Digitising public hospitals

Report 10: 2018–19

Queensland Audit Office
Better public services

Queensland Audit Office
Better public services

Your ref:
Our ref: PRJ00190

4 December 2018

The Honourable C Pitt MP
Speaker of the Legislative Assembly
Parliament House
BRISBANE QLD 4000

Dear Speaker

Report to parliament

This report is prepared under Part 3 Division 3 of the *Auditor-General Act 2009*, and is titled Digitising public hospitals (Report 10: 2018–19).

In accordance with s.67 of the Act, would you please arrange for the report to be tabled in the Legislative Assembly.

Yours sincerely

Brendan Worrall
Auditor-General

Content

Audit objective and scope

The objective of the audit was to assess how well Queensland Health (which includes the Department of Health and the hospital and health services) has planned and is delivering its digital hospitals program and whether it is realising the intended information-sharing and patient benefits.

We assessed:

- whether the plan (from 2014) to digitise Queensland public hospitals was based on robust analysis
- how effectively the program and hospital implementation projects have been managed
- whether the electronic medical record systems are delivering the expected benefits and are being used as expected by clinical staff
- whether the implemented system improves information access and sharing while still protecting privacy.

Scope exclusions

We did not, as part of this audit:

- test the adequacy of mitigating strategies to protect the integrated electronic medical record (ieMR) system and data from cyber threats
- investigate specific clinical concerns with the ieMR solution
- validate whether additional costs incurred by the hospital and health services in implementing the ieMR system were warranted.

Entities subject to this audit

- Department of Health
- Cairns and Hinterland Hospital and Health Service
- Metro South Hospital and Health Service
- Townsville Hospital and Health Service

We also consulted the Children's Health Queensland, Metro North, and Mackay hospital and health services to obtain their views on our lines of inquiry.

Further detail about the scope and approach is in Appendix B.

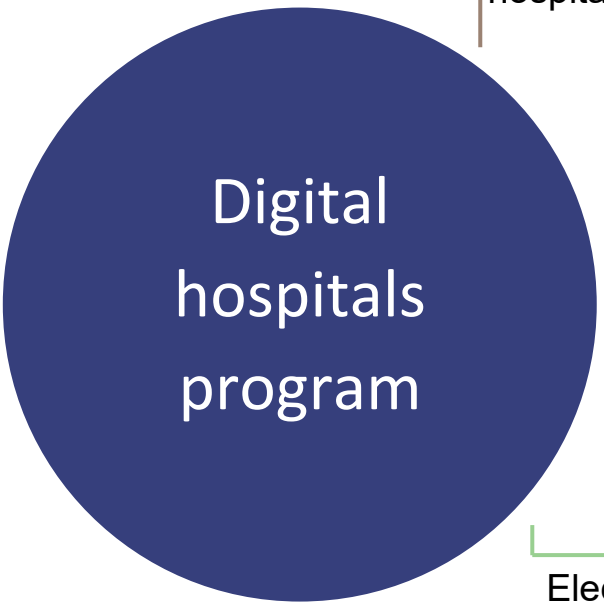
Reference to comments

In accordance with s.64 of the *Auditor-General Act 2009,* we provided a copy of this report to the Department of Health and the Cairns and Hinterland, Townsville, and Metro South hospital and health services. In reaching our conclusions, we have considered their views and represented them to the extent we deemed relevant and warranted. Any formal responses from the entities are at Appendix A.

Key facts

The 2016 ieMR program business case aimed to have 25 digital hospitals by June 2020.*

As at June 2018, there were eight hospitals and community health services with advanced digital hospital capability.



The program is being delivered through six funding packages (2011 to 2020).

Electronic medical records provide timely, accessible and legible information about patients at the point of care. This is transforming the health service workforce and how patients receive care.

In 2016, the program was estimated to cost $1.2 billion until 2025.^

**The draft 2018 business case updated the number of sites to 27 hospitals and the time frame for completion to March 2021.*

^ Source: 2016 ieMR program business case.

Introduction

What is a digital hospital?

In a digital hospital, processes are streamlined to create a 'paper light' approach. An electronic medical record is one of many applications that contribute to a digital hospital. An integrated electronic medical record solution allows patients' medical records to be created, stored, accessed, and shared electronically. But other elements of a digital hospital strategy may include automating and integrating biomedical devices, patient administration systems, laboratory information systems, and patient entertainment systems as well as integrating with corporate systems such as rostering and financial systems.

A digital hospital integrates its electronic medical records with its clinical devices, workflows, and processes. This enables clinicians (doctors and other health professionals) to see a patient's medical record anywhere and at any time. This brings together records from clinicians, with data, results, and other key clinical information such as pathology, pharmacy, and radiology reports. It also captures procedural information, and patient-related documents such as consent forms and other legal documents such as advance care directives.

In a digital hospital with electronic medical records, a clinician doesn't have to track down a patient's paper chart when treating them. The electronic medical records provide accessible, timely, and legible information about patients at the point of care. In a digital environment, clinicians can quickly access information from another digital hospital without having to wait for paper records to be sent through. They can also log in remotely and provide advice on a patient without being physically present.

The data captured in a digital hospital can be used to provide real-time information to manage a hospital and wider health service, enhance how patients are monitored, and enhance how medications are prescribed and managed. This should all result in better patient outcomes.

The benefits of digitisation will be realised over time as more and more hospitals increase their digital capabilities. The more advanced the implementation of digital solutions, the more benefits are expected to be realised.

Factors driving the need for digital hospitals

In line with international trends, the Queensland healthcare system is evolving to meet various pressures on health care arrangements. These include an ageing population, the growing burden of chronic conditions, and changing consumer expectations. These are driving the demand for services, resulting in a per capita growth of health services.

An integrated health information system is expected to deliver safer and more effective healthcare at a lower cost than can be achieved with an ad-hoc collection of disparate systems.

Appendix C shows the political, economic, social, technological, and legal drivers for digitising public hospitals.

Queensland's ieMR program

The integrated electronic medical record (ieMR) program has developed through several stages and changes in scope. The government has set a target for twenty-seven hospitals to fully implement the ieMR solution by June 2020 (the draft 2018 business case updated the time frame for completion to March 2021).

The ieMR solution has three levels of capability:

- 'basic' release capability—establishes a core electronic medical record (eMR) to digitise the paper medical record, with document scanning and basic clinical support such as allergy alerts and growth charts
- 'intermediate' release capability—enables electronic ordering and reporting of pathology tests and medical imaging, electronic discharge documentation, structured clinical notes, outpatient scheduling, and integrated emergency, maternity and surgery solutions. This is also known as the 'digital release'
- 'advanced' release capability—extends the solution to include electronic prescribing, medications management, anaesthetics, and research across all modules.

Key program time frames include:

- 2006—the program concept started with the development of an eHealth strategy.
- 2008—the Department of Health defined the program scope.
- 2009—the department released an eHealth implementation strategy and plan, which stated that 'Queensland Health would see the extensive rollout, covering 60 per cent of Queensland Health business, of an integrated electronic medical record'.
- July 2011—the department received approval for expenditure of up to $412 million (capital and operational expenditure) for the establishment and operation of the ieMR system.
- June 2014—the government changed the scope of the program, providing greater focus on the deployment of the ieMR with higher levels of capability at the Princess Alexandra and Cairns hospitals than previously envisaged. The department referred to the hospitals as the 'exemplar' hospitals.
- August 2015—the department published an eHealth investment strategy ($1.26 billion over 20 years) that stated it would invest $376 million in ieMR. (This does not include ieMR costs before 2015 or the cost of operating the ieMR.)
- In November 2016, the Queensland Government supported a business case that estimated the program would cost $1.2 billion. This included building and implementing the solution from 2010–11 to 2020–21 (capital and operational expenditure, including the $412 million originally approved in 2011) and business-as-usual costs from 2021–22 to 2024–25. The 2016 business case projected a potential benefit of $1.89 billion across the in-scope sites from 2015–16 to 2024–25. Cashable benefits made up 12.3 per cent of the total benefits projected.

The program is funded through a combination of appropriation approved by the Cabinet Budget and Review Committee and a co-contribution from hospital and health services (HHSs). The government is delivering the ieMR program through six funding packages from 2011 to 2020.

The department governs the ieMR program through the eHealth Executive Committee, the Digital Hospital Program Committee, and the Project Control Group. All three are chaired by eHealth Queensland, a business division of the Department of Health, and include representatives from hospital and health services. Figure A gives an overview of the committees.

Figure A
ieMR program governing committees

Committee name*	Chair	Accountability
eHealth Executive Committee	Chief Executive, eHealth Queensland	The committee oversees eHealth strategic planning and provides advice to the director-general on planning, prioritising, implementing, and realising benefits.
Digital Health Program Committee	Chief Digital Strategy Officer, eHealth Queensland	The committee provides overarching program governance for the implementation of the ieMR program.
Project Control Group	Chief Executive, eHealth Queensland	The group oversees the implementation of ieMR projects and influences decisions regarding the business and technology direction of implementation.

Note: * These committees are supported by three advisory groups (design, technical, and clinical advisory) and other clinical networks such as maternity and paediatric specialty sub-groups and optimisation groups.

Source: Queensland Audit Office

Transforming health care delivery

The ieMR program is transforming the way Queenslanders receive health care. The department reports that in September 2018, across nine sites that have the ieMR (including seven with advanced release capability and two with intermediate release capability), there were:

- 32 533 unique users with improved access to records at the point of care
- 237.2 million transactions recorded in the ieMR system
- 96.4 per cent of orders across pharmacy, radiology, pathology, and other diagnostic services completed electronically
- 32 583 patient allergies documented.

The statewide program is helping to create a more integrated hospital system by making it possible for hospital and health services across the state to access the same data to improve the efficiency and quality of care to patients.

The ieMR provides the foundation for future transformations in health care delivery, like the ability to gain greater insights and decision support from the system's data to improve the quality of patient care and operational efficiencies.

For example, an ieMR solution can:

- help reduce inpatient length of stay because there is a single integrated source of information
- reduce variation in clinical practices through standardised processes and workflows
- provide the ability to improve how at-risk patients are identified and managed.

We acknowledge the efforts of the department and hospital and health services staff in the ieMR implementations across Queensland hospitals to date.

Summary of audit findings

Planning and implementation

Aligning the strategic directions

The ieMR program is part of a broad program of work designed to meet the department's strategic plan, vision, and objectives for the Queensland health system and is a key component of the department's overall eHealth Investment Strategy.

External reviews commissioned by the department have confirmed that the strategy to digitise hospitals 'remains a sound strategy for building a collective patient health record and repository for research, analytics and further innovation'.

However, the actual cost of developing and implementing the ieMR is higher than forecast in the 2016 ieMR program business case. The higher costs of the ieMR program may have an impact on other planned initiatives if investment needs to be reprioritised.

Developing a business case

The department has developed and completed two business cases for the ieMR program since 2015—the Business Case Digital Hospital Program (September 2015) and the Integrated Electronic Medical Record Program Business Case (April 2016).

The April 2016 ieMR business case clearly described the target state and scope of services for the program. Its stated purpose was to critically examine three options for the future program rollout of the ieMR via benefit, cost, and risk.

However, we identified that the 2016 business case:

- significantly underestimated what it would cost each HHS to implement the ieMR solution. While HHSs are separate legal entities responsible for setting their own budget and monitoring their expenses, some have used the program estimates as a budget guide and have experienced significantly higher costs than planned. Labour costs associated with managing the transformation change are a key area where budgets have been exceeded.
- did not provide information to address potential dis-benefits (which is the term used to describe potential disadvantages) or analyse the risks to achieving the target benefits.
- only included a high-level options analysis. The business case did not include comprehensive information about the costs, risks, and benefits of alternative ieMR options. Due to the size of the state's investment in the program and the time that had passed since the original procurement process, we had expected to see some market testing of alternative options. Some stakeholders consulted as part of this audit remain unconvinced that continuing to use a single vendor for all sites is the best option.

We acknowledge that there are advantages in having a single vendor for all sites. But we also note that it is possible for hospitals with different digital systems to share data.

eHealth Queensland is preparing a business case to the Cabinet Budget Review Committee (CBRC) for the approval of continued ieMR funding, which it expects to submit in early 2019. The updates include lessons learned since the 2016 business case and include a section that analyses dis-benefits.

Program costs

Digitising hospitals involves transformational change. Therefore, accurately forecasting the costs for the program has proved challenging for the program and HHSs. The department provided the HHSs with a desktop estimate of costs. HHSs then needed to forecast their own costs. So far, HHS costs have exceeded the original estimates—particularly the resourcing needed to go into this change. Some of the in-scope hospitals have had to make additional funding requests to cover unexpected additional infrastructure and staff costs.

Some of the reasons hospitals' implementation costs have significantly exceeded budget estimates are because HHSs:

- used more resources than expected because they wanted to minimise disruption to hospital operations and minimise the clinical risk of the ieMR implementation
- spent more on clinical and end use devices because Queensland hospitals aim for higher device density to support a higher quality of care (the business case assumptions were based on the experience of hospitals overseas)
- chose to go beyond the standard build to implement a program of broader digital transformation for their hospital and health service.

The program has identified a funding shortfall for completing the rollout of the ieMR to all the in-scope hospitals and is in the process of developing a revised business case and funding submission. However, it still cannot accurately report what it has cost the hospitals to implement the ieMR. It cannot effectively and accurately monitor the total costs because:

- it does not receive complete financial information from all the HHSs participating in the program
- the department and HHSs do not have appropriate project management software to record and report detailed project costs.

We found that the project costs HHSs were reporting were higher than what the program was aware of. In response to our draft findings, eHealth Queensland conducted a preliminary assessment of HHSs' project costs and found that about 21 per cent of project costs HHSs were reporting did not relate directly to the ieMR program. However, the program advised us that Metro South HHS indicated that their financial records show the reported expenditure for its HHS does relate directly to the ieMR implementation in its health service.

eHealth Queensland recognises that it needs to do more detailed work to determine what HHSs have spent to implement the ieMR solution, so it can accurately report the total program cost.

Recurrent costs

While eHealth Queensland has funded the recurrent costs (costs of maintaining and operating) of the ieMR solution until now, it is still unclear what each HHS will have to pay annually for the ieMR system when the program closes in June 2025. At an aggregate level, the program (May 2018) is forecasting that HHSs will collectively have to fund an annual cost of about $90 million from 2024–25 (for vendor costs, labour support costs and non-labour support costs) based on a service charge which still needs to be finalised.

The 2016 ieMR business case did not indicate how much HHSs would need to pay to support the ieMR solution, which meant HHSs were not fully informed about the operating costs when they agreed to participate in the program. In its draft updated business case (October 2018), eHealth Queensland has still not indicated how much participating HHSs will need to pay in recurrent costs for the ieMR solution.

Program schedule

We found the program has

- an effective process for deciding which hospitals will implement the ieMR solution
- implemented a governance process to ensure the implementation schedule continued its momentum when some hospitals deferred from the planned timing of their implementation.

The program made slow progress between 2007–08 and November 2015. The department reported to us that progress was affected by internal and external factors. Internal factors included the upgrades to hospital infrastructure in preparation for the ieMR solution. External factors included a change of government and an instruction to defer program activity while the Queensland Health payroll program failure was investigated.

The program's momentum has increased since it implemented the first ieMR advanced solution at the Princess Alexandra Hospital in March 2017 (following the digital release in November 2015). There are now seven hospitals and one community health service with the advanced ieMR solution. It has less than two years to implement the solution in a further 19 sites. There is a risk the program's momentum could slow during this time because some of the HHSs scheduled to implement the ieMR solution do not have as strong a financial position as HHSs that have already implemented the solution. This could put the March 2021 revised target date at risk.

Managing value for money

The department negotiated contractual terms in the initial contract to assist in delivering value-for-money outcomes. The contract terms include Queensland Health being offered a price which is no less favourable than the price paid by any other purchaser from the contractor in Australia of similar products and/or services purchased in similar circumstances. The contract also includes volume discounts for 'whole-of-state' volumes.

However, the department cannot demonstrate that it has, and continues to obtain, the best price with the vendor to ensure the state is getting best value for money. While the department's contract with the vendor entitles it to obtain pricing as low as other similarly situated clients, it has not requested this information formally, or performed independent price benchmarking, because it believes the vendor has provided it with the best price. There is no evidence to indicate that the price the vendor offered at the time of the contract extension in 2017 was still the lowest.

Although eHealth Queensland regularly meets with the vendor to discuss performance, there is no evidence that it summarised and analysed the vendor's performance thoroughly before deciding to extend the contract.

The department has limited leverage when negotiating with the vendor when contract extension options are due. This is because the department has not sought alternative ieMR options and shows no indication of doing so. As a result, there is no competitive tension placed on the vendor.

Engaging system users

The program's engagement with one of the exemplar sites (the Princess Alexandra Hospital) was extensive. However, we found some system users outside of the exemplar site who felt their needs were overlooked. As a result, they reported feeling disengaged from the program.

For example, staff at the Townsville Hospital told us the original maternity module of the ieMR system did not meet their needs because the workflows did not align with the hospital's process. They said the program initially appeared to ignore their concerns because they did not affect the exemplar site (which does not deliver a maternity service). Since the design phase, Townsville HHS has been involved in the perinatal data collection optimisation group and it also chairs the maternity sub-committee.

