

Securing Quality Outcomes: Systemised Access to Digital Images

Australian Diagnostic Imaging Association

A roadmap to support image sharing by clinicians across different health providers

29 July 2013

A Roadmap to Support Image Sharing by Clinicians across different Health Providers

Background

Picture Archiving and Communication Systems (PACS) have been widely implemented throughout Australia in the last decade, across both the public and private sector, to improve both the efficiency and effectiveness of service delivery within an individual facility or health network. Whilst this first step in the progression to a truly "digital world" delivers some benefit to healthcare providers and their patients, the inability of different systems to connect, communicate and share information and images beyond organisational boundaries has a significant adverse impact on patient management. Securing quality outcomes for patients requires a systemised approach to accessing digital imaging.

Identifiable weaknesses in our current health setting include:

- (a) a failure to realise the clinical, strategic and economic benefits of interoperability to support data sharing of reports and images;
- (b) poor uptake, adoption and implementation of uniform data storage and interoperability standards, such as those developed by the Integrating Healthcare Enterprise (IHE) initiative, Digital Imaging and Communications in Medicine (DICOM), or Health Level 7 (HL7); and
- (c) no clear long-term agreed strategy on how the images and reports generated by Medical Imaging will eventually integrate into an electronic Health Record (eHR), including the Personally Controlled Electronic Health Record (PCEHR).

There is an identified need for an integrated eHealth infrastructure and framework that will deliver both efficient and secure access to patients' images and reports irrespective of their point of entry into the health system. Currently there is no integrated eHealth infrastructure to support the archiving (storage), retrieval or access to diagnostic images in Australia; despite well-tested patient-centric solutions being openly available for consideration. For Medical Imaging to continue to transform healthcare delivery in Australia (refer to Attachment 1), sound investment decisions need to be made which embrace the information technology available in our country to promote and improve patient care.

This paper presents a roadmap towards developing and deploying the architecture and platform to support image sharing by clinicians across different health providers, drawing on the perspectives of clinicians and patients in order to maximise the value contribution of the proposal.

The roadmap in this document will support image sharing by clinicians and is a separate initiative to the PCEHR. While the PCEHR will provide patients and clinicians with access to a summary of key healthcare events, image sharing as outlined in this roadmap is an essential tool for clinicians to support patient care. Foundations required to implement the roadmap will support storage of reports on the PCEHR.

Guiding Principles (“The Drivers”)

The seven key guiding principles for developing a sustainable eHealth infrastructure to improve clinician access to patient images include:

1. Recognising that clinician access to a patient's imaging history through a seamless and automated process at the point of clinical care will improve clinical management (e.g. decreased time to diagnosis) and patient care;
2. Recognising that affording Imaging Specialists access to a patients imaging history will improve reporting accuracy, making reports more meaningful to clinicians;
3. Accepting that current image sharing practices that do exist (e.g. the physical transfer of data from CD's) have significant limitations and due to the manual processes involved present data protection and medico-legal issues and risks;
4. Accepting that providers/referrers need to be able to access a minimum quality standard of image storage and have the ability to access images from all Medical Imaging providers, supporting the patient's right to choose their imaging provider;
5. Accepting that current business models and funding do not align or promote investment in the necessary infrastructure to support image storage and web-enabled clinician access to imaging;
6. Accepting that the inability to access patient imaging often results in the duplication of imaging tests, resulting in exposure to unnecessary risks, inconvenience and increased cost to both the patient and/or health system; and

7. Recognising the need for security and privacy of patient data through a solution that will support suitable authentication and authorisation techniques to ensure the security and privacy of patient data, in alignment with the National Privacy Principles.

Different Perspectives

Four perspectives need to be appreciated in order to fully comprehend the infrastructure limitations in the current healthcare environment as it relates to access to Medical Imaging, including:

The General Practitioner (GP)

The treatment and management pathway for many clinical conditions relies upon the GP having easy and efficient access to Medical Imaging results (reports and images). In many instances, a patient forgets to bring their hard copy films (or CD) and report to their appointment; or they may have had their examination performed at an imaging provider who has no connection whatsoever with their GP's information system, or whose CDs are not compatible with the GP's systems; or even worse, the patient may have had different procedures performed with different providers, often due to access restrictions to some services (e.g. MRI), creating another layer of complexity and frustration. The end result is that the GP has to either "chase" the results, or alternatively rebook the patient for another appointment at a time when they can bring their hard copy imaging with them, or in some cases manage the patient blindly without being able to review the Medical Imaging examinations at all.

