

Electronic Medical Record Evaluation Tools and EMR Core Report

Guide for Victorian Public Health Services

Version Amendment History

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1. Executive Summary

This paper presents findings of the chosen Health Design Forum (HDF) topic, EMR Evaluation Tools and Core definition. Its purpose is to provide a clear understanding of the core components and modules of an EMR and of the models available to assess Electronic Medical Record (EMR) capability within a health organisation.

Several options for EMR capability assessment are identified and analysed, including peer review, external audit, self-assessment and literature review. Of the models analysed, the external audit rated the highest. The benefits of an external audit includes the flexibility to tailor the audit to suit the needs of the organisation, service providers' proven track record in health, and enabling health organisations to benchmark at a local, state, national and international level. When this approach is combined with other methodologies, and with significant input from the respective health organisation, health organisations can be assured that their investment in an EMR is well assessed and a clear pathway is defined for future EMR capability enhancement.

The analysis identifies that integration and/or interoperability capability is typically not assessed as part of an EMR and nor is its contribution to the overall success or failure of an EMR deployment highlighted within the models. Conversely, studies have shown that high quality information, good integration and good infrastructure and design are likely to lead to improved health outcomes for patients.

As part of any existing EMR solution, or intended solution design, integration needs to be assessed in conjunction with the chosen EMR evaluation tool or tools, to ensure optimum integration is achieved to ultimately realise the benefits to the health organisation and to patients. Recording a patient journey and having that information at the fingertips of clinicians and administrators is paramount. "Information is 'the lifeblood of medicine' and health information technology is destined to be 'the circulatory system for that information'." - *David Blumenthal, MD, National Coordinator for Health Information Technology*

It is the conclusion of this report that standardisation and/or Australianisation are not adequately assessed by the identified EMR evaluation models, however this is key to ultimately sharing data beyond a health service as patients engage with various health organisations and health professionals during their healthcare journey. It is recognised that patient data will need to be sent beyond the walls of a single health service. "In the long term, the total cost of implementing and maintaining standards is reduced when all participants in data exchange use the same content standards. With more data flowing, care will be better coordinated, and data can be used for multiple purposes." —*John Halamka, MD, MS, chief information officer, Harvard Medical School; chair, U.S. HITSP, etc.*

The HDF EMR Adoption Assessment Options graphic (below) displays the various choices available to health organisations. The graphic plots the evaluation models against strengths, weaknesses, opportunities and threats (SWOT analysis) identified as part of this paper. The superior models are to the top left of the diagram – greater strengths and fewer weaknesses.

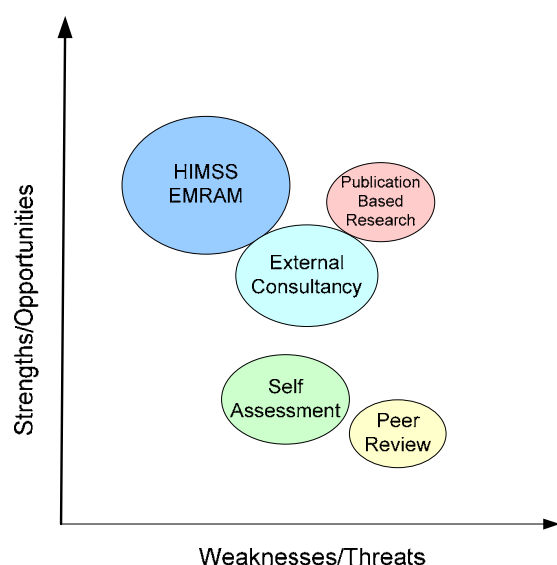


Figure 1 - HDF EMR Adoption Assessment Options

It is important for health organisations to assess their environment using a variety of EMR capability techniques that specifically address the needs of the organisation. The Health Information Management System Society Electronic Medical Record Adoption Model (HIMSS EMRAM) is a good foundational tool that can be used in conjunction with one or more techniques. The findings indicate that the HIMSS EMRAM provides a common international, national and local understanding of modules and functions that build a standard definition appropriate for the Victoria Public Health Sector (VPHS).

A secondary technique may include a consultancy firm to address any gaps in the HIMSS EMRAM. For example, organisations may need an integration and interoperability assessment and request advice as a separate activity.

Where a health organisation is highly specialised there will be more emphasis on consideration of the required speciality modules. When this is identified as a need, the order of HIMSS EMRAM module uptake may vary.

1. A “peer review” is essentially an exchange of EMR related information between health organisations and although this model has benchmarking capabilities, it is limited to the knowledge associated with the chosen health organisation. This model has been rated as low with strengths such as targeting an organisation with “like” qualities that offer a maturity level for lessons learned and an appraisal of experiences. The possible drawbacks with this model include: incomplete information for adequate benchmarking, poor quality data or investigation and lack of commitment to assign appropriate resources from the invited organisation.
2. An “external audit” may involve one of the following:
 - 2.1 Commission a not for profit organisation such as HIMSS Analytics. The HIMSS EMRAM is rated highly. HIMSS have highly regarded health professionals; who benchmark your health organisation against local, state, national and international health organisations. They have an extensive database covering various hospitals and health organisations throughout Europe, US, Australia and Asia. HIMSS Analytics will provide comprehensive reports that can inform ICT strategies. A drawback with the HIMSS model is that it does not include references to patient data flow, integration, infrastructure and the extent of implementation of key modules.
 - 2.2 Commission a consulting firm with a strong health practice to provide professional EMR capability assessment services. The benefits include: proven track record, professional advice, known market trends and pitfalls. External companies can tailor the audit to the organisation’s strategic direction. This option rates well, although some of these companies can lack internal knowledge, national and market trends and can have the potential to be high in cost.
3. “Self-assessment” consists of creating surveys and allocating or setting up a project team to evaluate the current state of an organisation and to define the future state, assess problem areas, review clinician requirements, and prepare a plan to achieve the health organisation’s ultimate goals. This model is again rated highly because the health organisation staff have inside knowledge and can cater for the specific needs of the health organisation. Self-assessment appears essential in most capability assessments, either as the major component or as an adjunct to one of the other capability assessment options. A drawback of this model is that staff can sometime be too close to the process and may lack objectivity in assessing their own processes.
4. “Review publications” – market scan including state, national and international experiences based on information researched. Evaluate current and future state to create a blue print for the organisation. This model was rated at the lowest level of all the models although it does have its benefits. The main drawback of this model is the information is only as good as the individual drawing the information. The information provided may be biased, unreliable and/or outdated.

This paper highlights the need to go beyond only using the HIMSS evaluation model or just using one EMR assessment capability technique.