Although some audit interviewees shared concerns about engagement, this does not mean that overall sentiment about the ieMR program is negative. The University of Queensland (UQ) Business School conducted a survey at the request of the department in August 2018 and found, on average, the impact of the ieMR implementation has been broadly positive for three HHSs (Mackay, Metro South, and Children's Health Queensland HHSs) that have implemented it so far. The Townsville and Cairns and Hinterland HHSs did not participate in the survey as they had not implemented the advanced ieMR capability.

Managing risks and issues

While the program has processes in place to manage risks and issues, it has not addressed some key risks and issues identified by system users. For example, it has not addressed the increased cost and effort to produce reports that were available (and necessary for statutory reporting, like emergency department access targets) in legacy systems.

The program has not been able to address some of the issues during the ieMR implementation phase because the focus has been on implementing the ieMR system as per the program timeline. For example, the program is aware that HHSs have not been able to get the information they need from the ieMR system, but they have not been able to allocate sufficient resources to address this gap.

We are aware that some clinicians have raised concerns about the ieMR solution with the director-general of the Department of Health and the Australian Medical Association Queensland. This indicates they saw the need to escalate their concerns above the eHealth program.

To address system users' concerns, the program is working with the Clinical Excellence Division of the department to engage, consult, and advocate with clinical teams to ensure the quality of clinical care. The division was established in 2015 to partner with health services, clinicians, and consumers to drive measurable improvements in patient care. In recent years, it has worked closely with eHealth Queensland to address clinical concerns relating to the ieMR system.

Data access and security

eHealth Queensland has designed sufficient operational controls to ensure data can be reliably exchanged between the ieMR and other systems that are connected. This allows clinicians to access clinical data recorded outside of the ieMR system. In accordance with the approved design, the department has provided clinicians and staff with easy access to patient information in the ieMR.

To mitigate the risks of inappropriate access, HHSs are expected to monitor access logs. They have a process for monitoring potential breaches of user access to clinical records and for taking disciplinary action against staff who use their ieMR access to view clinical records not relevant to their duties. However, this process relies heavily on cooperation from staff assigned the responsibility to review the user access records. It is not fully effective because there is a gap in the monitoring process. The HHSs do not have a process to ensure that staff complete their review of potential breaches of user access to clinical records.

We found weaknesses with the department's password controls for preventing unauthorised access to the ieMR. While the department offers guidelines to staff on best practice for creating passwords, it does not enforce this through preventative technical controls. The department relies on detective controls (an internal control mechanism), which alert it when an ieMR user attempts to guess a password through a high number of unsuccessful attempts. This reduces the likelihood that an account could be misused, which reduces the risk to the department and patients. However, there is still a residual risk. Unauthorised access to a clinician's account (through a successful password guess) could have significant adverse impacts. The department needs to address this.

We found weaknesses with HHSs' employee termination processes for ieMR users. The department has a compensating control (if a HHS does not remove a user's access upon termination) to de-activate user accounts after three months of inactivity. These accounts are linked to clinical data. As dormant accounts (through staff movements) could be exploited by internal users, HHSs should not depend on the department's compensating control. They need to implement a more timely and effective control to terminate user access for employees who no longer require access.

Benefits realisation

Establishing, measuring, and reporting benefits

The department's 2016 ieMR business case includes 10 benefits. Each of these benefits has a monetary value and six of them also have non-monetary values. This provides a basis upon which the success of the program can be measured.

The program is improving how it manages benefits by engaging with future sites earlier. It is providing more information and tools to enable HHSs to effectively manage benefits at the project level. We observed during the audit that the program's benefits management function has matured through the involvement of the Centre of Excellence (which was set up within eHealth Queensland to provide support to the program). Hospitals now measure their benefits with greater consistency.

The results the program is reporting to Cabinet and central agencies for some benefits are different to those it reports internally (within eHealth Queensland). This is because it uses different time frames (baseline data) for internal and external reporting. Its internal reports include all hospitals that have implemented the intermediate and advanced releases, while its external reports to date have only included benefits data for the Princess Alexandra Hospital. The baselines it uses to externally report the Princess Alexandra Hospital benefits provide a more favourable result than those it uses for internal program reporting.

Realising benefits

The program and HHSs are realising benefits, particularly in reducing unplanned readmission rates and reducing the time it takes for staff to access clinical information. For the three hospitals we audited, we found it is taking longer to realise the benefits than the business case forecast. They are, however, realising other benefits not included in the business case that show the ieMR solution is helping them improve how the hospitals deliver their service and patient safety.

Expected benefits

Hospitals that have implemented the ieMR have not achieved the targeted benefits within the expected time frames.

Of the six benefits the hospital sites are measuring, two benefits (stationery costs and unplanned readmissions) show uniform improvement across all three sites we audited. As at October 2018, the program reported that, in terms of the other four benefits:

- none of the three hospitals achieved the expected benefits for reduction in emergency department length of stay
- only one of the three hospitals (Townsville) achieved the target for inpatient length of stay
- two of the three hospitals (Princess Alexandra and Cairns hospitals) achieved the benefit target for reduction in inappropriate pathology testing
- only one of the three hospitals (Princess Alexandra) reported it achieved the target for reduction in inappropriate diagnostic imaging. The Townsville Hospital is close to achieving the target. The Cairns Hospital is unable to measure this target because it does not have an electronic interface for radiology results and ordering.

Additional benefits

The program has, however, realised some benefits that were not in the business case. The in-scope hospitals include some additional benefits in the centrally-coordinated tracking by the Centre of Excellence. These are all categorised as quality and safety benefits, which supports the view of many hospital staff we interviewed that the ieMR is primarily an investment in quality and safety of patient care.

The UQ Business School identified four major ieMR benefits:

- faster access to records, and more legible records, across the hospital
- automatic controls that make it easy to do the right thing
- more transparency of how the hospital functions
- potential for secondary benefits through business intelligence capability (the ability to use data to gain insights and make decisions). This is particularly the case when the data from the ieMR is aligned to other source systems.

The program has tracked additional ieMR benefits in its reporting. These benefits are reported by HHSs that have implemented the system and are directly related to clinical observations. For example,

- reduction in inpatient falls with serious injury
- reduction in hospital-acquired pressure injuries.

Maximising benefits

The ieMR program scope does not include developing the full functionality for clinical decision support, including the ability to analyse patient data to make better clinical decisions.

Although the Princess Alexandra Hospital has built some capability in using ieMR data to gain insights and make decisions (which is known as business intelligence), there hasn't been a central point to advance the ieMR hospitals' capability in this regard. While the Princess Alexandra Hospital has the budget, resources, and now the expertise to establish the capability, sites like Mackay and Townsville do not have the scale or funding to justify the investment on their own. They have entered into service level agreements with the Princess Alexandra Hospital to use its capability.

We understand the Clinical Excellence Division of the Department of Health has been involved in developing business intelligence capability. However, it has requested more resources to enable it to effectively fulfil this role.

Identifying, monitoring, and managing dis-benefits

Princess Alexandra Hospital is the only site that is actively monitoring dis-benefits. We found other sites did not have a mechanism in place to monitor and manage the dis-benefits of the ieMR program. The Townsville and Cairns hospitals identified a number of them in their business cases and other benefits realisation documents. The program does not provide central support to HHSs to identify, record, and manage dis-benefits.

Audit conclusions

Digitising Queensland's public hospitals is delivering benefits in terms of improving health service delivery and patient outcomes. The hospitals we audited that have implemented the ieMR system are realising some benefits, but at a slower rate than predicted in the program's business case. They are also realising other benefits not envisaged in the business case.

The consistent view expressed by stakeholders is that the ieMR is an investment in quality and safety of patient care. It also builds a foundation to gain further benefits in the future. Recent survey data by the UQ Business School found that, while ieMR users mostly have moderately positive views about the system immediately after go-live, they have more positive expectations about the future.

Learnings to date indicate it will take longer and cost far more to realise the expected benefits than the department forecast. The program is now at a critical junction because it cannot complete implementation in the remaining 12 hospitals without more funding.

To better inform government's decisions about future phases, the department needs to obtain a clearer understanding of the complete cost of implementing the program. The department has recognised it underestimated the costs and is preparing a revised business case. But it needs to do further work to validate what costs HHSs have incurred that directly relate to the ieMR program. It also needs to do further analysis and consultation with HHSs to determine how they will pay for the operating costs of supporting the solution when the program closes in 2025.

To maximise the value of the investment, additional resources need to be invested in developing business intelligence. Not all hospitals have the resources to do this, and the department needs to provide central coordination so all HHSs can use data to improve service delivery.

HHSs we audited demonstrated a commitment to the digital strategy and agreed it would be beneficial to implement the ieMR solution in the remaining hospitals. Opinions differ, however, on whether limiting the ieMR digital journey to a single vendor is the best way forward.

Some stakeholders have questioned whether there has been a strong enough focus on value for money. The program didn't conduct robust analysis of alternative vendors in recent business cases (even five years later, when the technology had changed and more potential vendors existed). Nor has the program focused on ensuring the program is continuing to receive the best price with the current vendor.

The department and HHSs need to strengthen information security. The digital world brings new security risks. The department needs to be more proactive in restricting how users can access the ieMR system, and HHSs need to better manage how they monitor and terminate user access.

Now the program is concentrating on delivering the ieMR solution it has configured, the roles and responsibilities of eHealth Queensland and the department's Clinical Excellence Division need to be reviewed. This will ensure there is adequate focus on delivering the ieMR solution to the remaining hospitals in the program, on managing stakeholder expectations, and on realising the benefits across the system as a whole.

Recommendations

Department of Health and the hospital and health services

We recommend that the Department of Health and the hospital and health services that have implemented the ieMR solution (Note 1):

1. continue to work together to identify the actual cost to date of implementing and operating ieMR. (Chapter 2)

   The Department of Health should:

   - use this information to update the Cabinet Budget Review Committee on the actual program cost to date. The information should form the basis for a more reliable estimate of what it will cost to complete the program and of the longer-term costs of maintaining the ieMR solution
   - in consultation with HHSs, consider whether the level of investment by HHSs to implement the ieMR solution is appropriate.

Note 1: The hospital and health services that have implemented the ieMR solution at varying ieMR stages include the Metro South Hospital and Health Service (ieMR advanced), the Mackay Hospital and Health Service (ieMR advanced), the Children's Health Queensland Hospital and Health Service (ieMR advanced), Cairns and Hinterland Hospital and Health Service (ieMR intermediate), Metro North Hospital and Health Service (ieMR basic), and the Townsville Hospital and Health Service (ieMR intermediate).

Department of Health

We recommend that the Department of Health:

2. completes its refresh of the eHealth investment strategy based on the revised cost of the ieMR program and any impacts it has on the strategy for other programs (Chapter 2)
3. provides the Cabinet Budget Review Committee with:
   - updated timing for the realisation of benefits
   - a balanced assessment of benefits realised (and dis-benefits) across hospitals from all hospital and health services that have implemented the ieMR (Chapter 3)
4. provides greater assurance that it is obtaining ongoing value for money from its ieMR vendor by:
   - investigating options for demonstrating value-for-money pricing, including conducting comparative vendor price analysis where possible
   - assessing and documenting the ieMR vendor's performance across its service contracts, with input from hospital and health services.

   This should occur at appropriate intervals and, at a minimum, before each contract extension decision (Chapter 2).

Recommendations

5. re-visits the governance arrangements for the program as it moves from building, configuring, and implementing the ieMR solution to business-as-usual and optimising the solution

   This should include:

   - re-visiting the focus and roles of the eHealth Executive Committee, eHealth Queensland, and other areas of the department such as the Clinical Excellence Division
   - continuing to obtain an independent review of program benefits periodically. (Chapters 2 and 3).

6. develops and implements an engagement strategy for all current and planned eHealth programs to assess the effectiveness of its engagement with hospital staff and clinicians and the effectiveness of the system implementation (Chapter 2)

   This should include:

   - specific actions, performance measures, and data sources to enable the department to assess how effectively the department engages hospital staff and clinicians
   - gathering information about concerns, risks, or dis-benefits that may inform the program about changes or modifications that need to be made to the program.

7. continues efforts to refine the business intelligence strategy and approach, and rollout solutions to hospital and health services to maximise the benefits from the ieMR implementation at each site (Chapter 3)

8. improves the preventative security controls of ieMR user accounts (Chapter 2).

   This should include enforcing password complexity requirements and implementing a change management process to educate clinicians on appropriate password settings.

Hospital and health services

We recommend that all hospital and health services participating in the ieMR program:

9. report regularly on their total ieMR project costs and broader costs associated with their digital transformation (separated from ieMR costs) to eHealth Queensland as well as to their own hospital and health service boards (Chapter 2)

10. improve their employee termination processes to ensure they promptly remove an employee's ieMR access when an employee or temporary staff member terminates their employment with their hospital and health service (Chapter 2)

11. implement a process to monitor whether reviews of inappropriate user access to ieMR patient data are completed (Chapter 2)

12. report dis-benefits to the program so the program can learn from these and if necessary, modify the solution or implementation approach (Chapter 3).

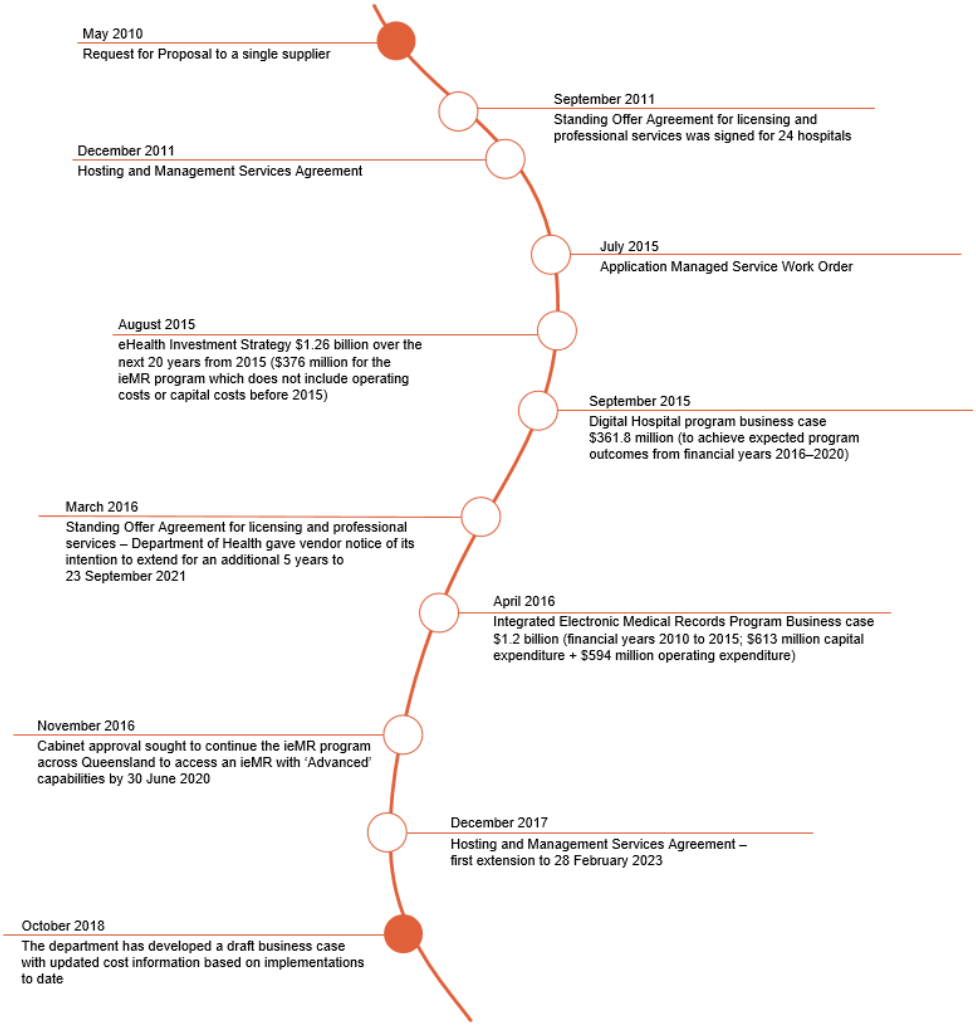
1. Context

Program progress, scope, and funding

The ieMR business case states that by 2020, 25 hospitals across Queensland will have moved from paper-based to electronic clinical workflows and processes. The draft 2018 business case update increases this to 27 hospitals. This accounts for 83 per cent of the state's public hospital activity and 80 per cent of public hospital beds.

As reported in the State Budget 2017–18, the total cost of the integrated electronic medical record (ieMR) program is projected to be $1.2 billion. This includes project costs and ongoing recurrent costs until 2025. Figure 1A shows key decision points in the ieMR program from 2010 to 2018.

Figure 1A
Key ieMR program decisions



Source: Queensland Audit Office.

The Princess Alexandra Hospital was the first to achieve digital capability (intermediate—see notes in Figure 1B) in November 2015. In March 2017, the Medications, Anaesthetics and Research Support (MARS) release went live as the final element (advanced capability) of the ieMR implementation at the hospital. The hospital is considered to be the largest digitally-advanced public hospital in Australia. As at June 2018, seven Queensland hospitals and one community health centre have implemented the advanced release of the ieMR solution.

Figure 1B shows the hospitals that have implemented the intermediate or advanced release of the ieMR solution.

