

**ELECTRONIC MEDICATION MANAGEMENT-ROLE IN MEDICATION SAFETY**

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**ABSTRACT**

Medication Errors are a continuing and seemingly intractable challenge for health care system. The main aim is to create awareness on safe use of drugs by using Electronic Medication Management (EMM). EMM plays a wide role in reduction of preventable adverse drug events including fewer prescribing and dispensing errors. By using EMM choosing appropriate and cost effective treatments are possible thereby increasing the quality of treatment to the patients and to improve the medication adherence. The various EMM resources include Prescribing system such as medication history recording, Hospital clinical information system, Medication review and reconciliation. Decision support system such as Evidence based order sets, Allergies and Adverse Drug Events history and alerts, Drug interaction checker. Dispensing systems such as Pharmacy software and Automated dispensing systems. Ordering and supply solutions such as Electronic transfer of prescription (ETP), Hospital messaging solutions and Administrative records like Electronic medication administrative records etc.

**KEYWORDS:** adverse drug events, electronic medication management, resources.

**INTRODUCTION**

Medication errors remain the second most common type of medical incident reported in hospitals and, of all medication errors, omission or overdose of medicines occurs most frequently. Reducing all errors will significantly improve patient safety and the quality use of medicines.

An electronic medication management (EMM) system enables prescribing, supply and administration of medicines to be completed electronically. EMM covers the entire hospital medication cycle including prescribing by doctors, review and dispensing of medication orders by pharmacists, and administration of medicines by

nurses.<sup>[1]</sup> The use of EMM for ordering medicines has been cited as the most promising application of information technology to help reduce serious medication errors.<sup>[1]</sup> Automating the medication ordering process produces standardised, legible, complete orders<sup>[2]</sup> and, when combined with clinical decision support systems, can reduce medication error.<sup>[4]</sup> Incorporating clinical decision support within EMM improves the quality and safety of medicines use.

**ELECTRONIC MEDICATION MANAGEMENT**

EMM is a broad term that incorporates any electronic clinical information system tool or software application used to support the medicines management cycle.<sup>[3]</sup>

This includes

PRESCRIBING SYSTEMS.	DECISION SUPPORT SYSTEMS	DISPENSING SYSTEMS.	ORDERING AND SUPPLY SOLUTIONS.	ADMINISTRATIVE RECORDS.
1.GP Desktop Computer, 2.Hospital clinical information system. (stand alone applications,EHR)	1. Evidence based order sets. 2. Allergy checking. 3. Drug interaction checker.	1. Pharmacy software. 2. Automated dispensing system.	1.Electronic Transfer of prescription. (ETP) 2. Hospital messaging solutions.	1. Electronic medication administration records.

### WHY WE NEED EMM

- Improving legibility of prescription orders. Ensure unambiguous and easy understanding.
- Supporting clinicians with choosing appropriate cost effective treatments and helping to reduce clinical variation.
- Improving accuracy and visibility of medication information being communicated between professionals and health care providers.
- Optimizing medicines supply chain to control cost and drive efficiencies.
- Increasing quality of information to ensure health providers and consumers has complete information.

### SAFETY BENEFITS OF EMM<sup>[6]</sup>

EMM implementers cite numerous benefits from EMM systems, however the greatest anticipated benefit of implementing EMM are the reduction of preventable adverse drug events (ADEs) including:

- **Fewer prescribing errors** as EMM systems provide clinical decision support.
- **Lower dispensing errors** through closed-loop medication ordering, automation and barcode scanning.
- **Reduced administration errors** through clearer information on electronic medication administration records, reminders, safety alerts and administration barcode checking.
- **Less omission and commission errors at transitions in care** through improved transfer of information.
- **Improved medication adherence** and minimised misuse, over-use and under-use of medicines.

These safety benefits have been described by implementers as reducing the number of medicines related episodes of care, reducing readmissions and length of stay in hospitals.