Inevitably, this dilemma leads to delayed, incomplete or ineffective patient management and increased cost to both the patient and/or the health system.

The Specialist

Whilst the access issues affecting GP's equally affect Specialists, in many instances the impact is amplified particularly with respect to acute patient presentations. Even though a patient may have had recent Medical Imaging examinations performed in the community-based setting, in the majority of cases the treating Specialist does not have access to the images or reports. In an overwhelming

number of cases this leads to duplication of imaging and in all cases it leads to an increased time-to-diagnosis.

Oncologists in particular struggle to effectively and efficiently manage their patients in situations where the complete imaging history is not accessible to them. In this patient population, the management pathways are significantly influenced by the diagnostic imaging findings and access to imaging is seen as a necessity to assess and monitor treatment response as well as to decide upon the need for treatment change. Whilst most imaging providers try to be proactive in acknowledging this necessity through the provision of a CD/DVD with the full data set of images (often in excess of 1000 images), there is no uniformity in viewing software and often interoperability issues persist particularly when serial examinations performed by multiple imaging providers need to be directly compared. The current processes, even when they do work, are very manual and result in considerable referrer inefficiency and frustration, particularly as the manual process is duplicated at subsequent appointments, there being no means of storing the image data in a meaningful or accessible way.

Orthopaedic surgeons also have a specific issue whereby, even if they do have access to imaging, the inconsistency in terms of the format and presentation of the images (e.g. the magnification factor applied) can make interpretation difficult. So whilst enabling access to imaging is the primary objective, standardisation of the image display on a consistent platform is also a requirement.

Case Study 1

An elderly female patient is admitted to a Public Hospital Emergency Department, accompanied by her daughter, following a fall at home.

The treating Emergency doctor orders Chest and Left Wrist X-Rays as well as a CT Brain upon admission. The daughter informs the doctor that her mother had already had a Chest X-Ray and CT Brain performed at a private practice near their home one-day prior.

As it was a Sunday, the Emergency doctor was unable to obtain a report from the private practice. Furthermore, no hard copy or soft copy images were available for review, resulting in the patient having to endure another CT and X-Ray examination.

If the Emergency doctor was able to query a patient registry from their department to query the patient's imaging history and retrieve the relevant images and reports for review, the patient would not have had to undergo repeat, duplicate examinations and the time to diagnosis would have been decreased.

The Imaging Specialist

A patient presenting to an imaging provider for a follow-up examination of an injury or disease would not be afforded a meaningful report from the Imaging Specialist without access to their imaging history (images and reports). To support the continuum of care concept, the Imaging Specialist requires access to the previous examination, which unless performed within the same practice, is often not available at the time of reporting.

The end result is either that the patient, or imaging provider on the patient's behalf, has to chase previous images and reports from other health providers, or the patient has to return to the practice with hard copy images to aid in a comparative report. In situations where previous imaging is not available despite "chasing" efforts, the patient is issued with a report that is unable to comment on the progression or resolution of disease or injury, which is fundamental information required to aid their management.

Case Study 2

A 48-year-old male patient presents to an Imaging Department for a CT examination of the chest, with a clinical history of known multiple pulmonary nodules diagnosed 12 months ago, ? interval change.

The patient had recently relocated from interstate and did not have his previous images or report available for the Imaging Specialist to review. The Imaging Specialist and their staff attempt to contact the interstate imaging provider to obtain a copy of the images (e.g. on a CD/DVD) but the images had not been archived and were therefore not accessible.

The Imaging Specialist is unable to comment on the number of size and number of nodules, compared the previous scan, so inserts the words "Films not available for comparison" in the report.

The dilemma for the treating Respiratory Physician is that the management pathway is largely dictated by the growth (in size and/or number) of nodules over an interval. Without this information, as is the case in this scenario, patient care is compromised and appropriate treatment would potentially be delayed.

If the Imaging Specialist was able to query a patient registry to retrieve the images and report from the Imaging Provider that the patient had presented to 12 months (in another State), then a comparative report with increased specificity and sensitivity would have prevailed.

The Patient

Ultimately, the patient will need access to their own imaging history as a “bolt on” to the proposed eHealth infrastructure, replacing the need for storing hard copy film and paper reports. Whilst this aspect lies outside of the scope of this paper, the mechanics of this proposal do provide the building blocks towards meeting this requirement by creating an indexing system through which a patient’s record can link with the stored images and reports held by an imaging provider.