Figure 1B
ieMR implementation progress

Hospital	Hospital and health service	Level of capability*	Go-live date**
Princess Alexandra	Metro South	Advanced	March 2017
Logan	Metro South	Advanced	December 2017
Beaudesert	Metro South	Advanced	January 2018
Redland Hospital Wynnum Manly Community Health Centre	Metro South	Advanced	May 2018
QE II	Metro South	Advanced	June 2018
Mackay Base	Mackay	Advanced	October 2017
Lady Cilento Children's	Children's Health Queensland	Advanced	April 2018
Cairns	Cairns	Intermediate	March 2016
Townsville	Townsville	Intermediate Enterprise Scheduling Management (ESM) and Surginet	July 2016 August 2018
Royal Brisbane Women's Hospital	Metro North	Basic ESM	May 2014 March 2016

Note: *'Intermediate' release enables electronic ordering and reporting of pathology tests and medical imaging, electronic discharge documentation, structured clinical notes, outpatient scheduling, and integrated emergency, maternity and surgery solutions. 'Advanced' release capability extends the solution to include electronic prescribing, medications management, anaesthetics, and research across all modules. ** Includes the go-live date to achieve the current level of capability (that is, does not include previous go-live dates for earlier phases of implementation).

Source: The Department of Health.

The Queensland Government, through the Department of Health, is delivering the ieMR program through six funding packages from 2011 to 2020, as shown in Figure 1C.

Figure 1C
ieMR program funding—as per funding Package 4 (August 2017)

Funding package (period)	Funding amount*—GST-exclusive ($ mil.)	Scope
Approved funding packages		
Package 1 (July 2011)	$186.5 (Program)	Core electronic medical records** at nine facilities in seven hospital and health services
Package 2 (April 2016)	$71.3 (Program)	One advanced release hospital (Princess Alexandra) Three intermediate release hospitals (Cairns, Mackay, and Townsville) Two basic release hospitals (Royal Brisbane and Women's, and Lady Cilento Children's)
Package 3 (Jul 2016–Aug 2017)	$56.7 (Program) $29.3 (HHS)	Advanced release capability for hospitals at: Mackay, Logan, Beaudesert (self-funded), Lady Cilento Children's, Queen Elizabeth II, Redland, Townsville, and Wynnum-Manly Community Health Centre.
Package 4*** (Jul 2017–Dec 2018)	$83.5(Program) $48.8 (HHS)	Advanced release capability for hospitals at: Sunshine Coast University Hospital, Nambour (self-funded), Ipswich, Gold Coast University Hospital/Robina, and Toowoomba
Planned funding packages		
Package 5 (Jul 2018–Dec 2019)	To be determined through future package submissions	Advanced release capability proposed for hospitals at: Redcliffe, Caboolture, Royal Brisbane and Women's Hospital, the Prince Charles, and Cairns
Package 6 (July 2019–2020)		Advanced release capability for hospitals at: Bundaberg, Mt Isa, Longreach, Thursday Island, Roma, Rockhampton, and Hervey Bay.

Notes:

* The funding amount does not cover business-as-usual costs
** The core ieMR functions were order entry, results reporting, electronic clinical notes, medications management, and statewide scheduling.
*** Funding Package 4 also includes funding to support infrastructure readiness activities for hospitals at: Royal Brisbane and Women's Hospital, the Prince Charles, Caboolture, Ipswich, Toowoomba, and Rockhampton.

Source: The Department of Health.

Primary healthcare facilities and community services in rural and remote health facilities are not in scope for the ieMR program. Health facilities located in remote areas, such as areas in the Cairns and Hinterland, and Torres and Capes HHSs, are covered under the Regional eHealth Project. This is a joint initiative between the two HHSs that began in 2015 and uses $34.95 million funding from the Australian Government's Health and Hospital Fund. The project aims to deliver an electronic health record system for Queensland Health's primary and community healthcare services across Far North Queensland. Its goal is to enable secure and reliable access to patient and clinical information, and the sharing of information with private and not-for-profit healthcare providers.

Roles and responsibilities

The Department of Health

The department provides centralised digital hospital program support and direction on the content and structure of Cabinet submissions for the ieMR program. The two main areas of the department involved in the ieMR program are:

- **eHealth Queensland**—responsible for the overall delivery of the ieMR program. This includes central coordination and project management capability, vendor and contract related responsibilities, assurances, and checkpoints for project delivery and solution delivery. It also supports and maintains the system's production environment while the program is being delivered to hospital sites, provides onsite go-live support, and optimises the state build
- **the Clinical Excellence Division**—accountable for monitoring and reporting on clinical performance, for example, patient safety. The Healthcare Innovation and Transformation Excellence Collaboration section within the Clinical Excellence Division is responsible for provision of clinical input to the ieMR program.

Hospital and health services

Public health services in Queensland are provided through 16 hospital and health services (HHSs). These are statutory bodies, each governed by their own board. HHSs co-contribute funds for the ieMR program. They are responsible for:

- the local project management, project delivery, and project documentation requirements
- the clinical engagement and change management functions (this may include backfilling staff who are released to support the ieMR solution implementation)
- training and go-live support
- any additional capital required (for example, extra computers and devices they purchase to integrate with the ieMR solution)
- additional software or services outside the scope of the advanced release of the ieMR
- business-as-usual costs (for example, training and local level support)
- paying their contribution for the annual operational costs (including software support costs, labour support costs, and non-labour support costs) to eHealth Queensland.

The Department of the Premier and Cabinet and Queensland Treasury

Both the Department of the Premier and Cabinet and Queensland Treasury provide advice on the content and structure of ieMR Cabinet submissions. They ensure the decision to implement ieMR and the way it is implemented are in line with the government's objectives.

ieMR vendor

Since 2011, a single vendor has been the sole supplier of electronic record management software for the ieMR program. It provides:

- licensed software, software support, and implementation services to deliver the ieMR in Queensland
- hosting and managed services and data centre infrastructure for the ieMR solution
- application-managed service for the ieMR solution (for example, application monitoring and incident management and problem management services).

The department engages other vendors covering a range of disciplines (such as hardware suppliers) under the ieMR program.

Standing offer agreement for the provision of eMR software licensing, support, and implementation services

The department, on behalf of the state, entered into a standing offer arrangement for licensing and professional services with the vendor on 23 September 2011. This sets out terms and conditions and the framework to be used for the department and the vendor to agree orders. The initial contract term was for five years with three optional five-year extensions. The department provided notice to exercise the first extension for five years, to 2021, on 18 March 2016. The cost of the first five-year term was $94.5 million, and eHealth Queensland forecasts that the cost of the second five-year term will be $147 million.

Hosted and managed services agreement

The department, on behalf of the state, entered into a hosted and managed services agreement for the ieMR solution with the vendor on 30 December 2011. The initial contract term is for five years with three optional five-year extensions.

The contract value is $68 million for the initial five-year term, plus additional fees for consulting services (at agreed hourly rates) and optional services. This includes a one-off set-up fee of $15 million, a monthly service fee that increases as the number of concurrent logons increase, consultancy services, and other optional services. On 20 December 2017, the department exercised the first extension for an additional five-year term, to 28 February 2023. The department estimates the value of this contract extension (from December 2017 to November 2022) to be $91.8 million.

In addition, in July 2016, the department and vendor agreed to a work order under this agreement for application management services for a seven-year period. The total value of this agreement is $23.6 million.

2. Planning and implementation

This chapter is about how well the digital hospital program has been planned and implemented.

Introduction

We assessed whether eHealth Queensland (a business division of the Department of Health) developed comprehensive plans to digitise public hospitals and whether the integrated electronic medical record (ieMR) program and projects were effectively managed.

We assessed whether:

- the plan to digitise hospitals supported the department's strategy and vision for future health service delivery
- the program understands the total costs of ieMR and is focused on value for money
- there was effective oversight of the program and projects, such as cost monitoring, contract management, and risk management
- the program effectively engaged system users and considered their specific work needs in the design phase and during deployment
- the implemented system improves access to and sharing of information while protecting privacy.

Aligning the strategic directions

We found there is a clear alignment between what the Department of Health (the department) intends to invest in, and how that addresses the drivers for change and its objectives for the health system. External reviews commissioned by the department have also confirmed that digitising hospitals 'remains a sound strategy for building a collective patient health record and repository for research, analytics and further innovation'.

eHealth Investment Strategy

The department's eHealth Investment Strategy (August 2015) demonstrates that the program aligns with the department's objectives for the health system and the challenges it faces. It forms part of a broader program of work required to achieve the department's desired future state for health service delivery. The ieMR program lays the foundation for further work to improve health outcomes.

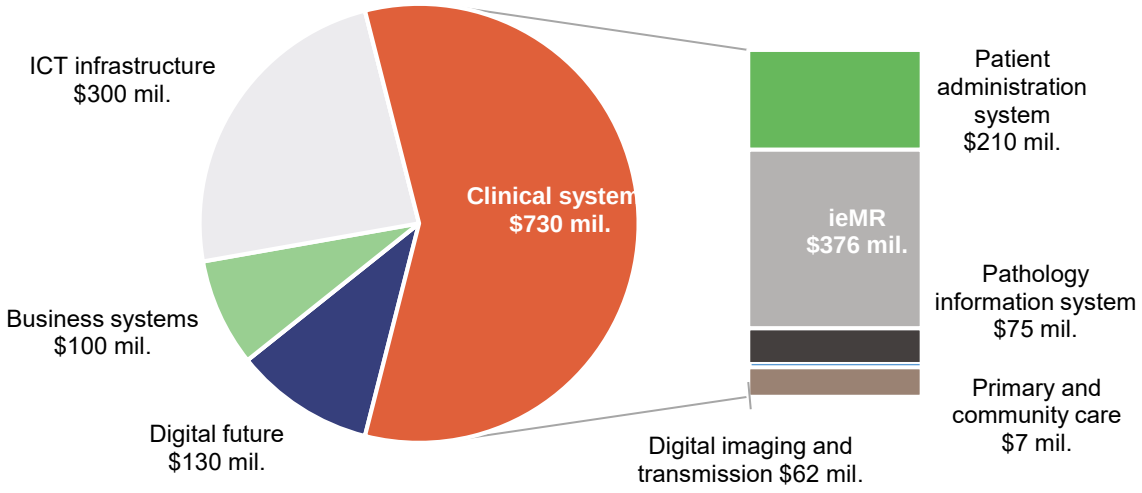
The strategy shows the state will need to invest beyond the ieMR program (and the funding the department and the hospital and health services (HHSs) receive) to address key factors placing pressure on the health system. These include population growth and ageing, longer life expectancy, increasing burden of chronic diseases, a geographically dispersed population, and the rising cost of service provision. The strategy provides a framework for prioritising and aligning each initiative with the department's objectives for the health system and the challenges it faces.

The strategy identifies the information and communication technologies the department and HHSs will need over 20 years from 2015. The total value of the strategy (indicative cost of implementation) is $1.26 billion, of which $376 million is for the ieMR. This does not include ieMR costs before 2015 or the cost of operating the ieMR.

This shows the Queensland Government and the department need to consider other investments as they implement the strategy. These include replacing the patient administration and pathology information systems and investing in the secure exchange of digital images across different health providers and settings.

Figure 2A shows that $376 million of the $730 million indicative costing for clinical systems is allocated to implementing the ieMR.

Figure 2A
ieMR program in the eHealth Investment Strategy



Notes: the indicative cost of the ieMR program in the eHealth Investment Strategy does not include costs incurred before 2015 or operating costs. ICT—information and communication technology.
* This performance audit assessed the ieMR component only, not the full eHealth investment.

Source: Queensland Audit Office.

ieMR business case

The department has developed and completed two business cases for the ieMR program since 2015—the Business Case Digital Hospital Program (September 2015) and the Integrated Electronic Medical Record Program Business Case (April 2016).

We found the business cases demonstrated that the department has a clear understanding of the desired outcomes and has clearly defined the value proposition and the key components to deliver the value. Appropriately, the department has updated its plans with new information and revisited the business case and submissions to Cabinet as required.

This aligns with the requirements of the model through which the government is providing six funding packages for the ieMR, from 2011 to 2020. The department is required to update Cabinet on the program's progress before it receives funding for the next package.

However, in the 2016 ieMR business case, we identified shortcomings with some of the analysis of options, costs, and benefits. These are explored further in the following sections.

Analysing options and value for money

We conducted an audit on 'Queensland Health—eHealth Program' in 2012 and found that the original procurement process undertaken by the department for the selection of a suitable vendor for the development of an ieMR system was appropriate and undertaken with probity and propriety.

For this audit, we assessed the adequacy of the processes supporting key program decisions post the original procurement. These included the continuation of the rollout of the ieMR to another 25 hospitals and vendor contract extensions.

2016 ieMR business case options analysis

The government asked the eHealth program to prepare a business case in 2016. The business case stated that 'the purpose of this document is to critically examine three options for the future program rollout of the ieMR via benefit, cost and risk'. The options involved considering using multiple vendors, continuing to use a single vendor, and limiting the rollout to just two hospitals.

The 2016 ieMR business case contained three options and used a multi-criteria assessment to select the preferred option—Option 2. Figure 2B shows the options the department considered.

Figure 2B
2016 ieMR Program Business Case—options for consideration

Option	Net present value of the option^	Benefit-to-cost ratio	Comment
Option 1 Two digital hospitals complete	-$177 million	0.83	This option does not meet the primary objective of the ieMR, that is, a single patient record that can be accessed digitally by clinicians at the point of care, across care settings.
Option 2 25 digital hospitals complete using a single vendor	$317 million	1.57	This option achieves 80% of state volume with a single vendor.
Option 3 10 hospitals + 15 —alternate vendors	$31 million	1.18	One or more solution providers are required to deliver the functionality between the 25 hospitals. This is because individual sites can select their own vendor.

^ The business case's net present value (NPV) calculations were derived from the benefit measures and metrics included in the business case, not using site-specific data. The NPV calculation includes capital and operating costs over the life of the program to 2025.

Source: Queensland Audit Office from the 2016 Integrated Electronic Medical Record Program Business Case.

The analysis in the business case does not demonstrate a sufficiently critical examination of the alternatives. The department engaged consultants to do a high-level analysis of costs and benefits of the three options without approaching the market. Due to the size of the state's investment in the program and the time that had passed since the original procurement process we had expected to see some evidence that the department engaged the market to determine what price other potential vendors would be willing to offer.

In the options table, Option 2 appears to have a higher benefit-to-cost ratio than Option 3. However, some components of costing and benefits in the third option are not publicly available, so the department made assumptions for those cost elements with its external consultants. The lack of market-tested data may skew the net present value and the benefit-to-cost ratio. Because the department did not seek pricing from the market, the net present value of Option 3 may have been higher than reported in the business case.

In addition, the department's funding Package 3 submission in November 2016 referred to giving further consideration of an alternative vendor (as per Option 3 of the business case) in funding Package 4. However, this was not revisited in the August 2017 funding Package 4 submission.

In its recent business case update (October 2018), the department's analysis shows that the net present value of Option 2 (its current strategy) has decreased from $317 million to $155 million, and that the cost-benefit ratio has decreased from 1.57 to 1.20 (the cost-benefit ratio for Option 3 in the 2016 business case was 1.18). The net present value has decreased because of the inclusion of additional costs, updating of benefit projections, and the timing of and changes to the implementation schedule.

We acknowledge that there are advantages in having a single vendor for all sites, including the ease of system integration, potential economy of scale, portability of patient records, and the ease with which staff can move around the state as they will be familiar with the same system in different hospitals. But we also note that system interoperability (when systems and devices can exchange data and interpret that shared data) makes it possible for hospitals with different digital systems to share data.

Because the department didn't do a thorough options analysis, it has not convinced some stakeholders we interviewed of the benefits of the option selected, which was to continue with a single vendor approach. The lack of benchmarking and market testing has led them to perceive there has been favouritism towards the vendor. Testing the market may not have changed the outcome, but more information may have improved stakeholders' confidence in the program decision.

The specific concerns raised with us included:

- the vendor may seek to increase prices in the future because it is the only vendor. The department's 2016 ieMR business case identified a risk that 'vendors do not maintain fair market prices throughout the program'. One of the mitigating actions was to 'engage third party market resource on a periodic basis to confirm vendor pricing provisions remain consistent or preferential to prevailing market conditions'. This has not yet occurred.
- lack of price benchmarking and market testing. The department issued a single vendor Request for Proposal for an electronic medical record solution in 2010. At the time, the department identified only one supplier that met its requirements. These requirements included: an appropriately mature ieMR product, a mature ieMR capability, and an Australian presence. The department did not benchmark the price nor test the market before it developed the program business cases in 2015 and 2016, even though there were other vendor options available by then. This is because it signed an initial five-year contract with the vendor in 2011 that includes three five-year extensions options, and it didn't see the need to test the market.
- restriction of vendor choice. The single vendor approach may also limit Queensland Health's future eHealth solutions due to the need for any future systems (that integrate with the ieMR solution) to be compatible with the vendor's product. This was highlighted as a program risk on the 2016 ieMR business case. The business case states that the risk can be mitigated by ensuring ICT investments are in line with the principles of the government's procurement policy.

In 2017, the department engaged a global research and advisory company to assess the continued appropriateness of the ieMR program vendor choice and strategy. It concluded that the approach to adopting an electronic health record for hospitals in the state remains a sound strategy for building a collective patient-centred health care and repository for research, analytics, and further innovation.

The global research and advisory company recommended the department review the commercial agreements with the vendor to ensure they were providing the same or better level of interoperability that they were being asked to commit to in other parts of the world, such as data-sharing functionality. We have found no evidence that the department has conducted the review.