### EMM AND THE MEDICINE MANAGEMENT CYCLE<sup>[1]</sup>

The medications management cycle is a complex, continuous process involving many stakeholders including prescribers, dispensers, administrators and consumers. The continuous optimisation of the cycle, combined with the principle of Quality Use of Medicines are common goals of governments and health providers. EMM systems are being implemented to support the various stages in the process.<sup>[7]</sup>

### EMM IN MEDICINES RECONCILIATION<sup>[8]</sup>

Medication reconciliation is a formal process of obtaining and verifying a complete and accurate list of each patient's current medicines. Matching the medicines the patient should be prescribed to those they are actually prescribed.<sup>[9]</sup> Medicines reconciliation is particularly important when care is transferred - when a patient is admitted to hospital, or transferred from hospital to the home.

### Common problems in medicines reconciliation,

- between 10%-67% of medication histories have at least one error,
- up to one third of these errors have the potential to cause patient harm,
- More than 50% of medication errors occur at transitions of care,
- Patients with one or more medicines missing from their discharge information are 2.3 times more likely to be readmitted to hospital than those with correct information on discharge,
- 85% of discrepancies in medication treatment originate from poor medication history taking.

These educational materials provide clinicians with information on the four steps of the medication reconciliation process, evidence to support its use and the importance of team work and communication among staff involved in the patient's care. EMM systems can facilitate improved medicines history and medicines reconciliation through: **Access to more information sources** that can help provide a clearer picture of a patient's current medicines, **Tools and processes** to facilitate workflows associated with medicines reconciliation. **EMM in medicines reconciliation** the Health Providers can now send **e-Referral** documents via a **secure messaging service** to providers with the appropriate infrastructure and capacity. e-Referrals are a standard format that may include: details about the patient, the reason for the referral, current medications; medical history, adverse reactions, and diagnostic investigations including pathology test results. These documents provide very useful information resources that can be validated with patients in the process of medicines reconciliation.

### EMM IN PRESCRIBING

The prescription of medication is one of the most common healthcare interventions made by health providers in both acute and primary care. Clinicians make a decision to provide treatment based on the information they have about the patient, their interpretation of the patients presenting complaint and diagnosis. They rely on access to the latest knowledge and guidelines, combined with their assessment of the patients needs in order to select the most appropriate medication.

### Common problems in prescribing

- Increasing numbers of patients have co-morbidities and more and more Australians are taking 4 or more medicines.<sup>[10]</sup>
- Medicines knowledge is increasing at a faster rate than it is possible for health providers to continually remain up-to-date.
- Only 57% of patients receive the appropriate treatment as per the relevant guidelines.<sup>[11]</sup>

## EMM IN ORDER, RECORD & REVIEW OVERVIEW

Once a decision is taken to prescribe a medicine, the next step is to make an order. We've already discussed some of the steps taken in this process in the previous section. In a hospital, this might be the step where a pharmacist reviews and verifies the order before it is sent on receipt to the pharmacy. In community this might be the receipt of a prescription or electronic prescription. The dispenser must now review the order, check its appropriateness and make a record against the patients record in their system.

### Common problems in order, record & review

- Legibility issues with handwritten orders are still common in acute care.
- Lack of information about the patients condition, comorbidities or concurrent medicines.
- Communication with prescribers for clarifications.

## EMM IN DISPENSING

Whether in hospital or community pharmacy, the dispensing systems and processes have already benefited from significant technology advances. Electronic transfer of prescriptions (eTP), barcode scanning and online claiming have helped drive efficiencies and make pharmacies safer.

### Common problems in dispensing

- Polypharmacy; increasing numbers of patients taking increasing numbers of medicines.
- Dispensing errors; including those caused by look-a-like and sound-a-like medicines, transcription errors or prescription legibility.
- Lack of information about patients comorbidities, concurrent medicines and allergies.

### There are a number of projects underway to help improve dispensing processes

- Closed-loop dispensing: Hospitals are implementing system to enable electronic orders to be sent directly to pharmacy systems.
- Better quality barcode: Work is underway to improve the GTIN information (barcodes) that suppliers share with electronic systems.
- Automated dispensing system: Robotic dispensing units are increasingly being installed in both acute and primary care pharmacies.