Delivering on patient access would be possible should the Government assist the Medical Imaging sector in the creation of the required infrastructure, and by making the investment necessary to support clinician and imaging provider access to imaging.

A Way Forward (“The Mechanics”)

The methodology for information sharing needs to be completely automated using a single log-in into one patient-centric database/registry, to facilitate access to images which reside in various imaging provider systems across both the public and private sector. This feat is doable - the information technology available is mature and tested internationally. Successful application in the Australian system requires the stakeholders to align together, which would be fostered through Government support and encouragement.

An eight-stage approach, whereby each stage is an essential and necessary part of the roadmap to improving clinician access, is necessary with the intent of delivering coordinated and integrated care across the continuum.

The stages are summarised below:

Stage 1 - Develop Nationally Consistent Guidelines for Image Data Storage, Retention and Disposal

There is currently no nationally agreed (or consistent) image storage, retention and disposal policy for Medical Imaging, nor are there any funding to invest in the infrastructure or operating costs to maintain local imaging provider archives. National Guidelines will provide an ability to access images once full data sharing infrastructure is operational.

Output: National Image Storage, Retention and Disposal Guidelines (including a proposed business model)

Stage 2 - Development of a Standard Catalogue of Clinical Terminology for Imaging Tests (Orderable Catalogue)

Currently in Australia there is no one standard list of orderable imaging tests or Medical Imaging codes in use. The codings utilised in Radiology Information Systems (RIS) are often locally created and specific to the needs of a particular organisation.

This deliverable will provide a nationally agreed and endorsed list of Medical Imaging descriptors to support national standardisation. This will support the build of standard orderable test sets in imaging, hospital and primary care information / vendor systems. This orderable catalogue will provide a consistent configuration for practice management within RIS for the requesting, scheduling and billing of examinations performed. It will also provide the basis of an index to facilitate searches for imaging reports in electronic Medical Reports and the PCEHR.

Output: National Orderable Catalogue Guidelines

Stage 3 - Assessment of Interoperability

Assessing the interoperability between the various systems in use across and within the public and private sectors is an essential requirement, particularly recommending interoperability standards (e.g. hyperlinks, URLs and Web Access to DICOM Objects (WADO) for access to patient imaging embedded within patient reports).

To enable images to be accessed from embedded links within reports, it is essential to use embedded links in a consistent manner. This will allow images to be accessed from electronic Medical Records and other infrastructure such as the PCEHR.

There are already several industry standards which could be used for this purpose and have been IHE defined; accordingly there is no need to create a new industry standard. An industry standard

needs to be adopted and incorporated into Guidelines for embedding links.

This deliverable will also include specifications to support interim and future viewing and use of reports and digital images based on documented use cases (workflow mapping).

The critical informatics issues centre on how different systems seamlessly communicate with each other and interoperate with the information they contain. There are communications standards that allow various IT systems to interoperate with each other using the raw data they generate. The current standards in Medical Imaging are DICOM, which allows systems to move the actual images between each other; HL-7, which allows health information systems to move clinical data; and the Integrating the Healthcare Enterprise (IHE) profiles, which provide a framework that allows systems to use the above standards to pass information.

This stage will also involve exploration of how Healthcare Identifiers (HI's) are best applied in Medical Imaging, aligning with the strategy proposed by the National E-Health Transition Authority (NEHTA).

Outputs: [National URL/Hyperlink/WADO Embedding Guidelines](#)

[National Access and Transfer Guidelines for Digital Imaging applying Healthcare Identifiers.](#)

[Technical Specifications for the access and retrieval of reports, images and requests](#)

Stage 4 - Development and Implementation Strategies related to Privacy and Governance

A successful solution would also need to support suitable authentication and authorisation techniques to ensure the security and privacy of patient data, in alignment with the National Privacy Principles.

How access rights of each clinician to a patient-centric registry / database are granted needs to be given consideration and requires a standardised national approach.

A governance framework would also need to be formed, outlining the responsibilities of each stakeholder as well as the global management responsibilities of the hosting body.

Outputs: [National Guidelines for Clinician Access to Digital Imaging \(Privacy\)](#)

[Governance Framework for Infrastructure Management](#)

Stage 5 - Development of Clinical User Guidelines

Standardisation, at a national level, to guide clinicians in terms of how to use the proposed eHealth infrastructure to the maximum benefit for their clinical practice is essential. For example, guidelines on how to access a patient's imaging history and query/retrieve data sets from other health providers is an essential educational requirement.