Managing value for money

Price negotiation

The department negotiated contractual terms in the initial contract to assist in delivering value-for-money outcomes. The contract terms include Queensland Health being offered a price which is no less favourable than the price paid by any other purchaser from the contractor in Australia of similar products and/or services purchased in similar circumstances. The contract also includes volume discounts for 'whole-of-state' volumes. The vendor is responsible for promptly making available to the department any more favourable price it makes available to other customers.

However, after its initial agreement with the vendor in 2011, the department has never requested the vendor to provide it with assurance (for example, through a letter of assurance) that it gets pricing as low as other similarly situated clients. This is because it believes the vendor has provided it with the best price.

The department appears to have limited leverage when negotiating with the vendor when contract extension options are due. This is because the vendor has the benefit of knowing that the department has not sought, and shows no indication of seeking, alternative ieMR options. Therefore, there is no competitive tension placed on the vendor. As a result, the department cannot demonstrate that it continues to obtain the best price with the vendor to ensure the state is getting best value for money from the current arrangement.

The department sought advice from a global research and advisory company that confirmed the overall strategy, but it did not seek advice that it was still getting the best price.

Contract extensions

The key commercial principles in the agreements centre on the level of discounts on both software and services. The department engaged an advisory company that reported the vendor's pricing at the time of agreement in 2011 was less than industry benchmarks and the lowest it saw for this vendor. However, there is no evidence to indicate whether the price the vendor offered at the time of the contract extension in 2017 was still the lowest.

We have stated in previous reports to parliament that:

> Planning for contract expiry gives departments enough time to test whether extending or renewing existing contracts, or returning to the market for a new competitive tender process, will deliver the best value for money. *Contract management: renewal and transition* (Report 10: 2013–14)

> Departments need to consider cost and non-cost factors of a private sector proposal not only when they assess the results of a competitive tender process, but also when they consider whether to exercise an extension option for an existing contract. This is important, so they can demonstrate that a decision to extend a contract represents better value for money than returning to the market for a new competitive tender process. *Management of privately operated prisons* (Report 11: 2015–16)

The ieMR program has two significant standing offer arrangements with the vendor:

- the ieMR Standing Offer Arrangement—used for the provision of software and services from the vendor
- the Hosting and Managed Services Agreement—used for the provision of hosting and managed services and application managed services by the vendor.

eHealth Queensland's contract management plan for the Standing Offer Arrangement states:

> There are three (3) x five (5) year extension options in the contract. The extension options are automatic in the sense that they are taken to have been exercised by the Principal unless the Principal, prior to the expiry of the Initial Term or the then-current Extension Term, gives at least 6 months' written notice prior to the end date of the current term, to the Contractor that the term will not be extended.

The department exercised the first extension for five years, to September 2021, on 18 March 2016. The decision to extend the ieMR standing offer arrangement was made before eHealth Queensland presented the 2016 ieMR business case to government (November 2016). Therefore, it was made prior to analysing any alternative options and confirming it is still best value for money.

We acknowledge the standing offer arrangement is an overarching framework under which individual contracts are drawn, and there is no commitment with respect to software or implementation services made as a result of extending the arrangement. The department extended the arrangement because it was using numerous software modules for which it required continued support.

On 20 December 2017, the Department of Health exercised the first extension to the Hosting and Managed Services Agreement for an additional five-year term, to 28 February 2023. The department estimates the cost of the additional five-year term is $91.8 million. The decision to continue with the existing contract for hosting and managed services was made after the 2016 ieMR business case. While this business case did not include a sufficiently detailed analysis of all options, the actual decision to extend the contract was expected, given the business case was already approved.

Vendor performance

The vendor provides service reports and attends meetings with eHealth Queensland to discuss operational, performance, and contractual matters as per the contract management plans. eHealth Queensland believes the vendor is performing within the framework of the commercial terms and conditions to the satisfaction of the department. However, other stakeholders we engaged during this audit expressed concerns with the system. We discuss this further in the 'Engaging system users' section.

Although eHealth Queensland regularly meets with the vendor there is no evidence that it summarised and analysed the performance of the vendor (including input from HHSs) thoroughly before deciding to extend the contracts.

Understanding the total cost of ownership

Total program and HHS spend to date

Digitising hospitals involves transformational change. Therefore, accurately forecasting the costs for the program has proved challenging for the program and HHSs. In the April 2016 ieMR business case, the program estimated a total capital cost of $612.9 million for Queensland Health to implement the ieMR to 25 hospitals. The number of hospitals has since been increased to 27.

The amount stated in the 2016 business case includes both the program funding and the HHS co-contribution. The actual expenditure to date for the HHS co-contribution to implement the ieMR per hospital has far exceeded the original business case estimates.

This is because:

- The department underestimated some of the cost elements of implementing the ieMR in its 2016 ieMR business case.
- HHSs have decided to spend more, for example, on infrastructure, a broader digital program scope, or to minimise disruption to hospital operations and minimise the clinical risk of the ieMR implementation.

The program has spent 61 per cent of its program budget to date, but it forecasts it will need to spend an additional $81 million above the 2016 ieMR business case estimate to complete the program. This is mainly because it has recognised that many HHSs do not have the financial capacity to absorb additional costs. It has therefore proposed that the government increase ieMR program funding for:

- labour from 25 per cent in the 2016 ieMR business case to 60 per cent in the 2018 draft business case update. This equates to $38.7 million
- end user and clinical devices from 0 per cent in the 2016 ieMR business case to 70 per cent in the 2018 draft business case update. This equates to $30.8 million.

So far, in its draft 2018 business case, the department is forecasting the total cost will increase by an additional $256.8 million to complete the implementation for all in-scope hospitals —an increase of 42 per cent. Because part of this is to be funded by HHSs, the total increase in government funding the program is requesting is $112.8 million.

Figure 2C shows the 2016 business case forecast that HHSs would co-contribute $125.5 million to implement the ieMR advanced solution in 25 hospitals. The actual expenditure to date shows that four HHSs have already spent $136.1 million (for twelve hospitals).

Figure 2C
Program and HHS actual spend against budget at June 2018

Item	2016 business case budget ($ mil.)	Actual (as at Jun 2018) ($ mil.)	Percentage of budget used	2018 business case update (draft) ($ mil.)
Program contribution	487.5	295.5	61%	568.5
HHS contribution	125.4*	136.1*	109%	301.2
Total project investment	**612.9**	**431.6**		**869.7**
ieMR delivered	25 advanced digital hospitals	• 8 advanced • 2 intermediate • 2 basic		27 advanced hospitals

Note: *$125.4 million was the budgeted project cost to deliver the advanced ieMR to all 25 hospitals. $136.1 million is the project cost incurred at December 2017 to deliver basic, intermediate, or advanced ieMR capability at 12 hospitals.

Source: Queensland Audit Office from the Department of Health's draft 2018 update to the ieMR business case.

The program has spent a lower proportion of its budget than HHSs have because it funds items that have a relatively fixed cost. For example, the program is funding ieMR software and implementation services from the vendor, with whom it can negotiate for an up-front fixed cost for each new ieMR site.

The HHSs, however, are funding more variable cost items and are therefore exposed to more risk of cost overruns. For example, HHSs were required to fund go-live costs such as training and additional staff resources during go-live periods, clinical equipment, and end user devices.

In addition, the budget and actual figures may not be directly comparable for the HHS contribution because the budget figures only account for standard build expected costs. eHealth Queensland has not fully completed its assessment of these costs, but during the audit, it did identify that some of the costs reported by HHSs are not directly attributable to the original scope of the ieMR program. This is because HHSs have elected to implement the ieMR solution to a higher specification. For example, HHSs have decided to implement 'swipe on and off' technology to make logging in and out easier. This was not in the original scope.

Estimating ieMR cost elements

The program provided each participating HHS with an estimate of the expected cost of the ieMR prior to it agreeing to participate in a funding package. This includes the HHSs' and program's total contributions and the assumptions used to develop the estimate.

Two of the most important cost drivers in estimating ieMR project costs are the people required to support the implementation and the devices the hospitals need to procure. We found the program's assumptions used for estimating ieMR resources and devices resulted in the HHSs underestimating some of their implementation costs.

ieMR resources for project implementation

The business case gave an accurate full-time equivalent (FTE) staff estimate for the program but not for HHSs:

- eHealth program resources—the business case estimate for FTE resources required for the program was 61.2 FTE for 2015–16 and 81.6 FTE for 2016–17 and 2017–18. The actual FTE numbers were close to this estimate. They were 76 for 2015–16 and 77 for 2016–17
- HHS resources—HHSs have used more resources than the business case assumed to support their implementation. We explain the reasons for this and provide two case studies in the following section: 'HHS spending decisions'.

The program implementation has had a significant impact on hospitals' existing resources. The degree of impact varies between clinical areas. For example, staff nominated as clinical leads need to give up some of their clinical hours to work on the program. Clinical input is critical to ensure the program delivers a safe and effective system. Staff at Cairns and Townsville hospitals raised the challenge of balancing this input where backfilling is not feasible. This is challenging for HHSs because they need to maintain business-as-usual services during implementation. It should be noted that we do not have any evidence to suggest patient care was affected during ieMR project implementations.

We acknowledge that the department now provides more detailed cost information to the HHSs. For example, it provided HHSs in funding Package 4 with a pack that includes cost categories such as labour, hospital implementation, software and implementation services, user devices, clinical equipment, and infrastructure and digital foundations such as power board upgrades. This shows a better understanding of the requirements as the program matures.

The assumptions for funding Package 5 contain additional details about the number of FTEs required for a 12-month implementation time frame. The FTE figures reported in the draft ieMR business case update (2018) are:

- minimum core team FTE = 13.3
- minimum labour modules FTE = 15
- additional labour for data migration, training backfill, and Health Support Queensland support costs.

The department is requesting additional funding for resourcing ieMR project implementations in the business case update (2018).

ieMR device assumptions

The program's assumption for the number of devices a hospital needs does not work well for hospitals in regional or rural areas. This is because they have different needs and different models of care compared to a metropolitan hospital. The program's assumption can result in an inappropriate number (under or over) of devices being purchased as part of the ieMR hospital implementations.

Interviewees from the Cairns Hospital mentioned they didn't know how many devices, for example, specimen label printers, were needed when the hospital first went live. The program developed device assumptions based on the type of devices. This varied from 0.05 per bed to 0.85 per bed. Figure 2D shows, for the Cairns Hospital (531 beds), the number of devices required as per the assumption and the actual number of devices as at March 2018.

Figure 2D
Cairns Hospital ieMR device numbers

Device type	Estimated	Actual	Variance
Barcode scanner	504	416	88 under the assumption
Electrocardiography	53	55	2 over the assumption.
Single patient printer	132	62	70 under the assumption
Specimen printers	451	188	263 under the assumption
Tablet	53	199	146 over the assumption.
Wall mount	53	103	50 over the assumption
Workstation on wheels	127	212	85 over the assumption
Wristband printer	185	78	107 under the assumption

Source: Queensland Audit Office.

This shows that the business case estimate did not appear to fully meet the needs of the hospital. The HHSs can make their own decisions on the number of devices they need. We are unable to determine whether the additional devices the hospitals obtained were warranted, due to a lack of benchmarking data.

The program's draft 2018 business case update includes a proposal for additional funding for clinical and end user devices because the HHSs have required these in greater volumes and at a greater cost than forecast in the 2016 business case.

HHSs' spending decisions

The program provided HHSs with program estimates and they then had to forecast their own costs. So far, HHSs have budgeted and spent considerably more than the original estimates. Some of the overspend relates to:

- more resources than expected because they wanted to minimise disruption to hospital operations and minimise the clinical risk of the ieMR implementation
- clinical and end user devices, because Queensland hospitals aim for higher level of device density to support high quality of care (the business case assumptions were based on the experience of hospitals overseas)
- additional costs, because they have chosen to go beyond the standard build.

Case studies 1 and 2 show examples of where the Townsville and Cairns hospitals have budgeted and spent more than the program's desktop estimates. We have not validated whether the costs were warranted, as it is not in scope for this audit.

Case study 1

Townsville Hospital ieMR (advanced release) project costs

The ieMR advanced release implementation at the Townsville Hospital will cost significantly more than the initial $3.28 million estimate eHealth Queensland provided as an input for the hospital's project planning. The difference between the original cost estimate and the current budget is around $4.48 million (about 137 per cent more than the original estimate). In particular, the cost of:

- labour is budgeted to be $3.7 million greater than the original estimate
- non-labour is budgeted to be about $540 000 greater than the original estimate.

Labour costs

The labour required was one of the key elements underestimated. For example, the program's estimate assumed the Townsville Hospital would require a minimum of 23 full-time equivalent staff (FTEs) in the hospital's project and clinical teams. However, the Townsville Hospital budgeted for 63 FTEs. The difference between the two figures is 40 FTEs (about 174 per cent more than the original estimate). This scenario highlights the difference between the initial estimates and what the HHS decided to spend because it is such a transformational change. The hospital adjusted its forecast, and its expenditure aligns with what it anticipated it would spend for the advanced release.

The department acknowledges in its business case update that HHSs are spending more than expected because of higher resource costs for clinical engagement, subject matter expertise, training, and backfilling of staff.

Non-labour costs

The variance in the non-labour costs was caused by the hospital deciding to retro-fit existing workstations to allow for 'tap-on: tap-off' login, barcode patient identification, and direct entry at the bedside by clinicians. The original program estimate is based on the implementation at the Princess Alexandra Hospital, which had different architecture needs and staff capacity. In addition, the 'tap-on-tap-off' functionality was not within the scope of the ieMR advanced solution.

Source: Queensland Audit Office.

Case study 2

Cairns Hospital ieMR (digital release) project costs

The ieMR program and the Cairns Hospital underestimated the cost of implementing the ieMR solution (digital release). The Cairns Hospital has since made additional funding requests to cover unexpected additional expenses such as infrastructure and staff costs. In particular, it underestimated the number of staff it would need for the project and the equipment it would need to procure. Like Case study one, this scenario highlights the difference between the initial estimates and what the HHS has spent to implement the ieMR.

We acknowledge that the Cairns Hospital was initially an exemplar site for the statewide ieMR program and therefore has incurred costs as it trialled aspects and learned lessons that can be used for the benefit of future implementations. We also acknowledge the HHS experienced significant changes in its governance arrangements and the project team during the digital release program. This affected its implementation costs and how well it could manage the implementation.

Labour costs

The hospital has 531 beds; therefore, according to the business case, the hospital should only need around 21.4 full-time equivalent (FTE) staff for the configuration and deployment phase. However, the hospital provided 38.3 FTE for the project.

In April 2015, Cairns and Hinterland HHS entered into an agreement with the department, as part of the program, to invoice the department for costs associated with employing up to 8.2 FTE. However, this only covered organisational wage costs and excluded penalties and allowances paid to each employee.

In December 2015, the FTE required increased to 55.5 FTE because the hospital needed additional resources to support the rollout. This shows the staff requirement was higher than estimated in the business case.

Non-labour costs

The HHS could only provide us with limited cost information for its ieMR implementation. From this, we identified the HHS's project expenditure to implement the digital release of the ieMR at Cairns Hospital ($4.2 million excluding the cost of labour) was almost double the project budget. This was mostly because of variations to existing contracts to purchase additional personal computers, laptops, accessories, and workstations on wheels. The project expenditure on devices alone ($3.13 million) well exceeded the project budget (for procurement, excluding the cost of labour) of $2.24 million.

Source: Queensland Audit Office.

Future forecasts

The project cost overruns to date demonstrate a need to continue to refine the estimates for all known project costs, in particular to determine the level of additional resources required by HHSs. In addition, the department should revise the eHealth Investment Strategy to assess the cost impact the ieMR program will have on other planned initiatives, especially now that the cost is much higher than the strategy forecast.

Over time, HHSs are gaining a greater appreciation for the costs that will be incurred. These learnings need to be passed on to future site implementations.

Smaller regional hospitals will be impacted by the cost elements more than larger metropolitan hospitals, as they have less ability to absorb the additional costs. This creates a significant risk to the budgeted financial performance of HHSs that implement the ieMR solution, and could adversely affect their operational performance during, and for the short term after implementation.

Metro South HHS mostly self-funded the ieMR advanced release solution at Logan Hospital. There is a risk that the smaller HHSs will not have the same capacity to absorb any cost overruns or unplanned expenditure in their implementations.

Recognising these funding risks, the program's draft 2018 updated business case includes a proposed change to the co-contribution by the HHSs. The program recognises that HHSs that plan to implement the ieMR in the future will not be able to fund the total cost of implementing it without additional financial support from the program.

Reporting actual project costs

HHSs are independent entities and are free to make their own choices about the level of investment in their ieMR solution. They are accountable to their own boards for their project costs. We found they reported their actual project costs to their respective HHS boards.

However, the program has been unable to obtain complete, timely, and accurate cost information from each HHS. This is because:

- some HHSs are not providing detailed information about the ongoing cost of their implementation outside of their internal reporting frameworks. The project teams are ultimately accountable to their own board for the successful implementation of the ieMR, and reporting to the program does not appear to be a priority for some HHSs
- Queensland Health's current financial system, FAMMIS, is not a suitable tool for complex project management. It does not allow the program and project teams to run meaningful cost reports. Instead, they perform manual and resource-intensive processes to extract data from FAMMIS and transform it into appropriate cost reporting.