Areas in which health services may wish to supplement the core EMR capability assessment may include:

- | | |
|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| • Areas of particular clinical speciality | • Efficiency of healthcare |
| • Emerging Australian standards, e.g. national identifiers, PCEHR | • Compliance with legal and ethical organisational requirements |
| • Government reporting requirements | • Fit for purpose |
| • Integration/interoperability | • Regulatory and statutory requirements |
| • Safety and quality of healthcare | • “Australianisation” to support, for example Pharmaceutical Benefit Scheme (PBS) and the Australian Medicines Terminology (AMT). |

To identify the components or modules of an EMR core an unstructured survey was conducted with health organisations in Victoria. The results were combined and compared with the HIMSS EMR Adoption Model, the Department of Health's published EMR core [1] and Gartner's EMR Core.

The full results of the study are included in Section 6.1.

The majority of participants nominated the following as components of the EMR core with a rating of greater than 50% from the surveyed results:

- | | |
|--------------------------------------------------------------|-------------------------------------------------------------------|
| • Client/Patient Administration/Practice Management/Claiming | • Prescribing/Medications Management/Pharmacy |
| • Care Plan/Clinical Documentation/Charting | • Billing Claiming/Eligibility |
| • Order Entry/Referral/Results Reporting/Diagnostics | • Document/Workflow Management |
| • Specialist Department Systems | • Risk Management/Incident Reporting/Quality Assurance/Compliance |
| • Scheduling/Recall/Reminder/SMS | • Data Warehousing/Repository/Storage/Health Information Exchange |
| • Assessments/Alerts/Allergies/Clinical Decision Support | • Messaging/Interfacing/Integration |
| • Discharge Summary | • Ambulatory/Emergency |

Five additional areas were identified when only reviewing health agency responses. The additional areas are:

- Telemedicine/Hospital in the Home
- Budget Modelling/Case Mix/Contract Management
- Patient Acuity/Workload Measurement/Resource Management
- Medical Pumps/Remote monitoring and
- Perioperative/Critical Care and Anaesthetics.

Gartner also suggested that based on their research, the following should be included in the EMR Core:

- Maternity
- Repatriation/Long term care
- Skilled nursing and behavioural.

The need to increase the efficiency of healthcare delivery and reduce duplication and errors is essential to enable health organisations to meet the increasing demand for services in the future. Overseas experience identifies that adoption of a comprehensive EMR system will assist in achieving these objectives. In line with the rise in chronic disease, complex conditions and ageing, there has been a rise in demand for specialist consultation and secondary referrals, which is anticipated to continue. These services are delivered primarily in hospital outpatient departments and specialist consulting rooms, although other areas such as community, hospital (emergency visits, Intensive Care Unit ICU, palliative care, theatres, rehabilitation, chemotherapy medical care), allied health, general practitioners, mental health and ageing are also likely to be impacted.

2. Introduction

The Health Design Forum has expressed an interest in examining the tools to evaluate an Electronic Medical Record (EMR) and to facilitate a common understanding about the core components of an EMR.

While there are a number of published academic studies and surveys that investigate and report on the value of an EMR, the make-up of the core for an Australian EMR remains largely undefined, as do methods for benchmarking against state, national and international healthcare systems/standards.

There is also increasing interest from health organisations to build EMR capability within Victorian healthcare organisations which will then deliver a range of associated benefits. The need for a solid core of EMR services is recognised, with the objective being to use the EMR to its full potential.

Understanding the models and evaluation tools available, where they are relevant and how they should be used, will assist healthcare organisations in their path towards a fully functional EMR solution.

The objectives of this paper are to identify:

- The tools and models available in, or relevant to, the Australian healthcare sector to support EMR adoption, i.e. HIMSS EMRAM
- The options for organisational assessment against available and proven EMR models
- The core functions within the models and variations
- The experts in this area, and their relevant experience within the sector
- The available sources of information, i.e. literature and publications.

There are four EMR evaluation options explored in this paper:

1. a “peer review” – consistent with a health service to health service EMR exchange of information and benchmarking capabilities;
2. an “external audit” – hire a company to review the current state of EMR and recommend future state while providing steps to achieve the future state, also providing state, national and international bench marking statistics,
3. “self-assessment” – create surveys and allocate a project team to evaluate current state and map future state, assess problem areas and clinician requirements, devise steps to achieve ultimate goal and
4. “review publications” – review market scan including state, national and international experiences and based on information researched, evaluate current and future state to create a blue print for your organisation.

2.1 Background

Many reports, such as the Intergenerational Report 2010, predict increasing pressure on the Australian health sector, due to population growth and an ageing population, resulting in rises in chronic disease, complex medical conditions, and general requirements for supporting an ageing population. Of particular interest is the rise in demand for specialist services which are delivered primarily in hospital outpatient departments and specialist consulting rooms. Impacts are also likely on other healthcare organisations such as community, hospital (emergency visits, Intensive Care Unit, palliative care, theatre/surgery, rehabilitation, chemotherapy), allied health, general practitioners, mental health and ageing, therefore an adoption of a comprehensive EMR system is key.

An EMR is described as:

“a patient focussed system through which staff caring for a patient can fulfil their duties without using paper medical records, where the data is stored in structured, computable form, supportable by real time active decision support, meet legal requirements and medical records best practice” [1].

Within the Victorian Public Health Sector (VPHS) there is great variance between health services’ specialities, services and demographics. Each organisation has a wide range of complex information

needs which varies from setting to setting and operate within different administrative, financial and clinician groups. Specialties often have specific information and health IT needs, over and above the notional core EMR type functions.

Clinical groups such as cardiology, renal, mental health, paediatrics, oncology, genetics and eye and ear are recognised as having specialist ICT needs and therefore the focus may be in addition to an EMR core. For example, an EMR may need to encompass an oncology module on top of a foundational EMR core because oncology is the core business of a health service. Each discipline may have several different task scenarios in a working day, with each scenario demanding a different system/module and/or interface. A successful EMR deployment should cater for all these needs and scenarios to enable a patient journey that ultimately improves patient outcomes and lowers patient risk, with information presented in a timely manner and available in an electronic format that can easily be shared where needed.

An enterprise EMR typically encompasses interconnected modules catering to the administrative and clinical needs of a health service. There may be different core EMR applications consisting of various functions and modules, and there are a number of different EMR adoption assessment methodologies available to consumers. Sorting through an array of evaluation tools and methodologies is equally important and will need to align with the EMR each service selects.