Output: [National Guidelines for Clinician Access to Digital Imaging \(Use\)](#)

Stage 6 - Development and Implementation Strategies for a Registry (XDS-I)

Integrating the Health Enterprise (IHE) profiles have gone a long way towards enabling system interoperability, for example through its definition of the cross-enterprise document sharing profiles for imaging (XDS-I). However, a national approach to the development and implementation of a cross enterprise registry that incorporates both the public and private sector is fundamental to this proposal. This

registry will hold the imaging history for any given patient (using a unique identifier number) and act as the hub from which clinician access is facilitated. At an international level, countries such as the United Kingdom, France and Canada have all adopted this “leap-frog” technology to enable clinician access across the health system.

This stage will also involve an assessment of hosting arrangements, with the host being a not-for-profit / non-corporate entity acceptable to Government and the Medical Imaging sector.

Outputs: [National Guidelines for the Management of a Cross-Enterprise Registry](#)

[Technical Specifications / Requirements of a Cross-Enterprise Registry](#)

Stage 7 - Development and Implementation Strategies for Provider Gateways

In order to connect all providers to a patient-centric registry/database, secure gateways will have to be implemented. This strategy has several layers as it does not just relate to the connection of all imaging providers to a common registry (horizontal integration), but also other health care providers in both hospital-based and primary care settings (vertical integration). National guidelines in terms of how this is achieved are essential.

Output: [National Guidelines for Implementing Provider Gateways](#)

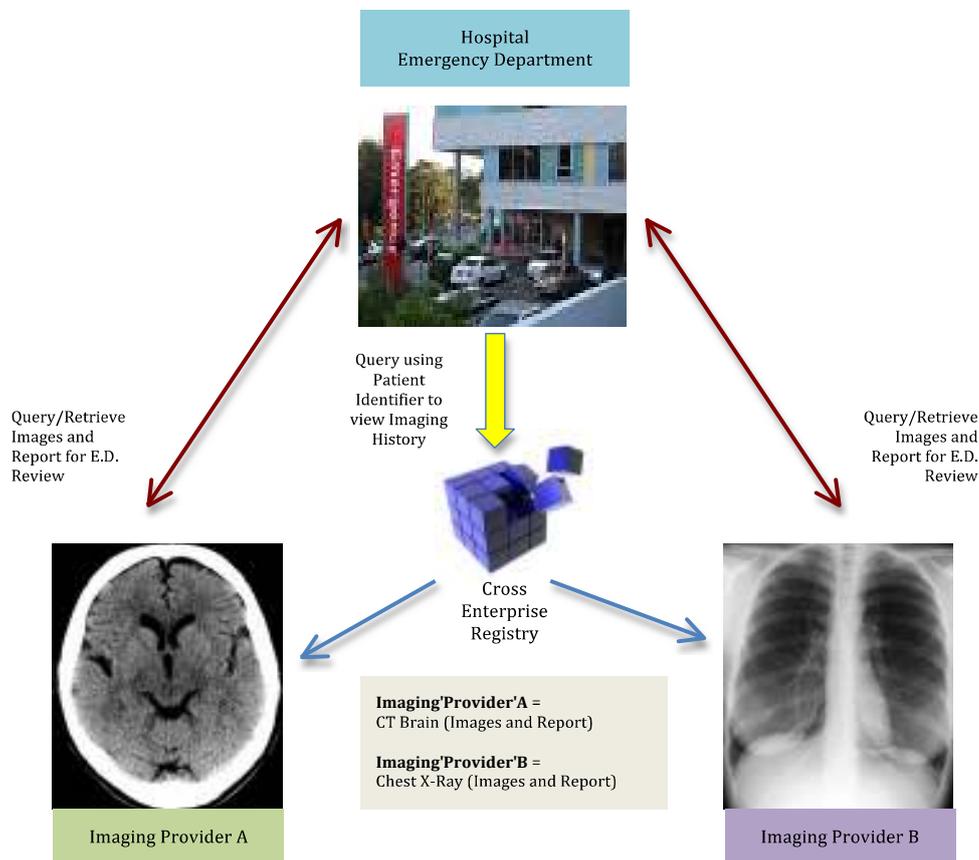
Stage 8 - Implementation of a Minimum Standard Image Viewing System for Clinicians

