
- e-commerce
- national performance framework.

7.1 Health information architecture

An enterprise can be defined as:

> An organisation (or cross-organisational entity) supporting a defined business scope and mission. An enterprise includes interdependent resources (people, organisations, and technology) that must coordinate their functions and share information in support of a common mission (or set of related missions).[56]

If we want national electronic health information interchange, it will be necessary to describe current technical and information architectures across the health 'enterprise', how they are used and their interactions. In addition, we will require methods of describing desired architectures and information flows to allow future developments to fit within an overall framework for health information in Australia.

The system and information designs and interactions that feature in most health information systems are complex. This underpins the need for a new approach to system-wide architecture planning to optimise the flow of information across clinical, administrative and financial domains. As system developers and implementers extend applications or adopt new architecture concepts, such as establishing a national

[56] Health*Connect* business architecture

connections or developing a National Health Information Model, it becomes increasingly important that we have infostructure able to achieve interoperability among technologies and designs and to identify the pathways for effective information flows.

Current status

In the United States, the Federal Enterprise Architecture Framework (FEAF) was established in 1999 to facilitate shared development of common processes and information by federal agencies. The FEAF is essentially a guide for collecting common architecture information and building a repository to store that information.[57]

The Health*Connect* architectures encompass a business architecture, which describes what the system needs to be able to do, and a systems architecture (based on the FEAF), which describes how the business architecture can be implemented in terms of data, applications and current technology.

Documenting the Health*Connect* architecture is a key component of the research and development phase of Health*Connect*. The first stage was to prepare the business architecture, which describes what Health*Connect* would need to be able to do to meet its objectives. Version 1.0 of the business architecture was finalised in April 2003. Version 1.9 was released for public comment in November 2004.

Once the business architecture was well advanced, work began on the systems architecture. This describes how components of Health*Connect* can be implemented most effectively in terms of data, application and technology, in order to meet the requirements of the business architecture. A draft version of the systems architecture was released for public comment in October 2003.

A number of state health departments have developed health enterprise architectures, encompassing elements of business, information, applications and technical architecture, which provides a basis for assessing the current situation and defines target architectures, as well as the migration strategies through which targets can be achieved.

Future requirements

Ideally, the use of architectural approaches in describing and designing systems across enterprises should enable flexibility as well as specificity.

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[57] <http://government.popkin.com/frameworks/feaf.htm>.

An enterprise architecture describes what an organisation or enterprise does, how it does it, and how information technology supports it. It is proposed that a long-term goal for the health system should be a national enterprise architecture that will:

- support the identification of opportunities to collaborate on, consolidate, and integrate current and planned initiatives across jurisdictions and the public and private sectors
- improve decisions about IT system investments
- align IT support with business objectives and drivers
- improve interoperability between processes and systems
- support realisation of economies of scale.

As a first step in moving towards a national enterprise architecture approach to health information systems, development strategies could focus on:

- defining the national health 'enterprise'
- considering the goals of a target national health enterprise architecture
- developing a national statement of principles to guide the development of health information systems and architectures.

Consideration should also be given to:

- an assessment of appropriate tools to be employed in developing a national enterprise architecture
- development of a strategy to raise awareness about the need for a national health enterprise architecture and to engage people in it
- the governance structures required to develop and maintain a national health enterprise architecture.

7.2 Improving business practice

The adoption of electronic commerce within the health care sector offers great opportunities to substantially reduce costs across both supply and distribution chains and to improve client services through faster turnaround. There is tremendous potential for e-commerce to reduce the costs associated with all business processes, including inventories, procurement and distribution of products.

Current priorities for health information standards and infostructure include:

- electronic business XML
- electronic supply chains
- electronic finance and billing.

7.2.1 e-Business XML (ebXML)

All industries, including health, can potentially benefit from the ability for XML[58] to be used consistently for exchanging all electronic business data, through the exchange of XML-based messages and documents among enterprises of any size and from any industry. There are international initiatives to coordinate efforts across a range of industries to avoid duplication and confusion where possible and to maximise the opportunities that XML offers, as a vendor-neutral, well-supported, and open standard to the market.[59]

7.2.2 Electronic supply chains

Re-engineering hospital supply chains through the better use of technology creates an opportunity for improved heath care via direct reductions in cost and resource efficiencies. *The National Action Plan to Facilitate the Take-Up of E-commerce in Australian Hospital Supply Chains* was published in October 2001.[60] It identifies key building blocks to support efficient electronic supply chains. These include the need to develop appropriate standards for electronic commerce and messaging in the health care sector and to establish an electronic catalogue for heath care products.