The Australian Bureau of Statistics (ABS) has listed the top long-term health conditions facing Australians as [18]:

| | | |
|-------------------------------------|-------|--------------------|
| • Arthritis | 14.8% | 3.3 million people |
| • Mental and behavioural conditions | 13.6% | 3.0 million people |
| • Asthma | 10.2% | 2.3 million people |
| • Heart Disease | 4.7% | 1.0 million people |
| • Cancer | 1.5% | 326,600 people |
| • Diabetes | 4.0% | 875,400 people |

In addition, the Victorian Metropolitan Health Plan Technical Paper predicts annual increases in the following areas of healthcare [16]:

| | |
|-------------------------|------|
| • Emergency and Medical | 2.8% |
| • Chemotherapy | 4.0% |
| • Renal and Peritoneal | 4.8% |
| • Palliative Care | 2.7% |
| • Mental Health | 2.0% |

The impact to health organisations is complex as early detection and preventative medicine strategies are formulated to reduce the disease burden and to accommodate the changes occurring in the health industry. For example, rates of daily smoking have continued to drop to 2.8 million people (16.3%) aged 18 years and over in 2011-12 from 18.9%.

Older Victorians are significant users of Victorian health services, and this trend is likely to continue into the future. The ageing population and the increase in life expectancy are anticipated to place additional resource pressures on the aged care and residential aged care sectors. For example, if current residential aged care benchmarks are retained, it is estimated that over 12,000 additional residential aged care beds will be required across metropolitan Melbourne [17].

It is anticipated that an EMR or an Electronic Health Record (EHR) can improve healthcare outcomes, reduce medical errors, and contribute to efficiencies and cost savings. In the HIMSS Analytics Advanced EMR benefits survey [4], health services reported the following benefits:

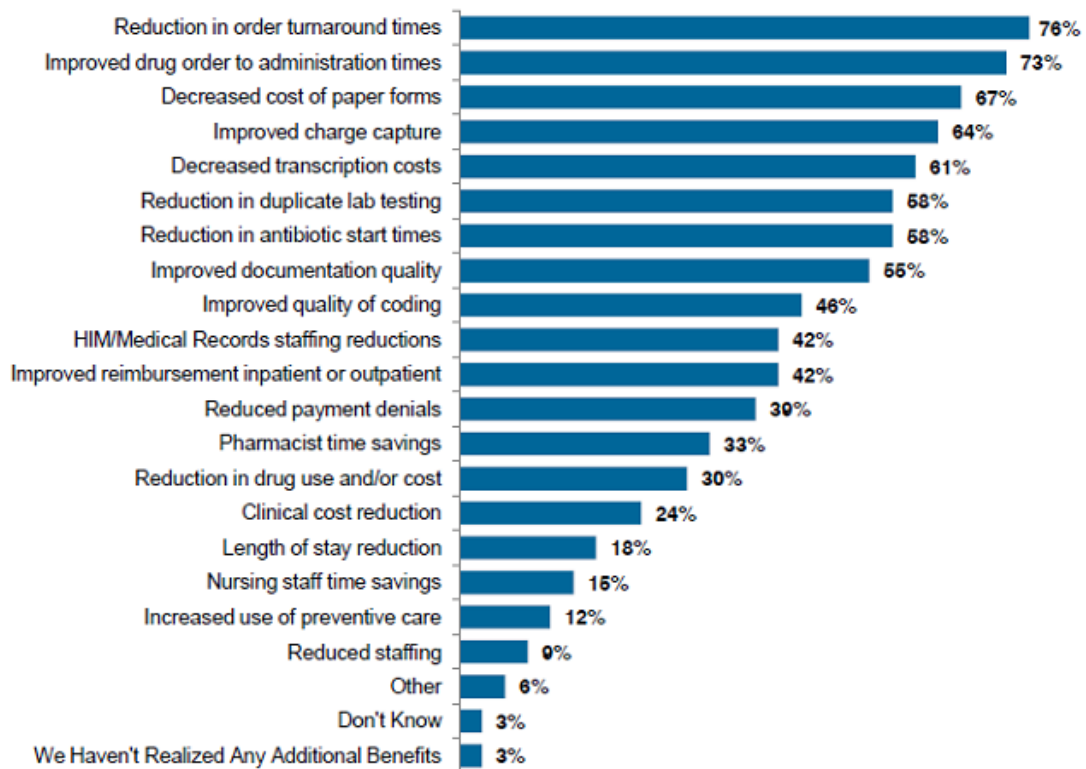


Figure 2 - HIMSS Analytics EMR Benefit Survey 02/12

2.2 Model Comparison

In evaluating the EMR capability assessment models, the HDA applied the following qualitative measures:

- Ability to benchmark against other health services, locally, nationally and internationally
- Cost / value for money
- Standards based approach / methodology
- Quality and completeness of final report
- A perceived expertise in health
- Likely duration of assessment activity
- Ability to adjust assessment scope to suit a particular health service
- Quality of input to subsequent program development (for EMR capability uplift)
- Likely impact on health service staff
- Availability of value add services

3. EMR Core

In a recently published paper (EMR Definition, 2012); the Victorian Department of Health defines an EMR as

“... a consumer-friendly and patient-focused system that staff can use to fulfil their patient-care duties without using paper; and which stores data in a structured, computable form, supports real-time active decision support, and meets legal requirements and best-practice standards for medical records”.

The paper expands the basic definition, stating that to the following:

“... an EMR system should at minimum provide the following capabilities”:

- **Electronic medical record** – a repository of clinical information used in patient care, which is captured in a structured computer-readable form that supports interoperability and clinical decision support. Information not directly related to the provision of care is not captured in the EMR, but is captured in other repositories not represented in Figure 1.
- **Administration** – providing functions to support patient management, resource management, and financial management.
- **Management and other administrative processes**, such as accepting referrals from external organisations. The administrative modules may also cater for direct consumer participation through, for example, access to managing registrations, bookings and other administrative tasks, or viewing their clinical information.
- **Clinical modules** – providing functions to support clinical care such as diagnosis, treatment, closed-loop medication management, real-time decision support and alerts. This must include access to historical clinical information such as scanned paper documents and other unstructured data. The clinical modules must also support standards-based communication with external organisations to enable, for example, the sending of standardised discharge summaries.
- **Specialist modules** – includes support for specialised clinical-care processes, such as modules to manage dialysis patients or transplantation surgery patients. These modules may also include extended support for clinical research and other discrete activities”.

The diagram below illustrates this definition.