We reviewed the program's reporting on the project costs for funding packages 3 and 4 for each site. We found the program was not fully aware of the HHSs' budgeted costs for four out of 10 projects in funding packages 3 and 4.

We also found two hospitals in funding Package 3 are not reporting their actual project costs to the program. Therefore, the program cannot report these costs in its monthly report to the Digital Hospital Program Committee (one of the departmental committees that governs the program). This also affects the program's ability to accurately update the business case and funding submission to the government. Because of concerns identified during this audit on the accuracy of project costs, eHealth Queensland is no longer recording HHS expenditure in its reporting to the Digital Hospital Program Committee.

During the audit, we found the project costs HHSs were reporting internally were significantly higher than what the program was aware of and had included in its draft business case update to Cabinet. As a result, eHealth Queensland conducted a preliminary assessment of the HHSs' project costs and requested that all participating HHSs provide it with transactional data. It formed a view that about 21 per cent of HHS expenditure (historical actuals and future budgets) did not relate directly to the ieMR program. Some of these cost items include operating costs for the ieMR solution, labour and non-labour costs for other broader digital initiatives, conferences, and broader application development. However, the program advised us that Metro South HHS indicated that their financial records showing the reported expenditure for its HHS do relate directly to the ieMR implementation in its health service.

eHealth Queensland recognises it needs to do further detailed work to determine what HHSs have spent on implementing the ieMR so it can accurately report the total program cost. Case study 3 shows an example of the challenge of accurately reporting project costs that directly relate to the ieMR program.

Case study 3

Mackay Digital Hospital program
In December 2014, the Mackay Hospital and Health Service Board approved a capital investment of $20.58 million over four years for its digital healthcare program. The eHealth program forecasted in its 2016 business case that implementing the advanced solution in the Mackay Base Hospital would cost $2.6 million. This assumed one exemplar implementation. From 2014 to October 2017, the Mackay HHS progressively implemented the ieMR solution at the Mackay Base Hospital through various partial rollout projects. It has reported that its digital healthcare program has cost $14.4 million as at 30 June 2018. But it is difficult to state what amount of Mackay's $14.4 million expenditure directly relates to the scope of the ieMR program. For example, its program budget includes items: • outside of the ieMR program scope, such as vendor costs for a patient administration system and rural facilities, and infrastructure costs for rural facilities • that go beyond the ieMR standard build, such as clinical tablets • that do not directly relate to the ieMR but are critical for preparing the HHS for digital capability, which included implementing Windows 7. This also shows that HHSs see the need to implement more than just the ieMR advanced solution in order to achieve the digital transformation they desire. We have observed this consistently across the sites we visited in this audit.

Source: Queensland Audit Office.

Recurrent costs

The costs to digitise do not stop once the program implementation is over. The total costs of supporting and maintaining the system are also being updated as more information comes to light from the hospitals that have implemented the ieMR. This is important in an environment where there are HHSs with financial sustainability concerns.

Hospital and health services' recurrent operational costs from 2025

The 2016 ieMR business case estimated that by 2024–25, the recurrent operational costs to support the ieMR in 25 hospitals would be $69.8 million. This includes labour costs, vendor costs, device costs, and local support costs. However, these costs were not broken down by hospital in the business case. It did not estimate how much each participating HHS would be required to contribute annually to support the solution.

The business case was not definitive about how the operating costs would be funded between the department and HHSs. This meant that HHSs were not fully informed about the total costs for supporting and maintaining the system when they decided to participate in the program.

The updated draft business case (October 2018) includes the eHealth program paying for the recurrent ieMR operational costs for the first two years after go-live. Therefore, all sites where ieMR has been implemented to date have had their recurrent costs paid for by eHealth Queensland (excluding local hospital technology support costs, which HHSs are already paying).

In 2018, the program developed a proposed cost recovery model under which HHSs will need to pay a service charge-back starting two years after their go-live. The Princess Alexandra Hospital, which was the first hospital to achieve advanced solution go-live in March 2017, will be the first hospital to start paying the service charge-back from April 2019. eHealth Queensland has forecast the service charge for the ieMR for 2018–19 will be $24.7 per weighted activity unit (a measure of health service activity that provides a way of comparing and valuing each public hospital service). But HHSs are not clear about what the service charge will be in 2024–25, when they will collectively have to pay the full operating costs. This is because eHealth Queensland has not yet communicated these costs to them. It plans to agree these costs with HHSs before April 2019.

In May 2018, the program forecast the total recurrent operational costs to support the ieMR in 27 hospitals will be $90.6 million by 2024–25. This excludes device support costs and local support costs, which were included in the $69.8 million in the 2016 ieMR business case. eHealth Queensland has not indicated in its updated business case how much each participating HHS will need to pay to support the ieMR solution and whether they have the financial capacity to pay the service charge.

Digital hospital implementation schedule

The program made slow progress between 2007–08 and November 2015. The department reported to us that progress was affected by internal and external factors. Internal factors included the upgrades to hospital infrastructure in preparation for the ieMR solution, and external factors included a change of government and instruction to defer while the payroll system was investigated.

Key time frames include:

- In 2007–08, the department originally planned to implement the program in two tranches. Tranche 1 involved statewide implementation of 15 specialist clinical and administrative systems and Tranche 2 involved ieMR system implementation in nine hospitals by 2012.
- In June 2014, the department changed the scope of the program to focus on implementing two digital hospitals (advanced ieMR solution) at the Princess Alexandra and Cairns hospitals. In November 2016, the Queensland Government supported a business case that estimated the advanced ieMR solution would be implemented in 25 hospitals by June 2020. This has now increased to 27 hospitals.
- In November 2015, the Princes Alexandra Hospital implemented the digital release of the ieMR solution. It implemented the advanced release in March 2017.
- Between March 2017 and July 2018, the advanced release of the ieMR solution has been implemented in seven hospitals and one community health care centre.
- Between July 2018 and June 2020, a further 19 facilities are scheduled to implement the advanced release of the ieMR solution.

We found that, since the 2016 ieMR business case, the department has had an effective process for deciding which hospitals will implement the ieMR solution. Its approach of basing this on the 21 facilities with the highest transactional volume in the state is justifiable, because this results in the greatest level of coverage for the system and benefits a greater number of patients.

While the actual order of implementation has not gone to plan, the governance process has ensured the program continued its momentum when some hospitals deferred the planned timing of their implementation.

Three hospitals in the Metro North HHS have been deferred from funding packages 3 and 4 and replaced with two hospitals from Metro South HHS and hospitals in Ipswich and Toowoomba. These changes to the implementation schedule have been managed and approved by the program's governance committees, Metro North HHS, and Metro South HHS, and communicated to government as part of funding submissions in 2016 and 2017.

Some of the HHSs scheduled to implement the ieMR solution in future funding packages do not have as strong a financial position as HHSs that have already implemented the solution. There is a risk the program's momentum could slow if those HHSs are unable to implement the solution because of funding concerns. The department recognises the funding concerns and is seeking additional funding through an updated business case.

Engaging system users

To engage system users for go-live, the Director-General of the Department of Health meets with hospital clinicians and executive prior to every ieMR go-live to confirm readiness to implement the ieMR solution. To date, ten hospitals have implemented varying levels of ieMR capability.

The program's engagement with one of the exemplar sites for the solution build (the Princess Alexandra Hospital) was extensive. However, the approach of using exemplar sites as a base to build a statewide solution made some system users who were outside the exemplar site feel disengaged and that their needs were overlooked.

For example, several staff at the Townsville Hospital told us the maternity module of the ieMR system did not meet their needs because the workflows did not align with the hospital process. However, there is an ongoing optimisation in perinatal data collection initiative with Townsville representation, and the Chair of the Maternity Sub-committee was from Townsville until 2018.

In addition, clinicians from the Cairns Hospital told us that they preferred Winchart (a locally developed system used by anaesthetists) over the ieMR anaesthetic system. The department previously supported Winchart but informed clinicians that it would no longer support it once the ieMR system was implemented. Clinicians felt they would have to switch to the ieMR system eventually when they could no longer support the system themselves.

The ieMR strategic assessment review report (in September 2016) identified the need for eHealth Queensland to demonstrate that the statewide build would cater for all identified hospitals and not just the exemplar site. We acknowledge that the program has an optimisation stream that responds to requests from clinicians to improve and enhance the solution as it is implementing it in additional facilities.

Although some audit interviewees shared concerns about engagement, this does not mean overall sentiment about the ieMR program is negative. In fact, two surveys conducted by the University of Queensland (UQ) Business School in May 2017 and August 2018 found that, on average, users at the Princess Alexandra Hospital, Mackay Base Hospital, Logan and Beaudesert hospitals, Lady Cilento Children's Hospital, Redland Hospital, and Queen Elizabeth II Hospital have positive sentiments towards the system.

The review also suggested that, while users mostly had moderately positive views about the system immediately after go-live, they had more positive expectations about the future. The UQ Business School did not survey two of the in-scope hospitals (Townsville and Cairns hospitals) as the hospitals had yet to implement the advanced ieMR capability.

Managing risks and issues

While the program has processes in place to manage risks and issues, it has not addressed some key risks identified by system users. We acknowledge the program has now allocated more resources to address these risks.

The 2016 ieMR business case recognised a range of implementation risks that could affect the program. The program identifies risks and issues through its various program committees as part of the program implementation, and it records these in a central risk register. However, the program has not adequately addressed areas such as:

- system issues—Neither the program nor ieMR projects have fully captured issues that system users have raised with us. An example of this is the increased cost and effort to produce reports that were available (and necessary for statutory reporting like emergency department access targets) in legacy systems. We are aware that some clinicians have raised concerns about the ieMR solution with the Director-General of the Department of Health and the Australian Medical Association of Queensland. This indicates clinicians have seen the need to escalate their concerns above the eHealth program.
- knowledge gaps—Interviewees told us that the program's understanding of the vendor and its pricing structure is highly concentrated in only a couple of people and the vendor's price-book (for products and services for future extension of the solution) is overly complicated. If the two people decide to leave the department, it will create a significant void in the program's knowledge base.

One of the reasons the program has not recorded these is because it views them as project-level risks/issues. Therefore, they are only recorded at the HHS level. However, the department should at least aggregate and analyse all risks at the program level to identify any systemic risks that need to be dealt with across the state. This will improve the effectiveness of the implementation across all hospitals.

The program has not been able to address some of the issues during the ieMR implementation phase because the focus has been on implementing the ieMR system as per the program timeline. For example, the program is aware that HHSs have not been able to get the information they need from the ieMR system, but they have not been able to allocate sufficient resources to address this gap.

To address system users' concerns, the program is working with the Clinical Excellence Division of the department to engage, consult, and advocate with clinical teams to ensure the quality of clinical care. The division was established in 2015 to partner with health services, clinicians, and consumers to drive measurable improvements in patient care. In recent years, it has worked closely with eHealth Queensland to address clinical concerns relating to the ieMR system.

One of the division's activity performance measures and targets is about engaging clinicians to optimise care in the digital health environment. It has started to develop an improvement toolkit to document lessons learned and improvement solutions. It is also providing go-live and post-implementation improvement services, including redesigning clinical workflows and processes, upskilling clinical staff, and implementing quality improvement solutions.

Managing data access and security

Data exchange

The ieMR enables information to be exchanged between systems within digital hospitals and with other statewide systems. This allows clinicians to access clinical data recorded outside of the ieMR system. If a patient moves between hospitals with an ieMR (within an HHS or to hospitals in other HHSs), clinicians can easily access their medical records.

eHealth Queensland has designed sufficient operational controls to ensure data can be reliably exchanged between the ieMR and other systems within Queensland's public hospitals.

Monitoring clinician and staff access to patient data

The department has provided clinicians and staff with easy access to patient information in the ieMR (that is, without placing additional restrictions on what clinical records they can access), in accordance with the approved design.

HHSs mitigate the risk of unauthorised access through monitoring and disciplinary processes. This is a reasonable approach, because the risk of denied access could contribute to an adverse patient outcome—even death—while a data privacy breach has far less potential for adverse impact.

The HHSs that have implemented the ieMR have a process for monitoring potential breaches of user access to clinical records and for taking disciplinary action against staff who use their ieMR access to view clinical records not relevant to their clinical duties. However, this process is not fully effective, because there is a gap in the monitoring process. The HHSs do not have a process to ensure the staff appointed to review the user access records complete their review of potential breaches of user access to clinical records.

Each month, eHealth Queensland generates a report for each HHS that shows potential breaches of user access to clinical records. eHealth Queensland sends this report to the HHSs to send to staff to whom they assign responsibility for reviewing the report. If these staff find a potential security breach, they refer it to the HR Workforce Solutions section of the HHS which then investigates the matter and, if necessary, enforces disciplinary action. However, the HHSs do not have processes for following-up with staff who do not review their report of potential access breaches. The process relies on the staff referring matters to the HR Workforce Solutions section.

Preventing unauthorised access to clinical records

Password controls

We found weaknesses with the department's password controls for preventing unauthorised access to the ieMR. While the department offers guidelines to staff on best practice for creating passwords in its Information Security User Responsibilities document, it does not enforce this through preventative technical controls. It relies on detective controls (an internal control mechanism).

eHealth Queensland's detective control alerts it when an ieMR user attempts to guess a password through a high number of unsuccessful attempts. While this reduces the likelihood that an account could be misused, which reduces the risk to the department and patients, the department needs to address the residual risk. Unauthorised access to a clinician's account (through a successful password guess) could have significant adverse impacts.

We are aware that the department is progressively implementing other forms of user authentication. It needs to roll out the more sophisticated authentication approaches with more complex passwords to strengthen security.

Removing user access after employment termination

We found weaknesses with HHSs' employee termination processes for ieMR users. While users of the ieMR system can only access it if they have physical access to a hospital, there is a risk that dormant user accounts created through staff movements (which also have weak password settings) could be exploited by internal users.

The department has a compensating control (if a HHS does not remove a user's access upon termination) to de-activate user accounts after three months of inactivity. As these accounts are linked to clinical data, HHSs should not depend on the department's compensating control. They need to implement a more timely and effective control to terminate user access for employees who no longer require access.

3. Managing and realising benefits

This chapter assesses whether the integrated electronic medical record (ieMR) system is delivering the expected benefits.

Introduction

We assessed how well the department and hospital and health services (HHSs) established the ieMR program benefits and managed the benefits and dis-benefits (the term used to describe potential disadvantages) of implementing the ieMR solution. We also assessed whether HHSs are on track to realise the expected business case benefits. Our assessment included the Princess Alexandra, Cairns, and Townsville hospitals.

It is important to note that benefits will be realised over time as the hospitals advance their digital capabilities. The full benefit is expected to be realised when each hospital reaches the advanced ieMR capability. At the time of the audit, the most advanced digital hospital was the Princess Alexandra Hospital, because it had implemented the full suite of ieMR releases in March 2017. (It implemented the digital release in November 2015.)

Establishing, measuring, and reporting the ieMR program benefits

Establishing and measuring the program benefits

In April 2016, the Department of Health defined 10 program benefits in its revised ieMR business case. The benefits include $34.8 million of cashable savings from direct financial benefits annually, and $241.9 million of non-cashable savings from service improvements and safety and quality benefits annually—when the ieMR solution is implemented in all 25 facilities. (There are now 27 planned for implementation.) An example of cashable savings is reduction in drug costs and an example of non-cashable savings is reduction in inpatient length of stay.

Appendix D shows the expected benefits as defined in the business case, their associated non-monetary and monetary values, and whether the benefit is cashable or non-cashable. The 2016 business case projected a potential benefit of $1.89 billion across the in-scope sites from 2015–16 to 2024–25. Cashable benefits made up 12.3 per cent of the total benefits projected.

Multiple sources from HHSs raised concerns about the inclusion of two benefits in the business case that are not practical to measure (nurse hours saved in data transcription and charting, and reduction in clinical and administrative staff time to access information). They were concerned that these measures did not consider the hospital setting and were based on theory rather than evidence.

The program did not establish how HHSs would measure the 10 business case benefits when it developed the business case. We found that each HHS developed its own approaches to measuring and monitoring benefits and demonstrated different levels of maturity in managing benefits. This created challenges in accurately aggregating and reporting benefits realised across the whole program.

In a June 2017 meeting of the Project Control Group (one of the governing committees, chaired by eHealth Queensland, which is a division of the department), a member noted that the lack of staff resources to manage benefits at the program level was a key issue for the program. This was more than 18 months after the digital release go-live at the Princess Alexandra Hospital.

In July 2017, eHealth Queensland established a Centre of Excellence to provide support services to the ieMR program such as leadership, budgeting, knowledge management, and statewide benefits management. We observed during the audit that the program's benefits management function matured through the Centre of Excellence. There is now greater consistency in how hospitals measure their benefits. In some cases, the Centre of Excellence has proposed different definitions for measuring benefits than those in the business case. This indicates the program now better understands what can be measured in practice.

The program is now engaging early with future sites about the required benefits activities to ensure hospitals capture and report them consistently. Additional requirements added to funding Package 4 (2017–18) emphasise the importance of benefits management. Sites included in funding Package 4 need to accept, measure, report, and ultimately realise the 10 benefits in the 2016 ieMR business case.

Reporting on benefits

We acknowledge the program’s benefits-realisation function has matured over time and has developed a benefits reporting methodology to standardise reporting in future.