7.2.3 Electronic finance and billing

There are several current initiatives to use standards for e-health to improve administrative services in both the private and public arenas, including electronic billing, claiming and eligibility checking. The majority of these initiatives are being undertaken by the Health Insurance Commission (HIC), which is responsible for administration of Medicare and the Pharmaceutical Benefits Scheme.

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[58] XML (Extensible Markup Language) is a flexible way to create common information formats and share both the format and the data on the World Wide Web, intranets, and elsewhere.

[59] UN Centre for Trade Facilitation & Electronic Business (UN/CEFACT) and Organisation for Advancement of Structured Information Standards (OASIS) (xml.coverpages.org/ebXML.html)

[60] <http://www.health.gov.au/healthonline/suppchn.htm>.

7.2.4 Current status

Standards Australia International's Health Informatics Committee is establishing technical sub-committees to work on standards for supply chain messaging and product identification and financial messaging.

A range of published standards is already available, including:

- UN/EDIFACT (United Nations Electronic Data Interchange for Finance, Administration, Commerce and Transport) for financial messages.
- MEDRUC (Medical Resource Usage and Cost) is the United Nations Standard Message in the UN/EDIFACT directory Version 97.b for health care reimbursement claims.
- REMADV (Remittance Advice Messaging—UN/EDIFACT standard).
- AS4937-2002 Exchange of claim and related information. This is an over-arching business model, identifying interchanges related to finance and billing in the sector.
- AS4705-2003 (Australian Standard message for simplified and no gaps medical claims). This is a standard message specification for the exchange of claims and claim responses for medical claims for privately insured in-patients.
- AS5023.1, 2, 3 and 4. (Health Supply Chain Messaging). This standard comprises 16 UN/EDIFACT message implementation guidelines for health, providing messaging guidelines for electronic hospital supply chains in order to support the formal collection, storage and transmission of data within hospital electronic supply chains. It is anticipated that this standard will reduce the number of different systems needed to transact business, providing a framework for trading partners to share information, irrespective of organisational changes or differences. (Parts 5 and 6 are also to be published in 2004).

Work is also proceeding on the following standards:

- Australian standard messaging for checking financial eligibility of insured patients. This will enable institutional or individual health care providers to obtain financial eligibility information on patients from funding institutions before or at the time of admission or treatment.
- Australian standard for hospital claims. This is about the migration of the industry-endorsed Australian hospital claim format to a message syntax that is more widely endorsed. The electronic hospital claim (HCLM) is designed to be sent between a hospital and a health insurer for in-hospital services not involving a medical practitioner (e.g. accommodation services, theatre services, prostheses, drugs and other consumables, allied health services.)
- HIC simplified billing. This has been developed to simplify medical billing and payment arrangements for private patients after in-hospital care. It is currently using

UN/EDIFACT, MEDRUC, REMADV and CONTROL messages. HIC also transmits the gap component of hospital medical claims from HIC to participating private health finds, and is working on a private health fund eligibility checking message format.

7.2.5 ebXML

United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) and the Organisation for the Advancement of Structured Information Standards (OASIS) have combined to initiate a worldwide project to standardise XML business specifications.

The National Office for the Information Economy and Standards Australia International initiated preliminary project work to consider the establishment of an aggregated Australian ebXML registry for data exchange. This will assist in making business-to-business transactions interoperable and by providing a technical resource for enterprises building e-business solutions.[61]

7.2.6 Additional requirements

If the benefits of XML are to be realised by industry, including the health industry, further work is needed to develop EbXML standards and infostructure, for example, on the proposed ebXML registry to store electronic messages and documents. The wider deployment of ebXML could also be supported by promoting common standards and harmonising messaging guidelines across industries, and by developing other resources to help businesses engage in e-business.