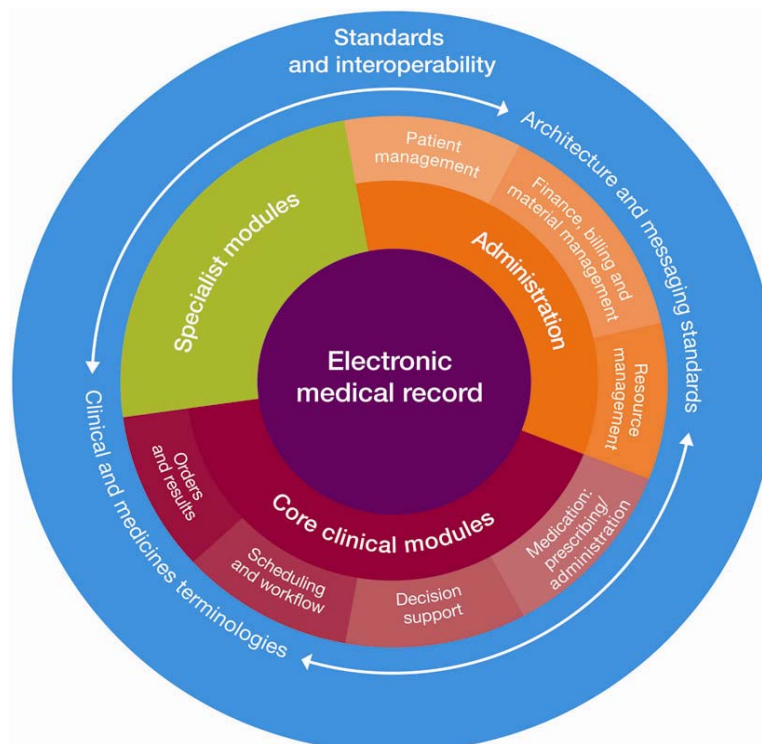


Figure 3 - Victorian Dept of Health EMR Core Functionality

4. Assessment Options

This section outlines the various options available to health services when evaluating EMR capability within an organisation. Four options explored are:

- Peer review
- External audit
- Self-assessment
- Literature search/publication review.

These options are the most common assessment opportunities available to health services. There will obviously be other options available to health organisations, not discussed below, but still relevant.

4.1 Option 1 – Peer Review:

Conducting a peer review involves a hospital-to-hospital or health service-to-health service review. There are a variety of methods available such as surveys, documentation and lessons learned that can be used for a comprehensive peer review. The first step under this option is to nominate a similar and where possible, more mature hospital or organisation of similar size and composition. Establish a series of sharing forums, presentations and workshops to gain knowledge and experience. Information learned from the evaluation process should be thoroughly documented.

A peer review should follow standardised processes, maximise the associated benefits and minimise the risks.

4.1.1 Option 1 - Strengths, Weaknesses Opportunities and Threats

| Strengths | Weaknesses |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none">• Targeted discussion with similar organisations can provide valuable information and insight• Learn from others in terms of both positive and negative experiences• Benchmarking against other similar hospitals is beneficial | <ul style="list-style-type: none">• Process and assessment criteria may be variable in nature, i.e. not standards based• The review organisation may not disclose all lessons learned or may not have any to share if they are at the same level• Reliant strong facilitation skills to extract useful feedback• Unintentional gaps may be present in the assessment because of time or resource constraints• May lack national agenda considerations if peer hospital/organisation is not aware of national projects/direction/impacts• May lack state, national and international experience• May be biased by experience and context of the reviewer |
| Opportunities | Threats |
| <ul style="list-style-type: none">• An opportunity for organisations to gain and share knowledge• Relationship building with other health services and individuals• Leverage direct experience/tools, especially where the reviewer's organisation is more advanced than the review candidate. | <ul style="list-style-type: none">• Health service or hospital competition may skew information exchange• May not adequately inform strategic direction, and hence result in additional work being required. |

Option 2 – External Audit

A number of independent audit consultancy companies which provide EMR evaluations including Deloitte, KPMG, Health IQ, Data Agility, Gartner to name a few and the Healthcare Information and Management Systems Society (HIMSS) Analytics.

4.1.2 Option 2.1: The HIMSS Analytics EMR Adoption Model

| Asia Pacific EMR Adoption Model SM | |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Stage | Cumulative Capabilities |
| Stage 7 | Complete EMR; CCD transactions to share data; Data warehousing; Data continuity with ED, ambulatory, OP |
| Stage 6 | Physician documentation (structured templates), full CDSS (variance & compliance), closed loop medication administration |
| Stage 5 | Full R-PACS |
| Stage 4 | CPOE, Clinical Decision Support (clinical protocols) |
| Stage 3 | Nursing/clinical documentation (flow sheets), CDSS (error checking), PACS available outside Radiology |
| Stage 2 | CDR, Controlled Medical Vocabulary, CDS, may have Document Imaging; HIE capable |
| Stage 1 | Ancillaries - Lab, Rad, Pharmacy - All Installed |
| Stage 0 | All Three Ancillaries Not Installed |

The HIMSS EMRAM Model identifies eight levels of EMR capability ranging from limited ancillary department systems through to a paperless EMR environment. The EMR Adoption Model scores hospitals in the HIMSS Analytics Asia Pacific Database on progress in completing the 8 stages (0-7) to creating a paperless patient record environment. [4]

Organisations can contact HIMSS Analytics to be assessed against the model. A report is presented to the organisation stating the level of compliance and the steps required for implementation to reach HIMSS level 7. The report is benchmarked against all other health services in the state, nationally and internationally. The reports are comprehensive and provide the health service with meaningful data.

Figure 4 - HIMSS EMRAM

A draw-back of the HIMSS assessment is that it is limited to evaluating the stages of the model and does not go beyond an assessment to holistically evaluate health organisations and how the EMR has or has not improved the clinicians ability to use the EMR “in a day and a life” treating patients or it does not assess fit for purpose.

According to HIMSS Analytics a level 3 EMRAM capability comprises all ancillary services including pathology, imaging, pharmacy, CDR, controlled medical vocabulary, CDS, document imaging and HIE, nursing and clinical documentation (flow sheets), CDSS error checking, Picture Archiving and Communication System (PACS) available outside imaging. Above level 3 includes orders and clinical decision support, full PACS, physician documentation, structured templates, full CDSS, closed loop medication administration, complete EMR, CCD transaction to share data, data warehousing, data continuity with ED, ambulatory and outpatients.

Based on the analysis conducted for this paper, there is strong evidence that a capability tool, whether it is the HIMSS Analytics tool or other, can not only assist in standardisation and benchmarking, but also provides a consistent terminology to understand the stages and evolution of the investment moving towards a common goal. Conversely, the model is focussed on the clinical mechanics of the system rather than identifying the true benefits of the system and how it impacts an organisation.

The HIMSS EMRAM model establishes a health service’s current EMR capability / adoption level. It determines future state or strategy for a health service and how a health service may move towards this future state, i.e. gap analysis, product acquisition, program of work.

The table below highlights the strengths and weaknesses of EMR adoption assessment using the HIMSS Analytics EMRAM.