The program reports on benefits internally to the program's governance groups, and externally to the Cabinet Budget and Review Committee (CBRC) and central agencies.

We found some of the benefits reported to Cabinet and central agencies are significantly different to those the program reports internally (within eHealth Queensland). This is because it uses different time frames (baseline data) for internal and external reporting. The baselines the program uses for external reporting provide a more favourable result than those it uses for internal reporting.

For internal reporting purposes (for all hospital sites that have implemented the ieMR solution), the program has measured the change in a benefit from a consistent baseline date of January–June 2015 to the most recent reports (as at February 2018). This enables consistent reporting across all project sites using the same time frames. Conversely, a variety of different baseline dates have been used for external reporting purposes, including for reporting to Cabinet (which to date only includes benefits data for the Princess Alexandra Hospital).

We understand the hospitals that have implemented the ieMR need more time to fully realise the expected benefits. As the quantum of benefits realised increases, it would be beneficial for the cashable and non-cashable benefits (as stated by the program) to be independently validated.

Figure 3A shows an example of the benefits the program reported internally and externally. We have included the baseline dates (the periods against which benefits are measured) of the report where available, but we have excluded the benefits results data from the Cabinet document for confidentiality reasons.

Figure 3A
Comparison of the Princess Alexandra Hospital's benefits reporting periods

Benefit (baseline date)	External reporting—CBRC submission (August 2017)	Internal reporting—Princess Alexandra Hospital (February 2018)	External reporting—Princess Alexandra Hospital (23 February 2018)
Reduction in unplanned readmissions	(Jul–Dec 2014*)	2% increase (Jan–Jun 2015)	17% reduction (Jan–June 2014)
Reduction in inpatient length of stay	(Jul–Dec 2014*)	3.2% increase (Jan–Jun 2015)	6% reduction (Jul–Dec 2014)
Medical stationery, storage, and retrieval costs	(Mar–May 2014*)	78.9% decrease in stationery cost (Jan–Jun 2015)	81% decrease in forms costs including printing (Mar–May 2014)
Reduction in inpatient falls with serious injury	(Jan–Jun 2017*)	0.1% increase in falls with serious injury (head injury or fracture) (Jan–Jun 2015)	Not included
Reduction in hospital acquired infections	(Jul–Dec 2014*)	53.4% decrease in SAB infections** (Jan–Jun 2015)	37% decrease (Jul–Dec 2014)
Formal endorsement of emergency department radiology results	(Jun–Nov 2015*)	93.7% increase (Jan–Jun 2015)	93% increase (Dec–May 2015)

Note: * We sourced baseline dates by reconciling reported movements to the Princess Alexandra Hospital's internal benefits reporting. ** Staphylococcus aureus bloodstream infections.

Source: Queensland Audit Office.

To date, the program has organised two independent evaluations of users' experience with the University of Queensland (UQ) Business School, based on interviews and surveys. The first evaluation was of the Princess Alexandra Hospital in May 2017. UQ conducted a second interim benefits evaluation of the Digital Hospital Program in August 2018. Across both surveys, 1 098 users responded to the survey pre go-live and 953 users responded post go-live. The interim benefits evaluation concluded that on average, users at:

- Princess Alexandra Hospital
- Mackay Base Hospital
- Logan and Beaudesert hospitals
- Lady Cilento Children's Hospital
- Redland Hospital
- Queen Elizabeth Hospital II

have positive sentiments towards the ieMR system. While users mostly have moderately positive views about the system immediately after go-live, they have more positive expectations about the future.

The evaluations noted two areas of improvements:

- managing the tension between optimisation and rollout. Staff at Princess Alexandra Hospital felt there was a high risk that the work required to optimise the system and work practices at the hospital would be significantly delayed because of constraints in resources and loss of control as the system continues to be rolled out across Metro South and many other hospitals in Queensland
- using the existing functionality in the ieMR more effectively.

In addition, the August 2018 report suggested the department needed to clarify the cost and benefits, as more investments will be needed to reap the ieMR benefits (in particular from analytics). The benefits will also take time to emerge.

Conducting independent evaluations of users' experience periodically will provide greater assurance about the program's benefits. So will reporting program benefits consistently and independently validating the cashable and non-cashable benefits claimed.

Realising the ieMR program benefits

The 2016 business case expected hospitals to realise the full potential value of benefits within two years of implementing the advanced ieMR solution. The business case also showed that HHSs were expected to use the directly cashable savings from benefits seven to 10 for recurrent operational costs until 2025 (refer to Appendix D).

The ieMR business case categorises benefits into those that improve patient safety and staff efficacy, improve services, or result in direct financial benefits. The business case makes assumptions about when benefits are likely to start being realised and the amount of time it will take to reach full potential. There will be gradual realisation of ieMR benefits as the system is implemented through different stages.

The business case defines:

- short-term benefits—These cover staff time in accessing information, nurse data transcription time, and costs of forms. These are expected to start being realised at 50 per cent from three months after go-live. This means the hospital is expected to see some of the benefits from three months
- medium-term benefits—These cover diagnostic imaging, pathology testing, and medication costs. These are expected to start being realised at 50 per cent from six months after go-live
- long-term benefits—These cover readmission rates, adverse drug events, emergency department length of stay, and inpatient length of stay. These are expected to start being realised at 50 per cent from one year after go-live.

Expected benefits

Hospitals that have implemented the ieMR have not yet realised some of the target benefit levels. The 2016 business case acknowledges some benefits will only be realised when the full ieMR system is implemented, whereas benefits such as form costs (where paper-based workflow forms are eliminated) will become apparent without the full implementation.

We acknowledge that each site does not start from the same baseline. As the local context for each site is different, there will be differences in actual benefits realised. We also understand the estimated total benefits depend on the implementation schedule and when hospitals receive certain ieMR functionality. In addition, benefits results can be affected by factors outside of a hospital's control. For example, a hospital may experience an increase in emergency department length of stay during an outbreak of illness.

Of the six ieMR program's business case benefits all three hospital sites are measuring, two benefit measures (stationery costs and unplanned readmissions) show a uniform improvement. For the other benefits measures the Centre of Excellence reported as at February 2018:

- none of the three hospitals achieved the expected targets for reduction in emergency department length of stay
- only one of the three hospitals (Townsville) achieved the benefit target for inpatient length of stay
- two of the three hospitals (Princess Alexandra and Cairns hospitals) achieved the benefit target for reduction in inappropriate pathology testing
- only one of the three hospitals (Princess Alexandra Hospital) reported achieving the benefit target for reduction in inappropriate diagnostic imaging. The Townsville Hospital is close to achieving the target. The Cairns Hospital is unable to measure this target because it does not have an electronic interface for radiology results and ordering.

Both basic and intermediate ieMR functionality have the capability to support the early realisation of benefits, but the benefits will be maximised through the advanced ieMR capability. For example, the 2016 business case shows that hospitals are expected to realise the reduction in unplanned readmissions benefit 21 months after the ieMR medication module release. However, preliminary results show the Cairns and Townsville hospitals have achieved a reduction in unplanned readmissions even before implementing the medications module at the hospital. This shows the reduction in unplanned readmissions benefit cannot be attributed to the ieMR alone.

The Centre of Excellence is working towards aggregating and normalising the reporting of business case benefits in order to publish consistent measures of performance across the participating HHSs.

Appendix E shows the benefits data the Centre of Excellence collected for the Princess Alexandra (Figure E1), Cairns (Figure E2), and Townsville hospitals (Figure E3).

Additional benefits

The program has realised some benefits that were not in the business case. These include:

- faster access to records, and more legible records, across the hospital. Clinicians can read patients' notes and access their diagnostic results if the patients have been to other digital hospitals. This also means HHSs with an ieMR save time and effort associated with retrieving and maintaining paper-based medical records
- automatic controls that make it easy to do the right thing. Pharmacists have reported a reduction in medication errors due to more awareness of what medications have been administered and what information has been communicated between doctors and nurses
- more transparency of how the hospital functions. Staff accountability has increased as their actions are recorded in the ieMR system
- potential for secondary benefits through business intelligence capability (the ability to use data to gain insights and make decisions). This is particularly the case when the data from the ieMR is aligned to other source systems
- allied health staff, like pharmacists and physiotherapists, being able to access patient data far more easily than was possible in a paper-based environment.

The hospitals can only realise these benefits when all the systems are connected (for example, with the Patient Administration System, which is being planned), and information is exchanged between the systems. This allows clinical information to be analysed and potential issues to be identified far more effectively than when information is recorded on paper forms.

Clinical performance improvements

The additional benefits hospitals are reporting to the Centre of Excellence are all categorised as quality and safety benefits. This supports the view of many hospital staff we interviewed that the ieMR is primarily an investment in quality and safety of patient care.

Figure 3B shows the additional benefits the projects are reporting.

Figure 3B
Additional benefits in central benefits tracking report

ieMR additional benefits	Princess Alexandra (reporting as at August 2018)	Cairns*** (reporting as at February 2018)
Reduction in inpatient falls with serious injury	11% improvement from the baseline	3.7% improvement from the baseline
Reduction in hospital acquired pressure injuries	44.4% improvement from the baseline	74.6% worsening^ from the baseline
Reduction in venous thromboembolism (VTE) incidents**	3.2% worsening^ from the baseline	Not measured
Reduction in hospital acquired infections	37.1% improvement from the baseline	24.8% worsening^ from the baseline
Increase in rate of radiology test result endorsement	Increase from 0% endorsement to 93.7% endorsement	Unable to report^^
Increase in rate of pathology test result endorsement	Increase from 70% endorsement to 80% endorsement	Not reported

Note: *The advantage of using the ieMR system is the fact that the hospital can now monitor and measure these incidents effectively **The blocking of a blood vessel by a blood clot. Includes both deep vein thrombosis and pulmonary embolism. ***Cairns is at intermediate ieMR capability and is therefore not yet positioned to realise the full benefit potential. ^Increased awareness of the true level of incidents can contribute to the 'worsening' statistics of clinical incidents. ^^The Cairns Hospital is unable to measure this target because it does not have an electronic interface for radiology results and ordering.

Source: Queensland Audit Office from ieMR Program Benefits Status Update, February and August 2018.

Although these safety and quality benefits are not only attributable to the ieMR, the system provides clinicians with prompts on tasks that improve patient safety. For example, the system helps clinicians identify patients who are at risk of a fall.

Developing ieMR business intelligence

As the ieMR program moves further into business-as-usual and optimisation phases, the department and the HHSs will need to focus on maximising the use of the information now being captured in the ieMR. We acknowledge that the department—in particular the Clinical Excellence Division—and HHSs have allocated some additional resources to improve the business intelligence capability.

Although the Princess Alexandra Hospital has built capability in ieMR business intelligence, there hasn't been a central point of experience, resources, and funding to advance the ieMR hospitals' data analytics capability to date. We understand the full functionality for clinical decision support was not part of the ieMR program business case and that the Clinical Excellence Division has been involved in developing business intelligence capability. However, it has requested more resources to enable it to fulfil this role effectively.

Hospitals will only realise the actual business intelligence benefits of an ieMR when clinicians have access to complete and accurate information for monitoring and improving patient care. In interviews we have conducted, clinicians have expressed frustration at their inability to capitalise on the emerging business intelligence benefits due to some or all of the following:

- the barriers to accessing data because the data sits within the ieMR vendor's data environment and not in the department's data environment
- unavailability of a data dictionary, which made it difficult to interpret data fields
- the lack of experienced data analysts to advance the business intelligence capability
- the lack of funding available in the program to build business intelligence capability
- the lack of sharing of data capability across project sites, leading to multiple isolated efforts to achieve the same goal.

The Healthcare Innovation and Transformation Excellence Collaboration (HITEC) was established in 2017 in the Clinical Excellence Division. It aims to expand several HHS-based analytics solutions for statewide use. Along with the development of standardised data views and the building of dashboards, all projects will include clinical guidance for how to interpret and use information. The business intelligence functions will be expanded to other hospitals with the ieMR system.

As of April 2018, the Clinical Excellence Division has committed 14.5 full-time equivalent (FTE) staff to the digital transformation of Queensland Health (which encompasses the department and the HHSs). This includes a digital patient safety office, a digital transformation team, a digital clinical content control office, and an improvement and innovation team. To support future implementation, the division has requested additional funding from eHealth Queensland. The proposal for the digital data team includes an additional 4.6 FTEs.

Case study 4 explains how the Princess Alexandra Hospital established a business intelligence capability and how other sites are now using this capability.

Case study 4

Princess Alexandra Hospital business intelligence

As the digital exemplar, the Princess Alexandra Hospital has developed a better understanding of the type of data that is available from the ieMR system than other hospitals in Queensland.

Developing ieMR reports

The Princess Alexandra Hospital assembled a project team with the aim of meeting the reporting needs of the HHS prior to go-live. The team started by collecting information from system users to determine what reporting they wanted from the ieMR. The number of reports that Princess Alexandra Hospital employees requested was far too large for the initial project team of two developers to deliver prior to go-live. The skills required for extracting and analysing data from the ieMR system are very specific and people with the knowledge of health-related business intelligence requirements are difficult to source in Queensland. As a result, the department sought support from the vendor to develop the reporting capability. This was a missed opportunity to develop internal expertise that could be shared among HHSs.

Developing an ieMR dashboard

The Princess Alexandra Hospital has developed a business intelligence dashboard that accesses data from the ieMR and other integrated systems. Data on the dashboard is updated in real time. It aligns to benefit measures and complements existing hospital reporting.

The dashboard itself needs to be tailored at each site and cannot be replicated easily due to factors such as clinicians' preferences. While the Princess Alexandra Hospital has the budget, resources, and now expertise to establish that capability, sites like Mackay and Townsville do not have the scale or funding to justify the investment on their own and have entered into service level agreements with the Princess Alexandra Hospital to leverage that capability.

Source: Queensland Audit Office.

Dis-benefits

Identifying potential dis-benefits or risks to benefits in the business case

The 2016 ieMR business case did not address potential dis-benefits or analyse the risks to achieving the target benefits:

Dis-benefits—The business case was silent on the potential for dis-benefits, like an increase in time clinicians spend on documentation after the ieMR implementation. The increase in time is reportedly due to the need to document observations and order drugs and testing via the system, rather than on a piece of paper.

It is expected that a change program of this size and complexity will result in some dis-benefits. However, these need to be identified up front, and the program should learn from them and adapt the program as required. We acknowledge the time spent by an individual inputting the clinical information improves the accuracy of legible documentation and continuous availability of that information to the wider multidisciplinary team. This saves time across episodes of care.

Risks to achieving the benefits—Some of the risks included in the business case can be linked to benefits realisation. For example, the business case states there is a risk that a loss of momentum during project execution will impact on costs and realisation of benefits. However, it does not state how this would affect the non-monetary and financial aspects of the benefits (refer to Appendix D Figure D1). The purpose of identifying risks to achieving benefits is to enable the program to address those risks during implementation. It also helps those responsible for the investment decision to know and assess what risks are involved.

At the time of developing the 2016 business case, the department followed the Queensland Treasury Project Assessment Framework (2015). It did not require or provide guidance on analysing specific dis-benefits in business cases.

Other guidance does recognise the importance of identifying dis-benefits. For example, the Benefits Management Framework (2016) developed by Building Queensland includes 'identify dis-benefits and how to mitigate' as part of the benefits management activity.

We recognise that in its most recent draft business case update (October 2018), the department has included a section on dis-benefits.

Identifying, monitoring, and managing dis-benefits during program implementation

The program included the risk in its benefits realisation management strategy that dis-benefits may escalate and not be managed, which it assessed as likely, with a high impact. The mitigating action the program documented for this risk was to focus on managing stakeholder expectations rather than documenting and managing the dis-benefits that sites and users may identify. In addition, the program includes transient dis-benefits (short term following implementation) in its calculation of net benefits. However, this does not provide transparency on what any dis-benefits are, particularly those with longer-term impacts, and what effect they are having.

The program is not centrally recording and monitoring dis-benefits to ensure transparency for stakeholders and to mitigate their impact on the effectiveness of the ieMR implementation. For example, two of the hospitals we audited noted that clinicians spend more time documenting clinical observations because they need to record them in a particular screen of the ieMR system that they find difficult to locate. The program has now included an analysis of this dis-benefit and others it has identified in its most recent business case update.

The Princess Alexandra Hospital actively monitors dis-benefits in its formal benefits documents, apart from one—the increased workload for clinicians from the implementation of the Medications, Anaesthetics and Research Support (MARS) module.

We found other sites did not have a mechanism in place to monitor and manage the dis-benefits of the ieMR program. The Townsville and Cairns hospitals identified a number of them in their business cases and other benefits realisation documents, but the program and sites are not reporting or tracking these.

Figure 3C shows the dis-benefits the Princess Alexandra and Townsville hospitals identified in their business cases and benefits realisation documents.

Figure 3C
Dis-benefits identified by location

Dis-benefits identified	Identified by:
Increased clinician time spent on documentation tasks	Townsville Hospital
Decrease in proportion of patients discharged within the required National Emergency Access Target (NEAT) time frames	Princess Alexandra Hospital
Decrease in patients seen on time	Princess Alexandra Hospital
Increase in length of stay	Princess Alexandra Hospital
Increase in unnecessary pathology testing (wrong blood in tube)	Princess Alexandra Hospital
Increased staff turnover due to transition of work practices from a paper-based system to a digital system	Princess Alexandra Hospital
Increase in new types of drug-related errors (changing profile of drug errors)	Princess Alexandra Hospital
Increased costs of running research and increased burden on researchers linked to digitisation of research trials	Princess Alexandra Hospital

Source: Queensland Audit Office.