7.3 National performance framework—a related matter

This section has been included to alert stakeholders to the role of the National Performance Framework.

To ensure that information is available on the performance of the health system, agreed frameworks and indicators are required to measure performance, to identify areas requiring additional effort and to track the results of different strategies and programs

[61] <http://www.noie.gov.au/projects/ebusiness/environment/interop/Interop_Discussion_Paper.pdf>.

over time. Without this information, it will not be possible to analyse the successes and challenges to our health system, to inform future policy and practice.

Current status

The National Health Performance Committee has developed a National Health Performance Framework to report performance of the Australian health system at a national level. The framework provides:

- a structure to guide the understanding and evaluation of the health system by facilitating consideration of how well the health system or program is performing
- performance measures at all levels of the health system
- a process for benchmarking and quality improvement.

The framework represents three major components of health system performance (Figure 3), all of which needs to be monitoring continually to assess how well the system is performing. Every component has a number of different dimensions, for which defined measures are being developed for use as performance indicators. The framework is represented in Figure 3 as three tiers (the components), each followed by one or more rows of cells (the dimensions). Thus *health status and outcomes* is one component of the National Health Performance Framework. It comprises four dimensions: health conditions, human function, life expectancy and wellbeing and death.

Note that it is possible that a single indicator may provide information about several different dimensions. For example, access to the health systems can influence health status and outcomes; socioeconomic factors can influence health conditions and access to continuous health care. It is also important to note that while the all components and dimensions of the framework are constant, the associated performance indicators are not—they are adapted and updated as required. [62]

Figure 3: National Health Performance Framework

[62] National Health Performance Committee, *National Health Performance Framework Report: A Report to the Australian Health Ministers Conference,* August 2001, p 8–9.

Health status and outcomes				
Health conditions	*Human function*	*Life expectancy and wellbeing*		*Deaths*
Determinants of health				
Environmental factors	*Socioeconomic factors*	*Community capacity*	*Health behaviours*	*Person-related factors*
Health system performance				
Effective	*Appropriate*			*Efficient*
Responsive	*Accessible*			*Safe*
Continuous	*Capable*			*Sustainable*

The National Health Performance Framework forms the basis of reports to Health Ministers on the overall performance of the Australian health system and comparative reports across systems. The framework has also been adopted for use by some state and territory governments and other Australian Government agencies.

8 Conclusion

Foundations for the future is designed to encourage senior executives, standards agencies and IM&ICT decision makers in the health and IT sectors to collaborate in the development of a national health information infrastructure that will enable widespread but secure information access, interchange and analysis. This is one of the necessary preconditions for health sector reform. It provides a basis for strategic investment in both private and public value adding.

Standardisation facilitates and is primarily concerned with changes in business operation. It is therefore a strategic business process for the health sector, underpinning a raft of health service delivery reforms.

Accordingly, key requirements for developing Australia's health information infrastructure include:

- agreed national priorities
- broad leadership, collaboration and contribution from across the health and IT sectors. Australia's overall health information infrastructure materialises from the collective decisions of a large number of stakeholders. While national direction-setting documents such as *Foundations for the Future* can highlight critical areas for investment, implementing their recommendations will require strategic commitment to interoperability and capacity building in a wide range of individual jurisdictions
- participation in international standardisation activities that have the potential to significantly influence Australia's future health IM&ICT capabilities
- sustained, effective communication
- national processes for the endorsement and adoption of high-priority standards.
- Accordingly, *Foundations for the future* describes national priorities, a series of recommendations to advance them, and a systems approach to improving standardisation across the Australian health sector—the SMS model.

The priorities outlined in this report are connected and arguably some could have been described in different sections. For example, work on terminologies and classification could have been discussed in the sections on supporting clinical care or interoperability. This simply illustrates the interdependence of strategies, and that progress must be made across the spectrum of priorities. It also highlights the need for the national IM&ICT governance organisations to work in partnership, and for a range of other agencies to communicate and collaborate to achieve higher-order goals.

Progress against the priority areas should be monitored systematically, and adjustments made as changing circumstances demand. However, a relevant, modern, effective, efficient and sustainable health system can only be built on sound foundations. *Foundations for the future* provides a structured framework for enhancing the critical information components of our health system.