4.1.3 Option 2.1 - Strengths, Weaknesses Opportunities and Threats

| Strengths | Weaknesses |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> • Proven methodology • HIMSS is recognised in Australia and internationally, and highly regarded for their benchmarking capability • Not for profit organisation • Extensive database • HIMSS Analytics provides comprehensive reports which can inform hospital boards on how to improve ICT strategies based on the findings at hand. I.e. world trends, benchmarking and quality improvements. • Reporting easy to understand and useful • Experienced and skilled healthcare IT and market research evaluators • Private, unbiased evaluation • Excellent benchmarking capability • High acceptance in Australian market • Economical • Accurate and reliable data • Can assist in predicting world trends | <ul style="list-style-type: none"> • Evaluation does not include interconnections of patient data from the various modules. (Integration ignored) • Organisations can have part of the adoption model in place in one ward only and can pass EMRAM stage • Some of the “Australianisation” of an EMR not specifically addressed • Data flows and work practices not included • HIMSS does not assess: <ol style="list-style-type: none"> 1. The time to perform a particular task 2. Ease of use 3. Productivity 4. ROI – Cost 5. Physician satisfaction 6. Number of key strokes 7. Time to execute a set of instructions 8. Training efficacy and impact 9. Number of screens visited to complete a specific workflow scenario • HIMSS does not discriminate if stages are implemented out of order. Potentially this could be problematic for speciality services. • HIMSS is calculated on the premise that if you implement A, then B is a benefit regardless of how well the product has been deployed. |
| Opportunities | Threats |
| <ul style="list-style-type: none"> • Benchmarking against state, national and international standards • Tailoring to Australian needs and environment (e.g. the CCD is not typically used in Australia) is possible as has been done for the EMRAM in Europe. | <ul style="list-style-type: none"> • Assessment is neither holistic nor comprehensive and may result in a more positive assessment of the health service than would occur under a more rigorous assessment process • HIMSS Analytics EMRAM may not adequately cater for highly specialised health services, again distorting the results achieved, and resulting in more work for the health service • Organisation decisions should encompass a variety of sources and not be limited to just this source |

4.1.4 Option 2.2: Assessment by External Consultancy

Little information is available publicly about consultancy EMR services from major consulting firms and organisations that specialise in health IT, including those listed above. Independent audit companies are able to tailor EMR evaluations to specific health care settings. For this reason, much of the available information regarding this topic is considered intellectual property and is not readily available.

There are several potential advantages of utilising the services of a large consultancy in EMR adoption model assessment. Large consultancies specialised in this area are able to offer a holistic service. This includes assistance with development of a strategy to raise the EMR capability within the health service, preparation of a program of work, assistance with resource requirements and high level cost analysis. Further assistance may also be available in areas such as business case development, priority setting, change management and benefits realisation. There are obviously limitations with this option as the solution may become so tailored that it has no application or benchmarking ability beyond the health organisation.

The table below reflects an expected result from engaging an experienced consultancy firm, with a strong health practice, to perform the EMR adoption assessment. Note that the contractual arrangements and scope of work may alter the analysis below, which assumes a comprehensive assessment, with development of a strategic plan.

4.1.5 Option 2.2 - Strengths, Weaknesses Opportunities and Threats

| Strengths | Weaknesses |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none">Established methodologyCan tailor assessment to suit nature of individual health serviceComprehensive reportFacilitates improved decision making process for organisations as the engagement with a consultancy firm will be more targeted to improving the organisation.Experienced and skilled healthcare IT and market research evaluatorsPrivate, unbiased evaluationProject-based approachProven stakeholder engagement skills | <ul style="list-style-type: none">May require an extended period to completePotentially high costRequires contract management within the health serviceWill be limited in scope based on financial considerationsChoice of consultancy is critical as skills and expertise of vendors can be lacking. |
| Opportunities | Threats |
| <ul style="list-style-type: none">Can adjust scope to include areas such as development of the future state, a gap analysis and strategic plan.May provide small pool of (external) resources familiar with the health service to aid future programs of workConsulting firm may provide value add beyond the core EMR capability assessmentCould request HIMSS EMRAM to be built into the assessment | <ul style="list-style-type: none">May not be based on broadly accepted international standards, limiting the ability to benchmark against other health services.Opportunity for vendors to lock this area of the market |

4.2 Option 3 – Self-Assessment

Self-assessment is an internal assessment of the organisation's EMR capability level utilising a series of tools such as self-assessment surveys, multi-disciplinary team discussions and conducting meetings/workshops. The purpose of the self-assessment is to understand the current state of the organisation's EMR capability and to create a roadmap to raise the capability level.

Surveys can be structured with the same set of questions with responses in a five-point Likert scale [6] or as simply as an unstructured freelance style whereby a clinician expresses their opinion without being led with set questions. There are observational studies that involve shadowing clinicians and observing their use of the clinical processes and procedures.

As a first step the organisation could prepare an "evaluation matrix," which details the desired features and attributes. This matrix, which can be paper or electronic, can help rate current state EMR implementation compared to desired state EMR implementation. Examples are available online by searching "EHR Evaluation Matrix." or <http://www.ama-assn.org/ama/no-index/physician-resources/16759.shtml> and <http://www.centerforhit.org/online/chit/home/cme-learn/tutorials/ehrcourses/ehr120/basicfunctions/hl7.html>

4.2.1 Option 3 - Strengths, Weaknesses Opportunities and Threats

| Strengths | Weaknesses |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none">• Targets specific organisation's need• Flexible• Maybe cost effective | <ul style="list-style-type: none">• Lacks the independent assessment of earlier options.• May lack industry or "Australianisation" standards• May lack national agenda. I.e. National identifiers• May lack benchmarking state, national or international ability• Additional burden (resource, costs) to create a new assessment model• Requires internal project resources to complete the assessment. |
| Opportunities | Threats |
| <ul style="list-style-type: none">• Set own targets and benchmarks• Can share approach and model with other like health services. | <ul style="list-style-type: none">• Unproven methodology• Risky for such an expensive investment of an EMR implementation.• May not provide sufficient input to the organisation's strategic direction (for EMR capability enhancement). |