### Structured content

- Australian Medicines Terminology enables standard unambiguous medicines naming as well as a unique identifier and machine readable information.
- My Health Record: Pharmacies can view information and contribute to the My Health Record through event summaries and dispense records.

## EMM IN SUPPLY OF MEDICINES

The National Product Catalogue (NPC) captures detailed product information from suppliers to be shared

throughout the supply chain. As medicines are registered, a unique concept identifier, description and supporting information is created in the Australian Medicines Terminology (AMT) Locate net is a global location number directory that helps identify where products are from Recall net allows for suppliers to issue electronic notifications to health providers to recall products that may be defective

## EMM IN MEDICINES ADMINISTRATION

Right drug, right dose, right route, right time to right patient. By introducing dose based prescribing, Electronic reminders and alerts, Electronic medicine administration records, Barcode verified administration, electronic ward cabinets. EMM systems are being introduced in hospitals and aged care facilities to ensure safer, more efficient medicines administration

## EMM IN 'MONITOR FOR EFFECT OF MEDICINES'

Monitoring medicines issued to patients to see if they are:

Effective, Tolerated, Used appropriately. One of the major advantages of EMM systems. New systems are being implemented to facilitate:

- The monitoring of the sale, supply and use of controlled drugs;
- Pathology reports shared in the My Health Record;
- Dispensing records in the My Health Record; and
- Better monitoring of adverse events and allergies.

There are a number exciting initiatives to improve monitoring the effect of medicines – here are a few examples

**Integrated vitals monitoring** an increasing number of acute care facilities are integrating their monitoring devices with EMR systems. This enables clinicians to monitor and record the impact of medicines.

**Pathology analytics and dashboards:** pathology is becoming more integrated in acute and primary care systems. Shared records, including my health record, will also contain more results. This enables more sophisticated analysis and reporting to facilitate better monitoring of medicines response.

**Antimicrobial stewardship software:** Acute and residential aged care facilities are now introducing software to help support and monitor the appropriate use of antimicrobials. These solutions combine EMM, pathology and decision support to optimise the use of antimicrobials.

**Home monitoring and wearable's:** There are now a growing number of remote monitoring technologies that can help capture patient recorded data. This can then be shared electronically or during consults. Examples include inhaler adherence monitoring, tablet counters through t electronic sphygmomanometers.

## EMM IN CONTINUITY OF CARE<sup>[12]</sup>

Transitions of care are known to be a point of vulnerability for medication management. Whether this

is a transfer within hospital department, at admission to, or discharge from hospital to home or residential care the presence of a curated medicines list will significantly improve the ability of the new healthcare professionals or teams to deliver safe, high quality care.

Studies show that approximately 20% of patients experienced a significant delay in medicine administration upon arrival at the facility and that 12% of missed doses were considered high risk.

**Intervention at care transitions by family and care givers** (facilitated by EMM) has been also been shown to reduce rates of hospital readmission and to improve patient confidence in medication self-management.

### DISCHARGE SUMMARIES

80% contained one or more discrepancies when compared with the discharge prescription; Only 50% of the changes to regularly scheduled medicines; Only 25% of the changes to medicines scheduled “as required”.<sup>[13]</sup>

EMM in continuity of care The role of the discharge summary

Healthcare providers can now send e-Discharge summary documents via a secure messaging service. Typically this would be from a hospital to a GP. However it is also now possible to send discharge summaries to a consumer’s My Health Record. e-Discharge summaries are based upon a specification and should include:

- details about the patient;
- overview of the episode of care or ‘event’;
- summary of interventions;
- diagnostic investigations including pathology test results.