Appendices

A. Full responses from agencies

As mandated in Section 64 of the *Auditor-General Act 2009*, the Queensland Audit Office gave a copy of this report with a request for comments to the Department of Health and the Cairns and Hinterland, Townsville, and Metro South hospital and health services.

The Department of Health co-ordinated a system-wide response to our report on behalf of the hospital and health services. The Director-General of the Department of Health is responsible for the accuracy, fairness and balance of its comments.

This appendix contains the Department of Health's detailed response to our audit recommendations.

Comments received from Director-General, Queensland Health

Queensland Government

Enquiries to: Ms Pamela Healy
Chief Audit Officer
Internal Audit Unit
Telephone: (07) 3708 5103
File Ref: C-ECTF-18/10411

22 November 2018

Mr Brendan Worrall
Auditor-General
Queensland Audit Office
PO Box 15396
CITY EAST QLD 4002

Email: qao@qao.qld.gov.au

Dear Mr Worrall

Thank you for your letter dated 2 November 2018, regarding Queensland Audit Office's proposed report to Parliament of the performance audit on digitising public hospitals.

Queensland Health doctors and nurses, and other clinicians and staff are working tirelessly to successfully develop and rollout the integrated electronic medical record (ieMR). The ieMR is already operating in Princess Alexandra Hospital, Cairns Hospital, Mackay Hospital, Townsville Hospital, Redlands Hospital, Logan Hospital, Queen Elizabeth II Hospital and the Queensland Children's Hospital. I welcome your report that recognises these efforts and confirms that "Digitising Queensland's hospitals is delivering benefits in terms of improving health service delivery and patient outcomes."

Queensland Health supports and will implement all of the recommendations and welcomes the confirmation that:

- planned benefits such as reduced inpatient length of stay, reduced pathology testing, reduced diagnostic imaging are being achieved in various hospitals that were part of the review (p11);
- additional benefits have been delivered including faster access to medical records, more legible records, system functions that make it easier to do the right thing, reduction in inpatient falls, reduction in hospital acquired pressure injuries, and a platform for future business intelligence capability (p11);
- there is a governance process that maintains the momentum of the program when hospitals need to change the timing of their implementation (p8);
- forecasting the exact cost of the program is challenging because of the transformational nature of digitising hospitals (p7);
- the report in August 2018 of the independent survey conducted by the University of Queensland Business School found that the impact of the ieMR in the three Hospital and Health Services who have implemented the Advanced Capability is broadly positive (p9);
- there are operational controls in place that ensure that data can be reliably shared across systems including the ieMR (p9);
- there is a consistent view expressed by stakeholders that the ieMR is an investment in quality and safety of patient care (p13);

Office	Postal	Phone	Email:
Level 37 1 William Street BRISBANE QLD 4000	GPO Box 48 BRISBANE QLD 4001	3708 5990	DG_Correspondence@health.qld.gov.au

- the Hospital and Health Services who were part of the audit agreed it would be beneficial to implement the ieMR in the remaining hospitals (p13); and,
- investing additional resources in developing business intelligence as part of the ieMR program would maximise the value of the program (p13).

I welcome the recommendations that assist Queensland Health to further progress the benefits realisation of the ieMR program; ensuring value for money; adapting the governance arrangements to meet the changing needs of a large, complex, multi-year and multi-site program; and, build on the existing stakeholder engagement arrangements.

In relation to statements in the report regarding seeking alternative ieMR vendors (p8 and p13), at the time of the approval to commence the ieMR program, there was consideration given to implementing either a single vendor or a multiple vendor strategy. A single vendor strategy for large hospitals supports important clinical quality and safety objectives as well as efficiency and value for money objectives. A single vendor strategy:

- reduces clinical risk as clinicians work across multiple sites and can use the same system in all locations;
- reduces training time as clinicians need to learn only one system;
- reduces the cost to build, test, implement and maintain the system as there is only one application;
- reduces issues of interoperability compared to a multiple vendor environment where there are significantly more interfaces required; and
- reduces network complexity as there are fewer applications running on the network.

Queensland Health will continue to consider these issues as we progress the roll-out of the ieMR program in metropolitan, regional, rural and remote hospitals and health services.

Reviewing benefits so early into a large transformational change program with generational impacts will always identify areas for improvement and your report recognises this challenge. Also, the review could have benefited from using national or international experts with experience in an ieMR implementation program involving large public hospitals with a shared and integrated system across multiple sites.

The report also confirms that in rolling out the ieMR, Hospital and Health Services have chosen to implement a larger number of integrated devices to support a higher quality of care and have also chosen to go beyond the standard build to implement a program of broader digital transformation when implementing the ieMR. As noted in the report, this has contributed to business case budget forecasts being exceeded but with a higher level of functionality and capability being implemented.

I would like to acknowledge your personal engagement in this audit through visiting hospitals and meeting with clinicians. I am sure that the insights you gained from this first-hand experience has assisted you in preparing the report.

As you are aware, I visit each hospital before each go-live and meet with the clinicians and program team. I find these discussions enormously rewarding and feedback from clinicians is that they also find them beneficial. Clinicians are able to raise and discuss any matters at these meetings and I use the following seven questions to guide the discussion:

1. Are all the staff in your area trained and confident in using the electronic health record?
2. Have the work flows using the electronic health record been developed and practiced in your clinical area?
3. Are you confident that your staff have embraced the new way of working with the electronic health record and that you have strategies ready to address issues that may arise?
4. Are all the computers and devices in place, tested and working quickly and reliably?
5. Do you have arrangements in place to operate if the electronic health record is not available?
6. Are you ready to respond to internal or public criticism of the electronic health record?
7. Are you confident that the go-live in your area is clinically safe?

Clinicians have the ability at these meetings to delay the go-live if they think that any of the seven areas will cause problems during or post go-live. Providing this level of accountability to clinicians supports the full engagement of the local clinical leadership and is key to a successful digital transformation.

At the request of the Honourable Steven Miles MP, Minister for Health and Minister for Ambulance Services, we have continued our ongoing efforts to improve the ieMR program. Some of the recent activities we have progressed that relate to the recommendations in the report are:

- we have expanded the responsibility for managing the vendor relationship to four people: the Director-General, Chief Clinical Information Officer and Chief Executive eHealth Queensland and a Chief Executive of a Hospital and Health Service with an ieMR hospital;
- we have commenced an external and independent assessment to confirm that, as per the Deed of Agreement with the Vendor, the prices we are paying are no less favourable than those being paid by other health service providers in Australia for similar products or services; and,
- to prepare for the need to focus on the optimisation work for the hospitals that have already gone live, while continuing to roll-out the program, we have transitioned the Senior Responsible Officer for the ieMR program to the Chief Clinical Information Officer. This is a normal strategy for such large programs that operate over many years when the business-as-usual environment for the hospitals who are already operating the ieMR is sufficiently mature.

I look forward to working with you as we progress actions to further strengthen the digital transformation of our hospitals that are consistent with the recommendations in your report. We will continue to focus on realising the benefits of the ieMR to deliver safe, quality and efficient services that achieve the best outcomes for our patients.

Should you require further information, the Department of Health's contact is Mrs Pamela Healy, Chief Audit Officer, Internal Audit Unit, on telephone 3708 5103.

Yours sincerely

Michael Walsh
Director-General
Queensland Health

3

Responses to recommendations

Queensland Audit Office
Better public services

Queensland Health

Digitising public hospitals

Recommendation	Agree/ Disagree	Timeframe for implementation (Quarter and year)	Accountable Officer	Additional comments
We recommend that the Department of Health and the Hospital and Health Services (HHSs) that have implemented the ieMR solution (Note 1):				
1. continue to work together to identify the actual cost to date of implementing and operating ieMR (Chapter 2) The Department of Health should: • use this information to update the Cabinet Budget Review Committee on the actual program cost to date. The information should form the basis for a more reliable estimate of what it will cost to complete the program and of the longer-term costs of maintaining the ieMR solution • in consultation with HHSs consider whether the level of investment by HHSs to implement the ieMR solution is appropriate. Note 1: The hospital and health services that have implemented the ieMR solution at varying ieMR stages include the Metro South Hospital and Health Service (ieMR advanced), the Mackay Hospital and Health Service (ieMR advanced), the Children's Health Queensland Hospital and Health Service (ieMR advanced), Cairns and Hinterland Hospital and Health Service (ieMR intermediate), Metro North Hospital and Health Service (ieMR basic), and the Townsville Hospital and Health Service (ieMR intermediate).	Agree	Quarter 1, 2019 *(Subject to confirmation of the Committee meeting schedule)*	Senior Responsible Officer, ieMR Program	Working with the HHSs, eHealth Queensland (eHealth) recently collected and aggregated detailed expenditure data to refine the Total Cost of Ownership (TCO), the supporting cost assumptions and a reliable forecast estimate for the cost to complete the program. This work is reflected in the ieMR 2018 Business Case Update that has been endorsed through the relevant Queensland Health governance committees and will form part of the submission to the Cabinet Budget Review Committee (CBRC) in early 2019. Proposed Action: 1.1 Finalisation and lodgement of the ieMR 2018 Business Case Update for CBRC consideration to endorse and to support continued investment in the ieMR Program. 1.2 Revise both the costing and funding principles to provide guidance to current and future rollout sites to support and guide HHS investment decisions.

1

Queensland Audit Office
Better public services

We recommend that the Department of Health:				
2. completes its refresh of the eHealth investment strategy based on the revised cost of the ieMR program and any impacts it has on the strategy for other programs (Chapter 2)	Agree	Quarter 2, 2019	Chair, eHealth Executive Committee (eHEC)	A refresh to the current 2015 eHealth Investment Strategy has been drafted and will be finalised by March 2019. The refresh will update the indicative costings for all strategic investment categories, including the ieMR. It will also focus on the capabilities and benefits of each strategic investment to support Queensland Health's 10-year vision. Proposed Action: 2.1 eHealth finalise the refresh of the 2015 endorsed eHealth Investment Strategy.
3. provides the Cabinet Budget Review Committee with: • updated timing for the realisation of benefits • a balanced assessment of benefits realised (and dis-benefits) across hospitals from all hospital and health services that have implemented the ieMR (Chapter 3)	Agree	Quarter 2, 2019 *(Subject to confirmation of the Committee meeting schedule)*	Senior Responsible Officer, ieMR Program	The impact of the digital transformation on hospital performance, user satisfaction, and patient care is an ongoing focus for clinicians and administrators alike; one that continues to be assessed and managed as rollout progresses across the State. We have been very clear that full benefits realisation does not occur until approximately two years after implementation. At this early stage of the benefits realisation journey, benefits are as expected; some have been partially observed and others require further attention, however confidence has improved as benefits realisation forecasts become reality. The ieMR 2018 Business Case Update reflects updates to benefits including what has been achieved to date, changes to timing of benefits and incorporation of dis-benefits. This Business Case has been endorsed through the relevant Queensland Health governance committees and will form part of the submission to the CBRC in early 2019. Proposed Action: 3.1 Finalisation and lodgement of ieMR 2018 Business Case Update for CBRC consideration to endorse and to support continued investment in the ieMR Program.

2

Queensland Audit Office
Better public services

4. provides greater assurance that it is obtaining ongoing value for money from its ieMR vendor by: • investigating options for demonstrating value-for-money pricing, including conducting comparative vendor price analysis where possible • assessing and documenting the ieMR vendor's performance across its service contracts, with input from hospital and health services. • This should occur at appropriate intervals and, at a minimum, before each contract extension decision (Chapter 2)	Agree	Quarter 1, 2019	Chief Executive, eHealth Queensland	The ieMR vendor is a strategic partner of Queensland Health and maintains an extensive Queensland based capability contributing to Queensland Health's ieMR strategic, operational and delivery focussed activities. This is underpinned by clear contractual obligations to both the ieMR project implementations and the ongoing support thereof. A commercial management process is in place to manage the terms and conditions including key performance indicators on a tactical, strategic and operational basis. As part of the establishment of the key commercial arrangements, support was provided from global advisory organisations to assist in assuring both value for money and commercial outcomes. Proposed Action: 4.1 Undertake an external, independent assessment to confirm that as per the Deed of Agreement with the ieMR vendor, the prices we are paying are no less favourable than those being paid by other health service providers in Australia for similar products or services. 4.2 Establishment of a Strategic Performance Review group comprising key executives of both organisations to meet quarterly to manage and document overall vendor performance informed by technical and clinical functions.

3

Queensland Audit Office
Better public services

5. re-visits the governance arrangements for the program as it moves from building, configuring, and implementing the ieMR solution to business-as-usual and optimising the solution • This should include: • re-visiting the focus and roles of the eHealth Executive Committee, eHealth Queensland, and other areas of the department such as the Clinical Excellence Division • continuing to obtain an independent review of program benefits periodically. (Chapters 2 and 3)	Agree	5.1: Quarter 2, 2019 5.2: Quarter 3, 2019 5.3: Quarter 2, 2019	5.1: Chair, eHEC 5.2: Chief Executive, eHealth Queensland 5.3: Senior Responsible Officer, ieMR Program	Governance Queensland Health reviews its program governance arrangements on an annual basis. The 2018 review of eHEC has already occurred, with recommendations including: • Combining the existing three advisory committees (including the Clinical Advisory Committee) into one Digital Advisory Committee • Revising its terms of reference with ICT investment decision making to be transferred from the Investment Review Committee to eHEC • Updating the eHealth Investment governance framework to ensure all key state-wide strategies come to eHEC for approval and that eHEC has a master schedule of all ICT Investments that meet digital investment criteria. An ieMR Target Operating Model (TOM) has been developed in line with best practice and industry benchmarks. Program Benefits An external review from a Tier 1 consultancy firm was undertaken during the update of the ieMR 2018 Business Case. This update included an in-depth assessment of benefits and dis-benefits for both measurement and realisation. External, independent Gate 5 assurance reviews (benefits realisation) will be undertaken that concentrate on confirming the level of achievement with the approved benefits realisation plan. The first Gate 5 assurance review is due to be undertaken from April 2019 at the Princess Alexandra Hospital. eHealth in conjunction with the HHSs, engaged an independent study to assess the benefits of the ieMR from an end-user perspective both before and after implementation. This was undertaken by Professor Andrew Burton-Jones, a leading research scientist at the University of Queensland Business School. His

4

Queensland Audit Office
Better public services

				study involved an academic research methodology including face-to-face interviews and surveys of a stratified sample totalling 2,051 users of the ieMR across seven hospitals that have implemented the ieMR Advanced release. Queensland Health believes this is an appropriate representation of end-user perspective. Early, interim results of this study suggest the ieMR Advanced release go-lives have been highly successful both from a project implementation and outcomes perspective as assessed by clinicians. Proposed Action: 5.1 Implement the recommendations of the 2018 eHEC review. 5.2 Implement the governance elements of the TOM. 5.3 Initiate the independent Gate 5 assurance review (benefits realisation) at the Princess Alexandra Hospital.

5

Queensland Audit Office
Better public services

6. develops and implements an engagement strategy for all current and planned eHealth programs to assess the effectiveness of its engagement with hospital staff and clinicians and the effectiveness of the system implementation (Chapter 2) • This should include: • specific actions, performance measures, and data sources to enable the department to assess how effectively the department engages hospital staff and clinicians • gathering information about concerns, risks, or dis-benefits that may inform the program about changes or modifications that need to be made to the program.	Agree	6.1: Quarter 2, 2019 6.2: Quarter 2, 2019 6.3: Quarter 1, 2019	6.1: Clinical Director, ieMR Program 6.2: Clinical Director, ieMR Program 6.3: Senior Responsible Officer, ieMR Program	Early engagement and on-boarding for new sites are a key focus area for the ieMR Program. All our learnings, together with global evidence shows local executive and clinical leaders need to lead the staff engagement for implementation success as well as owning of benefits realisation post go-live. The HHSs are responsible and accountable for local project management and delivery, clinical engagement and change management functions, training and go-live support. This is evaluated periodically through the project lifecycle and includes readiness assessments, staff surveys focusing on change and external assurance. Further, the Director-General undertakes a face to face meeting several weeks before go-live to provide the opportunity for executive and clinical staff to confirm their level of confidence for a safe implementation. Proposed Action: 6.1 Develop a state-wide approach to measure and evaluate the effectiveness of executive and clinical engagement of ieMR implementation projects and consider its application to other eHealth programs. 6.2 Incorporate recommendations from the University of Queensland Business School study as they relate to engagement into the state-wide approach to be developed. 6.3 Review existing sites dis-benefits approaches to develop a state-wide guideline for the definition, identification, capture, reporting and monitoring of dis-benefits.