4.3 Option 4 – Literature Search/Publication Review

Literature search and publication review of vendor ratings on the internet, specifically KLAS and Black Book rankings, which the Department has used in the past. Gauge your organisations EMR by searching for publications that are already done for you. KLAS publications or black book have specifically complied useful reports for consumers, although KLAS does have a notable disclaimer that “KLAS do not personally test products, nor do they express opinions about products. They collect aggregate and publish satisfaction data provided by users. These are independent performance ratings. These websites are global and an unbiased source for polling, surveys, market research, opinion mining and customer satisfaction results. The relevant websites are listed below and are not limited to this listing:

http://www.blackbookrankings.com/healthcare/2011_results.php

<http://www.klasresearch.com/about/klasdifference.aspx>

4.3.1 Option 4 - Strengths, Weaknesses Opportunities and Threats

| Strengths | Weaknesses |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none">• All the research and ratings are completed for organisations providing the product your agency uses is listed.• Information provided also considers speciality organisations such as Eye and Ear, Oncology or Paediatrics• Product evaluations available | <ul style="list-style-type: none">• Publications tend to be USA or Europe centric. “Australianisation” of the products is not included• Integration and modularisation is not considered• The organisation and the composition of the organisation is not considered.• The research is not specific to an organisation, but is product focussed• Older versions of applications may not be supported• Some applications may not be covered in the publications.• Research can be a lengthy process• The research does not reach into your organisation specifically, conversely it rates the software that you maybe using or wish to use in the future |
| Opportunities | Threats |
| <ul style="list-style-type: none">• Useful tool as an adjunct to other options provided in this paper• Publications may rate applications software that an organisation may wish to use in the future | <ul style="list-style-type: none">• May not adequately inform strategic planning and EMR capability enhancement• Should not be used as the only source of information, as inherently limited in the coverage provided. |

5. Beyond the EMR Core

While the EMR core is one of the focus areas of this HDF paper, for Victorian health organisations there are a number of other factors that must be considered in evaluating their current EMR capability and identifying functional requirements for any EMR capability enhancement project(s).

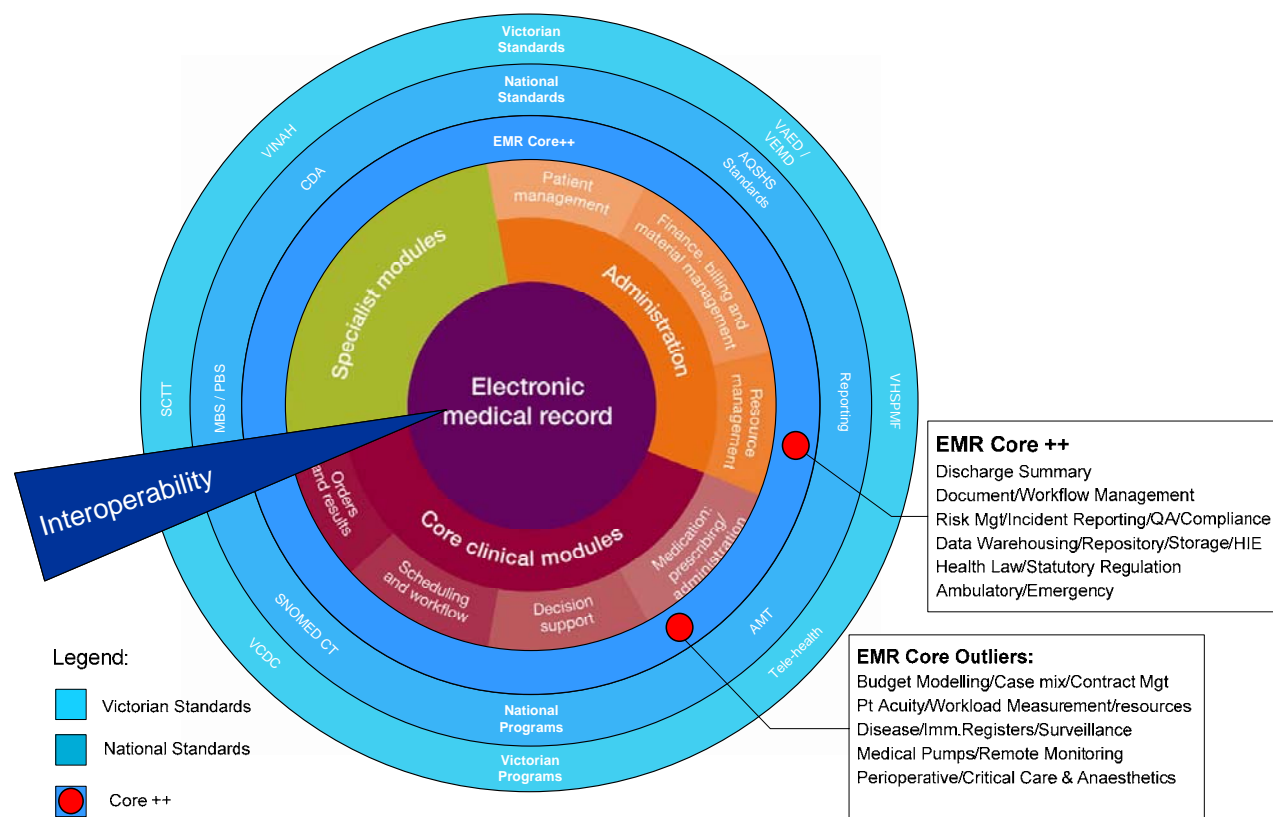
The diagram below shows the EMR core, as described in section 3, with three additional layers, the first is an extension of the EMR Core to include the surveyed results presented in Section 6, the national standards / reporting and Victorian standards and reporting. Of primary importance are the long established MBS / PBS regimes and the Victorian reporting requirements, both of which are essential to a health service's successful ongoing operations.

The model extends into emerging areas such as the use of HL7's Clinical Document Architecture (CDA), the Australian Medicines Terminology (AMT) and SNOMED CT-AU, all of which are standards or specifications introduced into the Australian health sector by NEHTA. CDA specifications cover documents such as electronic referrals, discharge summaries, and shared health summaries among others.

While not explicitly shown in the diagram, health organisations may wish to consider integration between their EMR solution and the Personally Controlled Electronic Health Record (PCEHR) system, noting that the PCEHR relies on CDA, AMT, SNOMED CT use within the sector, as well as other standards and specifications.

Interoperability between systems within health organisations, and between different health organisations, is important to the efficient operations and to supporting continuity of care for patients.

Figure 5 - EMR Core with Australian / Victorian extensions



EMR Capability Enhancement

Once a health organisation has completed an assessment of their current EMR capability, the next step will be to determine how best to increase their capability in line with health organisation and clinician requirements. The models analysed in this paper will provide varying levels of input to this process. This essentially requires a definition of the desired future state and the program of work to deliver the additional capabilities.

There are a variety of tools to help health organisations undertake strategic planning for EMR implementations, as well as a suite of services available from the HDA and various consultancy firms. One example of such a tool is the Tristar Health EMR Evaluation and Planning Toolkit, available at <http://tristarhealth.com/physician-resources/PhysRes-EMR-Planning.pdf>, though this would require enhancement to cater for a major health service.