Clinicians will need access to an agreed viewing platform by way of a Universal viewer that is deemed suitable for web-enabled image review and manipulation. The selection process will need to take into account the level of functionality required, which will differ between General Practitioners and Specialists, with the latter requiring a higher level of functionality including the ability to view images from multiple sources. There are many (free) choices available for exploration and consideration. Establishment of a centralised on-line support

infrastructure (help desk) to assist clinicians would be a essential requirement of this stage

Output: Minimum Standard Image Viewing System for Clinicians with Support Requirements and Guidelines

The end point, fulfilling the requirements of each of the eight stages, is best illustrated in the diagram which shows the interaction between an Emergency Department and two separate imaging providers through a cross enterprise registry, allowing the Emergency Department to query and retrieve two sets of images and reports that then form part of the patient's imaging history for local review and assessment.



A number of workshops, consultations and working groups would need to be established in order to meet the objectives of each stage taking into consideration the different views and perspectives of all stakeholders (as listed in the table below).

Suggested National Medical Imaging Stakeholders
Private Sector Providers
ADIA – Australian Diagnostic Imaging Association
Public Sector Providers
NSW Health
ACT Health
NT Health
QLD Health
SA Health
TAS Health
VIC Health
WA Health
Colleges
RANZCR – Royal Australian and New Zealand College of Radiologists
RACS – Royal Australasian College of Surgeons
RACGP - Royal Australasian College of General Practitioners
RACP - Royal Australasian College of Physicians
RANZCOG - Royal Australian and New Zealand College of Obstetricians and Gynaecologists
Government
DoHA – Department of Health and Ageing
Medicare Australia
NEHTA – National E-Health Transition Authority
Standards Bodies
IHE – Integrating the Health Enterprise
HL7 Australia – Health Level 7
Other Key Stakeholders
AMA – Australian Medical Association
AANMS – Australasian Association of Nuclear Medicine Specialists
ASUM - Australasian Society for Ultrasound in Medicine
RDAA – Rural Doctors Association of Australia
CSANZ – Cardiac Society of Australia and New Zealand
BSA – Breast Screen Australia
MSIA – Medical Software Industry Association of Australia
Patients/Consumers (Patient Advocate Groups)
Diagnostic Industry Advisory Council representatives
ARPANSA – Australian Radiation Protection and Nuclear Safety Agency
AOA – Australian Orthopaedic Association
DIMA – Diagnostic Imaging and Monitoring Association

Advantages (“Value Proposition”)

The advantages / value in improving clinician access to imaging are:

1. Improved Quality
 - Improved patient care (decreased time to diagnosis / treatment);
 - Improved reporting accuracy by Imaging Specialists (comparative reporting).
2. Improved Safety
 - Reduced duplication of imaging (repeat imaging), hence reduced radiation dose.
3. Improved Efficiency / Productivity
 - Easy access will expedite patient management;
 - Decreased labour hours for clinicians and their support teams (no chasing of films or reports), equating to improved utilisation of human resources.
4. Improved Privacy
 - Improved compliance with National Privacy Principles (NPPs).
5. Scalability
 - Scalable sharing of imaging documents between imaging departments and other providers across the health system with different clinical IT systems (completion of the Medical Imaging component of the PCEHR);
 - A step towards patient access to their own imaging history.
6. Patient Centric - Competition Neutral
 - The scope of this proposal is non-competitive in nature

The Challenges

The challenges to improving clinician access to imaging are:

1. Funding

Recognition that image sharing is a vital component of patient safety – both for image interpretation and from a broader clinical care perspective, and that it requires Government, provider and referrer investment.

2. Support from Stakeholders (the “sharing” community)

Acknowledgement of the various stakeholder views, in terms of the nature of clinical access and user guidelines required.

3. Industry Collaboration

Seeking agreement in terms of the approach for an orderable catalogue and the guidelines associated with the storage, retention and disposal of image data.

Acknowledgement that investment is not just required of Government, but also through Medical Imaging sector investment in local infrastructure.

It should be noted that the Royal Australian and New Zealand College of Radiologists and the Australian Diagnostic Imaging Association have formed a joint working party to foster the level of collaboration required as well as proactively work towards addressing the challenges that present. Equally, collaboration with Government and other stakeholders is critical. In order for this proposal to succeed and for there to be a tangible benefit to patient care, there needs to be visible support and development funding.

Timeframe

Indicative timeframes, which assume cooperation by all stakeholders, are noted in the tables below. Several of the stages can be achieved concurrently. The total estimate timeframe for delivery of the entire solution would be four years.

