Implementation of a clinical system at Austin Health: understanding the challenges of implementing e-medications management

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Abstract
Austin Health embarked on a project to implement an electronic medical record (EMR) to all of its campuses in late 2009. The project locally was the largest and most complex IT/change management project that had been undertaken by the organisation. The project included significant technical activities: upgrade of wireless network, deployment of mobile point of care devices and specialised printers, as well as the activities associated with ensuring the design and configuration of the software would support the clinical practice. No clinical system implementation would be successful without paying attention to the way it is used. Change management and clinical adoption strategies were employed to ensure the implementation would support clinical practice.

Key Words: Electronic Prescribing; Medical Order Entry Systems; Point-of-Care Systems; Medication Therapy Management

Supplementary Terms: Computerised Physician Order Entry (CPOE); Change Management

Introduction
As part of its strategic priorities, Austin Health has a clear strategy to develop a fully electronic medical record (EMR) across all its sites, over a 10-year period. Austin Health embarked on a project to implement the Victorian State Government supported clinical system Cerner Millennium to all of its campuses in late 2009. The project locally was the largest and most complex IT/change management project that had been undertaken by the organisation and would impact all 5,000 clinical staff. The project included significant technical activities: upgrade of wireless network, deployment of mobile point of care devices and specialised printers, as well as the activities associated with ensuring the design and configuration of the software would support the clinical practice.

There are numerous challenges when implementing a clinical system into any hospital and gaining adoption and acceptance is a long journey. Success factors are frequently described in the literature as being the need for stakeholder engagement, culture change, user training, slow and considered implementation, and user-friendly systems that fit into clinical workflow (Gagnon et al. 2012). This paper identifies how Austin Health approached these challenges in the journey to implementing electronic ordering and electronic medication management, with particular emphasis on the implementation of the inpatient medication management implementation.

Implementation overview
The project was part of the ‘whole of health ICT strategy’ of the State Government at the time. Austin Health was one of two lead agencies to implement the ‘state build’ solution where the majority of design decisions had been pre-determined and where limited localisation would be required. As Austin was a lead site, this approach required intensive review and testing before the system could be declared ‘fit for purpose’ and resulted in the implementation being split into two phases.

The first phase of the system implementation incorporated electronic pathology/radiology orders with direct interfaces into the receiving Laboratory Information System and Radiology Information System, results review and endorsement, discharge summaries and electronic discharge prescribing. This phase was implemented in a ‘big bang’ approach across all three campuses in June 2011. The training and support strategy for the June 2011 implementations catered for the training of 3,300 staff prior to the go-live; and 94 effective full time (EFT) super users were recruited to provide on-floor support during the go-live periods. A ‘24 x 7’ help desk was established for the first three weeks post go-live. This functionality was extended to outpatient areas six weeks later.

The deployment strategy for the second phase was a different approach: it was a phased implementation. The second phase incorporating inpatient prescribing, medication administration and dispensing was implemented in June 2012 with six sub-acute wards at two of the Austin Health sites and was extended to all acute wards by the end of 2012. By the end of June 2013, all clinical inpatient areas will be ‘live’ on inpatient medications; that is the implementations in the Emergency Department, Intensive Care Unit, Mental Health Services and Palliative Care will be completed. The phased approach was due to...
a number of factors: the lead time required to complete the building of the pharmacy catalogue for different clinical areas; the level of change management and post go-live support required for different areas; and the logistics of ensuring everyone has enough training to be competent in e-prescribing and e-medication administration.

A multidisciplinary clinical project team was established to support the implementation activities of both phases. A governance structure that incorporated a number of specialist clinical workflow groups responsible for developing current and future state workflow was created, but was linked to the mainstream governance system of the organisation. A communication and change management strategy ensured stakeholders were engaged from all major clinical business units.

Implementing e-medications management
The e-medications management project commenced in July 2011. It included a number of activities:

Defining the scope of the e-medications management implementation
The scope for the inpatient medication implementation was determined through a ‘proof of concept’ project that was conducted over three months. It was defined as:

- Inpatient medication orders to replace the National Inpatient Medication Chart (NIMC):
  - Includes Venothrombotic Embolism (VTE) risk documentation that was part of the NIMC.
  - Excludes continuous infusions, complex oncology regimes, patient controlled analgesia (PCA) that were all recorded on separate forms and were not easily replicated in the software.
- Inpatient medication administration.
- Pharmacists review of the medication chart and verification of orders.
- Fluid balance charting.
- Immunisation documentation.
- Nursing/patient care orders; that is, to enable orders to be placed that had traditionally been placed on the NIMC such as the order for fluid restrictions.