Dermot O'Neill in his dissertation entitled "The potential role of Maturity Models in an Assessment of Hospital I.T. Capability in Ireland" identifies the following capability areas:

- Electronic Medical Record
- PACS
- Enterprise Resource Planning
- Interoperability
- Project Management
- Programme and Portfolio Management
- HIT Use and Management
- Enterprise Architecture
- Quality Management

6. EMR Core Quick Guide

| | Client Patient Admin Practice Mgt Claiming | Care Plan Clinical Documentation Charting | Order Entry Referral Results Reporting Diagnostics | Specialist Department Systems | Scheduling Recall Reminder SMS | Assessments Alerts Allergies Clinical Decision Support | Discharge Summary | Prescribing Med Management Pharmacy | Billing eClaiming Eligibility | Telemedicine Hospital in the Home | Document Workflow Management | Risk Mgt Incident Reporting QA Compliance | Clinical Risk Assessment | Budget Modelling Case Mix Contract Mgt | Patient Acuity Workload Measurement Resource Mgt | Disease Immunisation Registers Surveillance | Enterprise Management | Medical Devices Pumps Remote monitoring | Data Warehousing Repository Storage HIE | Messaging Interfacing Integration | Health Law Statutory Req. NeHTA Medical Vocab | Ambulatory Emergency+ | Mobility Support+ | Reporting Analysis Tools + | Perioperative,Critical Care & Anaesthetics + |
|-------------------------|--------------------------------------------|-------------------------------------------|----------------------------------------------------|-------------------------------|--------------------------------|--------------------------------------------------------|-------------------|-------------------------------------|-------------------------------|-----------------------------------|------------------------------|-------------------------------------------|--------------------------|----------------------------------------|--------------------------------------------------|---------------------------------------------|-----------------------|-----------------------------------------|-----------------------------------------|-----------------------------------|-----------------------------------------------|-----------------------|-------------------|-----------------------------|----------------------------------------------|
| HIMSS Asia Pacific - L4 | ✓ | * | * | ✓ | ✓ | | ✓ | * | | | ✓ | | | | | | | | * | | * | ✓ | | | |
| HIMSS Europe Model - L4 | ✓ | * | * | ✓ | ✓ | | ✓ | ✓ | | | ✓ | | | | | | | | * | | * | ✓ | | | |
| HIMSS US Model - L4 | ✓ | * | * | ✓ | ✓ | | ✓ | ✓ | | | ✓ | | | | | | | | * | | * | ✓ | | | |
| Department's Core | * | | * | * | * | * | | * | * | | | | | | * | | | | | * | * | * | | | |
| Gartner | * | * | * | * | | * | * | * | | * | * | * | * | | | * | | | | * | * | * | * | | * |
| Agency A - Metro Region | * | * | * | | * | * | * | * | * | * | * | * | | * | * | * | * | * | * | * | * | * | * | | * |
| Agency B - Metro Region | * | * | * | * | * | * | * | * | * | * | * | * | | * | * | * | * | * | * | * | * | * | * | | * |
| Agency C - Metro Region | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| Agency D - Metro Region | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| Agency E - Rural Region | * | * | * | | * | * | * | * | * | | * | * | | | | | | | * | * | * | * | | | |
| Combined Results | 100% | 90% | 100% | 80% | 90% | 70% | 90% | 100% | 60% | 40% | 90% | 60% | 30% | 30% | 40% | 40% | 20% | 30% | 70% | 70% | 70% | 100% | 20% | 10% | 40% |
| Health Organisations | 100% | 100% | 100% | 60% | 100% | 100% | 100% | 100% | 100% | 60% | 100% | 100% | 40% | 60% | 60% | 60% | 40% | 60% | 80% | 100% | 80% | 100% | 40% | 20% | 60% |

6.1 EMR Core Surveyed Results:

The results provided in the EMR Quick Guide have been gathered by unstructured surveys conducted within the VPHS. The results display an array of opinions on what constitutes an EMR Core. Further, when reviewing the surveys by health organisations only, the results alter slightly to include areas such as telemedicine/Hospital in the Home, Budget modelling/Case mix/Contract Management, Disease/Immunisation registers/Surveillance, Medical Devices/Pumps/Remote monitoring and Perioperative/Critical Care and Anaesthetics.

Results that posted greater than 50% include:

- Client/Patient Admin/Practice Management/Claiming
- Care Plan/Clinical Documentation/Charting
- Order Entry/Referral/Results Reporting/Diagnostics
- Specialist Department Systems
- Scheduling/Recall/Reminder/SMS
- Assessments/Alerts/Allergies/Clinical Decision Support
- Discharge Summary
- Prescribing/Meds Management/Pharmacy
- Billing Claiming/Eligibility
- Document/Workflow Management
- Risk Management/Incident Reporting/QA/Compliance
- Data Warehousing/Repository/Storage/HIE
- Messaging/Interfacing/Integration
- Health Law/Statutory Req/NeHTA/Medical Vocab and
- Ambulatory/Emergency.

Areas not included in HIMSS EMRAM in specific detail are:

- Assessments/Alerts/Allergies
- Billing/eClaiming/Eligibility
- Telemedicine and Hospital in the Home
- Risk Management/Incident Reporting/QA/Compliance
- Clinical Risk Assessment
- Budget Modelling/CaseMix/Contract Management
- Patient Acuity/Workload Measurement/Resource Management
- Disease/Immunisation/Surveillance
- Enterprise Management
- Medical Devices/Pumps/Remote Monitoring
- Messaging/interfacing/Integration
- Mobility Support
- Reporting/Analysis and
- Perioperative/Critical Care and Anaesthetics

Of the items listed, the following items were not covered by the HIMSS EMRAM model, but were considered important by health organisations:

- Assessments/Alerts/Allergies
- Billing/eClaiming/Eligibility
- Telemedicine and Hospital in the Home
- Risk Management/Incident Reporting/QA/Compliance
- Budget Modelling/CaseMix/Contract Management
- Patient Acuity/Workload Measurement/Resource Management
- Disease/Immunisation/Surveillance
- Medical Devices/Pumps/Remote Monitoring
- Messaging/interfacing/Integration
- Perioperative/Critical Care and Anaesthetics

Gartner raised these additional areas that were not covered by the original survey.