6

Queensland Audit Office
Better public services

7. continues efforts to refine the business intelligence strategy and approach, and rollout solutions to hospital and health services to maximise the benefits from the ieMR implementation at each site (Chapter 3)	Agree	7.1: Quarter 2, 2019 7.2: Quarter 4, 2019	7.1: Chief Digital Strategy Officer, eHealth Queensland 7.2: Chief Executive, eHealth Queensland	The implementation of the ieMR has enabled further insights into hospital performance through data analytics. Data from the ieMR is supporting clinical collaboration between colleagues and partners across the state; driving improvements in clinical care and innovation through research, proactive decision making and empowering clinicians and hospitals to proactively manage their performance and standards compliance in near real-time. Key outputs over time will include the standardisation of key data to allow common analytics opportunities and localised opportunities to leverage information to improve local outcomes. In the short-term sites will leverage analytical capabilities provided by Metro South HHS. In the medium to longer term, the Clinical Excellence Division, eHealth and HHSs are collaborating on implementing a funded state-wide clinical and business intelligence platform to enable the establishment of a central shared platform and associated services to address the following urgent state-wide needs: • clinical and business risks relating to any loss of clinical, corporate and system reporting and data collection capability from sites switching to the ieMR; and • reliable, trusted and validated data management and reporting from the ieMR and other critical enterprise systems. A strategy on the long-term structure, investment and governance approach to business intelligence specific to health is in development. Proposed Action: 7.1 Finalise the two-year Business Intelligence Strategy and Approach. 7.2 Begin implementation of the first stage of the state-wide Business Intelligence Platform.

7

Queensland Audit Office
Better public services

8. improves the preventative security controls of ieMR user accounts. (Chapter 2) This should include enforcing password complexity requirements and implementing a change management process to educate clinicians on appropriate password settings.	Agree	8.1: Quarter 4, 2018 8.2: Quarter 1, 2019 8.3: Quarter 4, 2018	8.1: Chief Executive, eHealth Queensland 8.2: Chief Human Resources Officer, Department of Health 8.3: Chief Executive, eHealth Queensland	With more than 240 million transactions and almost 33,000 unique users with access to the ieMR every month, privacy and security of sensitive patient information is a primary consideration. Further, there have been no external data breaches, denial of service, loss of data or successful phishing or ransomware attacks on the ieMR since the progressive implementation of the ieMR commenced in 2015. The ieMR application and activities by its users are already managed by various levels of security. Access to the ieMR application needs both an active account to access the Queensland Health network and separate approved security profile to the ieMR application aligned to role type. In addition to the in-built monitoring of activity, security measures are supported by Queensland Health's employment agreement, local HHS practices and other fully funded security initiatives. Current initiatives, either active or undergoing further development, focus on the areas of: governance, accountability, usability, access and technical compensating controls. The primary focus of each area is to strengthen the user access management capability of the ieMR as it progresses through the security maturity journey. Proposed Action: 8.1 Implement an automated process to user access upon employment cessation or users whose last login was more than 90 days previous. 8.2 Department of Health to ensure the standard requirements and materials are included in relevant induction and exit processes. 8.3 Continue the implementation of the fully funded Advanced Identity Management Program to international industry best practice standards that will include more complex password management amongst other strategies.

8

Queensland Audit Office
Better public services

We recommend that all Hospital and Health Services participating in the ieMR program:				
9. report regularly on their total ieMR project costs and broader costs associated with their digital transformation (separated from ieMR costs) to eHealth Queensland as well as to their own hospital and health service boards (Chapter 2).	Agree	Quarter 1, 2019	Chair, Digital Hospital Program Committee (DHPC)	The ieMR Program currently reports its monthly performance and direct ieMR Project costs only at the Department of Health governance boards. This has included the level of co-investment of some HHSs. HHSs also report financial investment on their digital transformation independently through their relevant Boards. Proposed Action: 9.1 Reporting Framework to be updated that clearly articulates the required reporting elements, frequency and level of transparency required to relevant governance bodies and stakeholder groups. 9.2 Update all HHS co-investment expenditure reported to DHPC in accordance with data collected from ieMR Program Business Case Update 2018 for sites that have already completed the ieMR Advanced release implementation project. 9.3 Ensure all in-flight and future project implementation costs of HHSs are reported in accordance with the updated Reporting Framework.

9

Queensland Audit Office
Better public services

10. improve their employee termination processes to ensure they promptly remove an employee's ieMR access when an employee or temporary staff member terminates their employment with their hospital and health service (Chapter2).	Agree	10.1: Quarter 1, 2019 10.2: Quarter 1, 2019 10.3: Quarter 4, 2018	10.1: Health Service Chief Executives 10.2: Health Service Chief Executives 10.3: Chief Executive, eHealth Queensland	As stated in Recommendation 8, the ieMR application and its usage is already managed by various levels of security. Access to the ieMR is strongly governed at a local level by information management teams and governance structures within HHSs. Access to the ieMR application needs both an active account to access the Queensland Health network and separate approved security profile to the ieMR application aligned to role type. Proposed Action: 10.1 HHSs to review compliance of existing policy requirements for managers and application custodians to notify eHealth of staff system access change requirements. 10.2 HHSs to ensure the standard requirements within their updated policies are included in relevant induction materials and exit processes. 10.3 Implement an automated process to remove system access of users upon employment cessation or users whose last login was more than 90 days previous.

10

Queensland Audit Office
Better public services

11. implement a process to monitor whether reviews of inappropriate user access to ieMR patient data are completed (Chapter 2).	Agree	Quarter 2, 2019	Chief Clinical Information Officer, Queensland Health	An extensive suite of user access reports are available that provide the ability to interrogate ieMR access data to identify potential inappropriate user access. Users of the ieMR are provided access to the application based on defined security roles. Changes to permissions of the defined security roles are governed at a state-wide level by the ieMR Clinical Advisory Group In addition, all ieMR HHSs are represented on the Health Information Management Specialty Sub-Group. The purpose of this group is to ensure there is policy standardisation across sites. Proposed Action: 11.1 Review of the current state-wide approach to further ensure appropriate access to and monitoring of patient data 11.2 Queensland Health to undertake additional staff communications reminding staff of obligations relating to appropriate access to patient ieMR records, the monitoring and review processes in place and the enforcement of any breaches of Queensland Health policies.
12. report dis-benefits to the program so the program can learn from these and if necessary, modify the solution or implementation approach (Chapter 3).	Agree	12.1: Quarter 1, 2019 12.2: Quarter 1, 2019	12.1: Senior Responsible Officer, ieMR Program 12.2: Health Service Chief Executives	Overall, the ieMR Program is demonstrating positive outcomes and benefits are being achieved to date. Where benefits are reported, these will typically be net of dis-benefits. Some negative outcomes are transient or localised dis-benefits. Proposed Action: 12.1 Review existing sites dis-benefits approaches to develop a state-wide guideline for the definition, identification, capture, reporting and monitoring of dis-benefits. 12.2 HHS to report dis-benefits and lessons learned in accordance with the guidelines to be developed.

11

B. Audit objectives and methods

Audit objective and scope

The objective of the audit was to assess how well Queensland Health has planned and is delivering its digital hospitals program and whether it is realising the intended information-sharing and patient benefits.

The audit addressed the primary objective through the following sub-objectives and lines of inquiry.

Figure B1

Sub-objective		Lines of inquiry	
1	How well has the digital hospital program been planned and implemented?	1.1	The plan (from 2014) to digitise Queensland public hospitals was based on robust analysis.
		1.2	Program and project practices are effectively managed.
2	Is the digital hospital program achieving the expected outcomes and benefits?	2.1	The electronic medical record systems are delivering the expected benefits and are being used by clinical staff as expected.
		2.2	The implemented system improves access to, and sharing of, information while protecting privacy.

Source: Queensland Audit Office

Entities subject to this audit

- Department of Health
- Cairns and Hinterland Hospital and Health Service
- Metro South Hospital and Health Service
- Townsville Hospital and Health Service

We also consulted the Children's Health Queensland, Metro North, and Mackay hospital and health services to obtain their views on our lines of inquiry. As part of the audit, the Auditor-General also viewed the integrated electronic medical record (ieMR) technology at the Princess Alexandra and Lady Cilento Children's hospitals.

Scope exclusions

We did not, as part of this audit:

- test the adequacy of mitigating strategies to protect the ieMR system and data from cyber threats
- investigate specific clinical concerns with the ieMR solution
- validate whether additional costs incurred by the HHSs in implementing the ieMR system were warranted.

Audit approach

The audit was conducted between September 2017 and July 2018. The audit included:

- interviews with staff from the Department of Health, hospital and health services, and representative bodies such as the Australian Medical Association Queensland
- document review and data analysis, including tests of security controls
- visits to the Princess Alexandra, Townsville, and Cairns hospitals.

C. Drivers for digitising hospitals

Figure C1

Drivers	Comments
Political	Queensland's 10-year $1.26 billion eHealth Investment Strategy (August 2015) identifies the integrated electronic medical record (ieMR) program as a key investment priority to build the foundation for accessing and sharing medical records across the health system. In November 2016, the Queensland Government supported a business case that estimated the advanced ieMR solution would be implemented in 25 hospitals by June 2020. This has now increased to 27 hospitals.
Economical	Expenditure on healthcare is growing. Technology developments can reduce the costs of some health services by making them cheaper to deliver. They can reduce costs through decreased paperwork, improved safety, reduced duplication of testing, and improved health.
Social	The ageing population, the growing burden of chronic conditions, and consumer expectations are driving the demand for services, resulting in per capita growth of health services, and more expensive technology.
Technological	New technology reduces the chances of human error and allows accessing and sharing of medical records across the health system. New technology supports clinical care and improves patient administration and workflow.
Legal	Government and consumers expect the health system to fully exploit available technology to prevent high-risk errors (such as medication errors). As a result, a hospital may be deemed accountable for what it should, or could, have known, not what it did know.

Source: Queensland Audit Office.

D. Business case benefits

Figure D1 summarises the benefits as defined in the April 2016 integrated electronic medical record (ieMR) business case.

Figure D1

	#	Benefit	Non-monetary benefits per year—units	Monetary value per year*—$ mil.
Safety and quality (non-cashable)	1	Reduction in unplanned readmissions	514 readmissions	$2.4
	2	Reduction in adverse drug events	16 285 adverse drug events	$137.7
		Total benefit		$140.1
Service improvement (non-cashable)	3	Reduction in inpatient length of stay due to a single integrated source of information, reduced clinical variation, and improved identification of at-risk patients	11 597 bed days	$16.6
	4	Nurse hours saved in data transcription and charting due to biomedical device integration with electronic medical records	68 961 staff hours	$4.1
	5	Reduction in doctor, nurse, allied health, and administration staff time spent accessing information	1 238 470 staff hours	$69.8
	6	Reduction in emergency department (ED) length of stay	105 082 ED hours	$11.3
		Total benefit		$101.8
Direct financial (cashable)	7	Reduction in drug costs due to improved medication ordering		$2.8
	8	Reduction in inappropriate pathology testing	Inappropriate pathology tests	$7
	9	Reduction in inappropriate diagnostic imaging from improved access to existing images at the point of care	Inappropriate diagnostic imaging	$21.4
	10	Reduced medical record stationery, storage, and retrieval costs		$3.6
		Total benefit		$34.8

Source: 2016 ieMR business case provided by the Department of Health.

E. ieMR benefits by site

Figure E1
Integrated electronic medical record program (ieMR) benefits against program business case—Princess Alexandra Hospital (go-live November 2015)

ieMR business case benefit	January–June 2016 % change from baseline**	July–December 2016 % change from baseline**	January–June 2017 % change from baseline**	July–December 2017 % change from baseline**
Reduction in unplanned readmissions—annual benefit target: 4 per cent reduction after 21 months*				
Baseline: 7.88% readmission rate measured in January to June 2015	-3.58%	1.16%	-1.53%	-5.23%
Reduction in inpatient length of stay—annual benefit target: 1.55 per cent reduction after 21 months				
Baseline: 3.1 days measured in January to June 2015	0%	0%	3.23%	0%
Reduction in emergency department length of stay—annual benefit target: 11.9 per cent reduction after 21 months				
Baseline: 4.12 hours measured in January to June 2015	4.13%	-	0.73%	-
Reduction in inappropriate pathology testing—annual benefits target: 5.35 per cent reduction after 15 months				
Baseline: 7 tests per weighted activity unit (WAU) measured in May to October 2015	-	-2.9% (May to October 2016)	-	-5.3% (May to October 2017)
Reduction in inappropriate diagnostic imaging—annual benefits target: 5.35 per cent reduction after 15 months				
Baseline: 1.34 tests per WAU measured in September 2015	-	-26.73% (September 2016)	-	-26.16% (September 2017)

ieMR business case benefit	January–June 2016 % change from baseline**	July–December 2016 % change from baseline**	January–June 2017 % change from baseline**	July–December 2017 % change from baseline**
Reduced medical record, stationery, storage, and retrieval costs—annual benefit target: 30 per cent reduction after 12 months				
Baseline: $62 306 forms cost (including printing) measured in March to May 2015	-69% (March to May 2016)	-	-75% (March to May 2017)	-

Note:

*The benefit is linked to Medications, Anaesthetics and Research Support (MARS) implementation. 21 months has not passed since its implementation
**A negative figure means the hospital achieved a positive trend in the benefit area.

Source: Queensland Audit Office from ieMR Program Benefits Status Updates.

Figure E2
ieMR benefits against program business case—Cairns Hospital (go-live February 2016)

ieMR business case benefit	September 2016–February 2017 % change from baseline**
Reduction in unplanned readmissions—annual benefit target: 4 per cent reduction after 21 months*	
Baseline: unplanned readmission rate 14.1% measured in September to February 2016	-9.9%^
Reduction in inpatient length of stay—annual benefit target: 1.55 per cent reduction after 21 months	
Baseline: inpatient length of stay 4.03 days measured in September to February 2016	0.3%^
Reduction in emergency department length of stay—annual benefit target: 11.9 per cent reduction after 21 months	
Baseline emergency length of stay—admitted patients: 5.4 hours measured in September to February 2016	5.6%^
Reduction in inappropriate pathology testing—annual benefits target: 5.35 per cent reduction after 15 months	
Baseline: 6.3 tests per WAU measured in September to February 2016	-25.4%^
Reduced medical record, stationery, storage, and retrieval costs—30 per cent reduction after 12 months	
Baseline: $464 301 measured in September to February 2016 (annualised figure)	-62%^

Note:

*The benefit is linked to MARS implementation. The Cairns Hospital hasn't implemented it yet.
**A negative figure means the hospital achieved a positive trend in the benefit area.
^Movement data sourced from the ieMR Centre of Excellence Benefits Realisation Snapshot as at 31 August 2018.

Source: Queensland Audit Office from ieMR Program Benefits Status Updates.

Figure E3
ieMR benefits against program business case —Townsville Hospital (go-live July 2016)

ieMR business case benefit	Actual % change from baseline (6 months)**	Actual % change from baseline (12 months)**
Reduction in unplanned readmissions—annual benefit target: 4 per cent reduction after 21 months*		
Baseline: 9.8% unplanned readmission rate measured in January to June 2016	17%	-2.04%
Reduction in inpatient length of stay—annual benefit target: 1.55 per cent reduction after 21 months		
Baseline: 3.05 days average length of stay for multi-day acute patients measured in January to June 2016	-3.28%	-4.92%
Reduction in emergency department length of stay—annual benefit target: 11.9 per cent reduction after 21 months		
Baseline: 4.47 hours average length of stay for admitted patients measured in January to June 2016	32.46%	38.06%
Baseline: 2.33 hours average length of stay for non-admitted patients measured in January to June 2016	20%	12.86%
Reduction in inappropriate pathology testing—annual benefits target: 5.35 per cent reduction after 15 months		
Baseline: 6.82 tests per WAU measured in January to June 2016	-1.26%	2.2%
Reduction in inappropriate diagnostic imaging—annual benefits target: 5.35 per cent reduction after 15 months		
Baseline: 0.94 tests per WAU measured in January to June 2016	-4.89%	-4.48%
Reduced medical record, stationery, storage, and retrieval costs—30 per cent reduction after 12 months		
Baseline: $442 860 in stationary costs measured in January to June 2016 (annualised figure)	-12.5%	-9.2%

Note:

*The benefit is linked to MARS implementation. The Townsville Hospital hasn't implemented it yet.
**A negative figure means the hospital achieved a positive trend in the benefit area.

Source: Queensland Audit Office from ieMR Program Benefits Status Updates.

Auditor-General reports to parliament

Reports tabled in 2018–19

1. Monitoring and managing ICT projects
   Tabled July 2018
2. Access to the National Disability Insurance Scheme for people with impaired decision-making capacity
   Tabled September 2018
3. Delivering shared corporate services in Queensland
   Tabled September 2018
4. Managing transfers in pharmacy ownership
   Tabled September 2018
5. Follow-up of Bushfire prevention and preparedness
   Tabled October 2018
6. Delivering coronial services
   Tabled October 2018
7. Conserving threatened species
   Tabled November 2018
8. Water: 2017–18 results of financial audits
   Tabled November 2018
9. Energy: 2017–18 results of financial audits
   Tabled November 2018
10. Digitising public hospitals
    Tabled December 2018

Audit and report cost

This audit and report, including seven end-of-conduct briefs and two preliminary reports we provided to the department and the three health and hospital services we audited, cost $674 000 to produce.

Copyright

ISSN 1834-1128.

Performance engagement

This audit has been performed in accordance with ASAE 3500 *Performance Engagements.*

qao.qld.gov.au/reports-resources/parliament

Suggest a performance audit topic

Contribute to a performance audit in progress

Subscribe to news

Connect with QAO on LinkedIn

T: (07) 3149 6000
M: qao@qao.qld.gov.au
W: qao.qld.gov.au
53 Albert Street, Brisbane Qld 4000
PO Box 15396, City East Qld 4002

Queensland Audit Office

Better public services