Building the catalogues
The clear aim for the Austin Health project team was to build a robust local medications order catalogue that included medications specific to our clinical populations and minimised selection errors. Austin Health developed its own guidelines for the inpatient order catalogue and building of order sentences, based on the United Kingdom National Health Service (NHS) guidelines (NHS National Patient Safety Council 2010). This was prepared to support all pharmacists involved in the build and to ensure consistency amongst our own team. The underlying principle was that the choice of medication name display and their dosing format should support users to prescribe correctly and administer medications easily and safely, and that it was consistent with the current NIMC.

Development of an interface to the dispensing system
The inpatient medication implementation is one of the first closed-loop implementations in Australia. Orders are placed in Cerner PowerChart, verified and assigned a product by a Pharmacist in Cerner PharmNet and at this point a message is triggered to transfer the order into the dispensing system (Merlin). Mapping of codes in each of these three systems is critical to making this work.

Review of workflows
All work processes (workflows) related to doctors, nurses and pharmacists were reviewed in detail. Future state workflows were developed in the context of the inpatient medication functionality. Where possible, specific workflow requirements were built into the system to support clinical practice as documented in the established clinical guidelines. An example of this was the work done to document VTE prophylaxis in Cerner in a similar way to the existing paper-based protocol using the NIMC.

Additional functionality to support new workflows
A number of nursing tasks were ‘ordered’ via the NIMC. Items such as checking compression stockings or ordering a fluid restriction were not on the inpatient medication catalogue. This deficiency meant that workflows would be split with some orders on paper and some in Cerner. To overcome this problem and to mend the ‘broken’ or split workflows, an additional order catalogue was built that included various patient care orders.

Devices and the IT infrastructure
Access to computers and improving the information technology (IT) infrastructure was a considerable investment. The infrastructure review included an upgrade of the wireless infrastructure across all clinical areas of the Health Service, and the purchase of a range of mobile devices for all disciplines impacted by the implementation. The majority of this was completed prior to the June 2011 implementation. For the inpatient medication implementation, medication trolleys with lockable drawers were rolled out to support the nurses administering medications, and pharmacists were all provided with a mobile tablet personal computer in order to verify and review medications at the bedside.

Testing
Our test plan included four cycles of checking and cross checking by pharmacists and medical staff. User acceptance testing scripts were structured to reflect proposed workflows. Medical staff actively participated in testing and advised on both content and workflows, with the result being processes that were aligned with clinical practice.
Managing change and supporting users
A longer lead in period to concentrate on change management activities with wards, departments and clinical units was incorporated as part of the preparation for ‘go-live’. Workflow groups were established to identify specific issues for every area so that the workflows were adapted and adjusted to make the process as easy as possible at the time of implementation. This process also improved their understanding of what was to come.

The super user strategy used for the initial implementation was repeated. The strategy was extended to include super users from all disciplines (i.e. nursing, medical and pharmacy staff). The nursing super users actively participated in preparing their ward for the implementation and completed competency assessments for all nursing staff who would be using the system to administer medications. The medical super user was invaluable in assisting junior medical staff to understand both how to use the system and to provide advice and support in prescribing complex medications. The pharmacy super users supported the pharmacists to review and verify the medications prescribed electronically and assisted with their workload until they were comfortable and confident in using the system.

Both the project team and super users completed a change management training session to assist them in supporting users, managing themselves through the change and ensuring that their communication skills could cope with all types of situations.

Training and communication plan
Training for inpatient medications required a minimum of two hours classroom training for all disciplines. Training material and user guides were developed to support staff and these are readily accessible on the intranet. A Learning Management System was developed to enable users to refresh their knowledge and to practice using the system.

Benefits baseline
Data collections for measuring the baseline were completed in the last month before go-live. These included observational studies on nursing medication administration during peak medication administration rounds and observational studies and time and motion studies of pharmacists’ activities and interventions.

Planning for downtimes
The business continuity plan for periods of downtime needs to be carefully considered when a clinical system is implemented. There is no scope to have the clinical system unavailable for any length of time, and consideration and adequate planning for backup of all integration systems, for wireless systems, local computers and servers were critical. A concurrent project was the implementation of the Cerner 724 downtime solution – the solution to provide access to patient data in the event of an unplanned outage. This solution replicates the database every two minutes and provides access to patient information on a standalone PC attached to generator power and supported by individual uninterrupted power supply (UPS).

Guidelines were developed to manage both planned and unplanned downtime. These processes are supported by a downtime pack containing everything required to manage a downtime such as simple instructions and paper forms. Specific training in managing downtimes was provided during the first weeks after go-live.