- Maternity
- Repatriation/long term care
- Skilled nursing and behavioural

Core Quick Guide Note:

1. Note + Added by agency after survey was posted
2. ~ = Covered in HIMSS > L4 only

7. Glossary

| Term | Description |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AMT | Australian Medicines Terminology |
| AQSHS standards | Australian Quality and Safety Health Service standards |
| ARGPM | Australian Regulatory Guidelines for Prescriptions Medicines |
| Australianisation | <ul style="list-style-type: none"> improve safety and quality of healthcare improve efficiency of healthcare comply with legal and ethical organisational requirements ensure fit for purpose meet regulatory and statutory requirements i.e, Australian regulatory guidelines for prescription medicines (ARGPM), Pharmaceutical Benefit Scheme PBS Australian Medicines Terminology AMT Victorian Admitted Episodes Dataset VAED Victorian Emergency Minimum Dataset VEMD Medical Benefit Scheme MBS National eHealth Transition Authority NEHTA Health Level 7 HL7 National Data Dictionary International Classification of Diseases ICD10 Systematised Nomenclature of Medicine Clinical Terms SNOMED CT Australian Standards for Secure Messaging Delivery the integration to improve the patient journey And any specific hospital or health services requirements that make core business functions fail if NOT implemented i.e. Oncology module for Cancer Centre, Paediatric Intensive Care Unit, Paediatric Hospital |
| CDA | Clinical Document Architecture |
| CPR | Computerised Patient Record (in Gartner report) |
| DHS | <p>Australian Government Department of Human Services, which now incorporates Medicare Australia.</p> <p>Also Victorian Department of Human Services.</p> |
| DH | Victorian Department of Health |
| DoHA | Commonwealth Department of Health and Ageing |
| EBM | Evidence Based Medicine (in Gartner report) |
| EHR | Electronic Health Record |
| EMPI | Enterprise Master Patient Index |
| EMR | Electronic Medical Record |
| HDA | OCIO Health Design Authority |
| HDF | Health Design Forum |
| HDO | Health Delivery Organisation (in Gartner report) |

| Term | Description |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HI | Healthcare Identifier |
| HIT | Health Information technology |
| HIMSS | Health Information and Management Systems Society. |
| HL7 | Health Level 7, a widely accepted standard to support exchange of medical information, both administrative and clinical. |
| HS | Health Service |
| ICD10 | International Classification of Diseases |
| MBS | Medical Benefits Scheme |
| NEHTA | National eHealth Transition Authority |
| OCIO | Office of the CIO, Victorian Department of Health |
| PACS | Picture Archiving and Communication System |
| PAS | Patient Administration System – a system used for the recording of patient and provider information to support management and coordination of service provision. |
| PBS | Pharmaceutical Benefit Scheme |
| PCEHR | Personally Controlled Electronic Health Record |
| ROI | Return on Investment |
| SCTT | Service Coordination Tools Templates |
| SNOMED CT | Systematised Nomenclature of Medicine Clinical Terms |
| VAED | Victorian Admitted Episodic Dataset |
| VCDC | Victorian Cost Data Collection |
| VEMD | Victorian Emergency Minimum Dataset |
| VHSPMF | Victorian Health Service Performance Monitoring Framework |
| VINAH | Victorian Integrated Non-Admitted Health, a minimum dataset and reporting specification |
| VPHS | Victorian Public Health Sector |
| Integration | To provide the right information at the right place and at the right time and thereby enabling communication between applications. The exchange of electronic messaging. I.e. HL7, CDA |
| Interoperability | Is the ability of diverse systems and organisations to work together (inter-operate) to enhance workflows and processes without barriers and broken data flows. |
| Health Organisation | Health Organisations exist for areas related to health, such as and not limited to health services, hospitals, community centres, mental health, health alliances |

8. References

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| | | | |
|----|-------------------------------------------------------------|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| 16 | Metropolitan Health Plan Technical Paper Rural and Regional | | http://www.health.vic.gov.au/healthplan2022/ |
| 17 | AIHW | Australian Institute of Health and Welfare | http://www.aihw.gov.au/publication-detail/?id=10737422172 |
| 18 | ABS | Australian Bureau of Statistics | www.abs.gov.au |

9. HIMSS Defined EMR Components

HIMSS Analytics defines the stages of their EMR Adoption Model as follows (HIMSS EMRAM Overview 2012)

- Stage 0:** The organisation has not installed all of the three key ancillary department systems (laboratory, pharmacy, and radiology).
- Stage 1:** All three major ancillary clinical systems are installed (i.e., pharmacy, laboratory, and radiology).
- Stage 2:** Major ancillary clinical systems feed data to a clinical data repository (CDR) that provides physician access for reviewing all orders and results. The CDR contains a controlled medical vocabulary, and the clinical decision support/rules engine (CDS) for rudimentary conflict checking. Information from document imaging systems may be linked to the CDR at this stage. The hospital may be health information exchange (HIE) capable at this stage and can share whatever information it has in the CDR with other patient care stakeholders.
- Stage 3:** Nursing/clinical documentation (e.g. vital signs, flow sheets, nursing notes, eMAR¹ is required and is implemented and integrated with the CDR for at least one inpatient service in the hospital; care plan charting is scored with extra points. The Electronic Medication Administration Record application (EMAR) is implemented. The first level of clinical decision support is implemented to conduct error checking with order entry (i.e., drug/drug, drug/food, drug/lab conflict checking normally found in the pharmacy information system). Medical image access from picture archive and communication systems (PACS) is available for access by physicians outside the Radiology department via the organization's intranet.
- Stage 4:** Computerised Practitioner Order Entry (CPOE) for use by any clinician licensed to create orders is added to the nursing and CDR environment along with the second level of clinical decision support capabilities related to evidence based medicine protocols. If one inpatient service area has implemented CPOE with physicians entering orders and completed the previous stages, then this stage has been achieved.
- Stage 5:** The closed loop medication administration with bar coded unit dose medications environment is fully implemented. The eMAR and bar coding or other auto identification technology, such as radio frequency identification (RFID), are implemented and integrated with CPOE and pharmacy to maximise point of care patient safety processes for medication administration. The "five rights" of medication administration² are verified at the bedside with scanning of the bar code on the unit dose medication and the patient ID.
- Stage 6:** Full physician documentation with structured templates and discrete data is implemented for at least one inpatient care service area for progress notes, consult notes, discharge summaries or problem list & diagnosis list maintenance. Level three of clinical decision support provides guidance for all clinician activities related to protocols and outcomes in the form of variance and compliance alerts. A full complement of radiology PACS systems provides medical images to physicians via an intranet and displaces all film-based images. Cardiology PACS and document imaging are scored with extra points.
- Stage 7:** The hospital no longer uses paper charts to deliver and manage patient care and has a mixture of discrete data, document images, and medical images within its EMR environment. Data warehousing is being used to analyse patterns of clinical data to improve quality of care and patient safety and care delivery efficiency. Clinical information can be readily shared via standardised electronic transactions (i.e. CCD) with all entities that are authorised to treat the patient, or a health information exchange (i.e., other non-associated hospitals, ambulatory clinics, sub-acute environments, employers, payers and patients in a data sharing environment). The hospital demonstrates summary data continuity for all hospital services (e.g. inpatient, outpatient, ED, and with any owned or managed ambulatory clinics).

¹ Electronic Medication Administration Record

² The right patient, the right drug, the right dose, the right route, the right time