Stage	Objective	Timeframe
Stage 1	Develop Nationally Consistent Guidelines for Image Data Storage, Retention and Disposal	6 months
Stage 2	Development of a standard catalogue of clinical terminology for imaging tests (Orderable Catalogue)	6 months
Stage 3	Assessment of Interoperability	12 months
Stage 4	Development of Privacy and Governance Guidelines	6 months
Stage 5	Development of Clinical User Guidelines	6 months
Stage 6	Development and Implementation Strategies for a Registry (XDS-I)	6 months
Stage 7	Development and Implementation Strategies for Provider Gateways	6-12 months
Stage 8	Implementation of a Minimum Standard Image Viewing System for Clinicians	6 months

Phase	Requirement	Timeframe
Phase 1	Concurrent Completion of Stages 1-2	12
Phase 2	Concurrent Completion of Stages 3-5	12
Phase 3	Completion of Stage 6	6
Phase 4	Completion of Stage 7	12
Phase 5	Completion of Stage 8	6
		48 (4 Years)

Cost Implications/ Cost-Benefit Overview

Whilst international experience suggests that the adoption of open standards of interoperability, such as XDS-I, offers a cost-effective solution, the overall cost implications of the proposal need to be measured against the benefit it would deliver.

There needs to be acknowledgement that Medical Imaging sector costs as well as Government costs will be required to achieve these objectives.

Whilst a detailed business case is required, the scope of this document is to pin point the areas that will require investment, either by the sector or Government.

Sector Investment

- Provider costs associated with the local archiving of images and reports. In essence, the cost of storage would be a long term obligation of the imaging provider;
- Provider costs associated with connectivity (gateways);
- Provider costs associated with embedding links to image data sets within reports (URL)

Government Investment

- Incentives for Imaging Providers to archive patient images (exploring episodic and/or ongoing funding arrangements);
- Investment in the eHealth infrastructure to enable deliverables (e.g. a Cross Enterprise Registry) (exploring episodic and ongoing funding arrangements for global management and maintenance);
- Incentives for Imaging Providers to connect to the eHealth infrastructure (exploring episodic and/or ongoing funding arrangements)

The costs outlined above will need to be balanced against areas of cost savings, including:

- (a) the significant projected savings by greatly reducing the need for repeat imaging (duplication); and
- (b) the efficiency and productivity gains resulting in the more effective use of health resources, predominantly human resources.

There are certainly risks to Government if it does do not endorse this proposal; the greatest risk being the inability to incorporate Medical Imaging into the “big picture” development of the PCEHR, which will detrimentally impact on patient management and care. Government acknowledgement that improving clinician access will also positively influence and impact on the achievement of other health objectives outside of the Medical Imaging arena is also important, such as, but not limited to, improving emergency department throughput by reducing the time to diagnosis.

Need for Support

Delivery of integrated, coordinated and organised healthcare at multiple levels within the health system can be greatly enhanced through investment in eHealth infrastructure. The horizontal integration of imaging providers across both the public and private sector, combined with vertical integration of the same imaging providers with Hospitals, General Practice and other health care providers will ensure that the clinical and fiscal responsibilities to the patient population are met within the Australian system.

A systemised approach to seamless image (and report) sharing needs to be seen as a vital requirement of patient safety, securing quality outcomes by ensuring that the imaging history is available at the point of entry into the health system (point of care) to aid patient management decisions.

The support of both Government and the Medical Imaging sector is required to achieve this feat, collaboratively working towards national targets that will unequivocally lead to better patient care and secured quality outcomes.



Joint Informatics Committee
22 July 2013
Brisbane

Participants:



Observers:



Australian Government
Department of Health and Ageing



Attachment 1

How Medical Imaging is Transforming Healthcare Delivery

Medical imaging has transformed Medicine.

Medical Imaging has significantly changed how clinicians measure, manage, diagnose, treat, and even think about medical illnesses, disease and conditions. This has resulted in a seismic change to the Australian healthcare landscape - in how care is delivered and the quality of care that patients receive.

Medical imaging innovations have made imaging faster, more precise, and less invasive.

This has led to the broader application of imaging for more patients and conditions, though requiring greater clinical input from Imaging Specialists. Whilst Imaging was once thought of primarily as a diagnostic tool, today it is also used for treating, managing, and even predicting disease.

Medical imaging is essential for virtually all major medical conditions and diseases.

Medical Imaging is a standard, integral part in the medical management of cancer, stroke, heart disease, trauma, and neurological conditions (amongst others).