Outcomes
A number of positive outcomes have been achieved. Adoption/system use results demonstrate a high rate of adoption at the completion of the June 2011 implementation. Within three weeks of go-live all radiology orders were electronic and 95% of pathology orders and discharge scripts were completed electronically. Adoption rates in the outpatient clinics varied significantly despite a one-on-one training strategy. 62% of outpatient radiology orders are now electronic; however only 20-30% of prescriptions and pathology orders are electronic.

There have been reductions in EFT in both the Radiology and Pathology Departments as a result of the direct interface into their respective systems. The time saved in reducing double data entry has been much more than anticipated.

The Pharmacy Department has formally evaluated the implementation of discharge prescriptions. The preliminary outcomes of the evaluation indicated that there was:
- a significant decrease in error prone abbreviations on discharge prescriptions
- potential for improved consistency between the discharge medication regimen and the discharge summary sent to the GP
- a significant reduction in information that needed to be corrected or added to a prescription to ensure reimbursement by Medicare Australia
- an increased number of low level pharmacist interventions.

The results of the benefits studies are not yet completed for the June 2012 implementation of inpatient medications. It is anticipated that these will give more robust information of whether the implementation of the system has improved patient safety. The anecdotal feedback is that electronic inpatient medication administration had very high rates of adoption amongst nursing staff. Rates of adoption amongst medical staff are more variable. Junior medical staff have learned to prescribe electronically, but more work is required to embed workflows and clinical guidelines on which the system is based.

Lessons
We have summarised the lessons learned in the context of success factors for successful EMR implementations identified in the literature: the need for stakeholder
engagement; culture change; user training; slow and considered implementation; and user-friendly systems that fit into clinical workflow.

**Stakeholder engagement and culture change**
The implementation has been supported at an executive level with active stakeholder engagement and consistent support throughout the life of the project. This is critical to success because a project of this size involves cultural change across the whole organisation.

The change management model was generally successful, particularly with nursing and pharmacy staff. The long lead time and active participation meant that everyone was prepared. Improvements could be made in engaging medical staff more effectively. In the Medical Units that engaged in the process, contributed to building the medications to support their prescribing practice and who trained together, the adoption process has been smooth. For others, the implementation has been difficult, and acceptance is not yet achieved.

The recruitment of super users was one of our most successful implementation strategies. Having super users well trained for the initial support means that they are also a resource for the ward on an ongoing basis.

**User training**
Training for nursing staff and pharmacists was mandatory and all had to complete a competency assessment. This rule was not applied in the same way for medical staff. Attendance at training sessions was poor, so most have learned on the job. The lesson learned is that the approach needs to be universal and all staff need to be competent in using the clinical system as the tool for managing their clinical practice.

**Slow and considered implementation**
The slower roll out with medications enabled us to work through issues with each area and adapt the workflows, within defined parameters, to suit the particular clinical requirements of each area. This also assisted in providing sufficient support for each go live. This assisted in managing the risks associated with implementing medications on each site.

**User-friendly systems**
Feedback from medical staff has been consistent. The system is not intuitive; it is difficult to learn how to use in a short period. For staff who use the system infrequently, it is particularly difficult to remember how to complete a prescription or order a test effectively when they are under pressure in a busy Outpatient Clinic. Multiple training sessions and the provision of support over an extended period are required to embed the system with these users. The user satisfaction surveys have highlighted the difficulties in communication with medical staff, finding suitable training times and methods and in supporting them through change.

**Guidelines to support the medications catalogue**
Guidelines on how to structure the medications catalogue were developed as we went, using the United Kingdom NHS guidelines as a base (NHS National Patient Safety Council 2010). The lesson learned is that the guidelines need to be clear and well established prior to commencing the build tasks so that all sites have a consistent approach.

**Conclusion**
There have been many lessons learnt about implementing a ‘state built’ clinical system. During the life of the project the approach has changed to allow Health Services to make design decisions and customise content to meet local needs. It is now recognised that to maintain a true ‘state build’ rigorous guidelines and governance processes are required. Local benefits are emerging, including reduction in pathology and radiology clerical EFT, improved efficiencies for medical staff in ordering, improved legibility and completeness of orders/prescriptions and improved Pharmaceutical Benefits Scheme (PBS) processes.

Despite overall high levels of adoption, the transition to clinical acceptance has proven to be a slow process, particularly with senior medical staff. The journey to a full EMR is well underway at Austin but it will take time and patience to embed changes and continually improve the system to meet user needs.

**References**


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