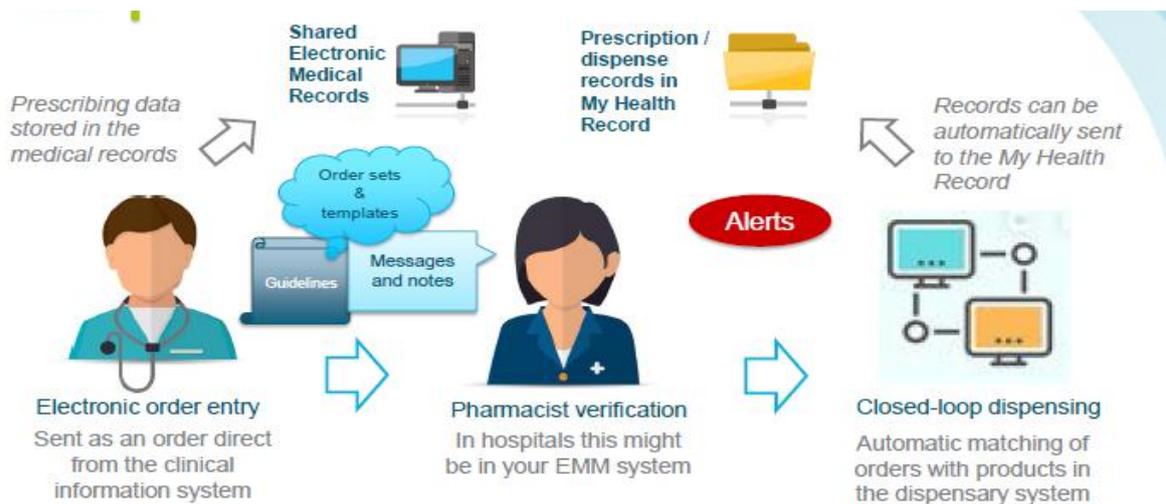
There should also be detailed information about medicines including:

- current medications on discharge;
- ceased medications on discharge.

Discharge summaries are important documents in handover and care transition. The ability to share these documents electronically and access them via My Health Record should help improve medicines management across care transitions.



Figure 1: EMM AND MEDICINE MANAGEMENT CYCLE.



**Closed-loop ordering, verification and dispensing.**  
**Enabled by standardised medicines terminology & unique identifiers**

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Figure 2.

## REFERENCE

- Horsky J, Kaufman DR, Oppenheim MI, et al. A framework for analyzing the cognitive complexity of computer assisted clinical ordering. *Journal of Biomedical Informatics* 2003; 36(1-2): 4-22.
- Khaushal R, Shpjana KG, Bates D. Effects of computerized physician order entry and clinical decision support systems on medication safety. *Archives of Internal Medicine* 2003; 163: 1409-1416.
- APAC 2005 Guiding principles to achieve continuity in medication management July 2005; [https://www.health.gov.au/internet/main/publishing.nsf/Content/5B47B202BBFAFE02CA257BF0001C6AAC/\\$File/guiding.pdf](https://www.health.gov.au/internet/main/publishing.nsf/Content/5B47B202BBFAFE02CA257BF0001C6AAC/$File/guiding.pdf)
- Schiffman R, Liaw Y, Brandt C, Corb G. Computer-based guideline implementation systems: a systematic review of functionality and effectiveness. *Journal of the American Medical Informatics Association*. 1999; 6(2): 104-114. Khaushal R, Shpjana KG, Bates D. Effects of computerized physician order entry and clinical decision support systems on medication safety. *Archives of Internal Medicine* 2003; 163: 1409-1416.
- Ammenworth E, Schnell-Inderst P, Mcachan C, Siebert U. The effect of electronic prescribing on medication errors and adverse drug events: a systematic review. *Journal of the American Medical Informatics Association* 2008; 15(5): 585-600.
- <https://www.safetyandquality.gov.au/our-work/medication-safety/electronic-medication-management-systems/+&cd=1&hl=ta&ct=clnk&gl=in>
- <http://www.icarehealth.com.au/blog/5-ways-organisation-benefit-from-electronic-medication-management-2/>
- APAC 2005 Guiding principles to achieve continuity in medication management JULY 2005 [http://www.health.gov.au/internet/main/publishing.nsf/Content/5B47B202BBFAFE02CA257BF0001C6AAC/\\$File/guiding.pdf](http://www.health.gov.au/internet/main/publishing.nsf/Content/5B47B202BBFAFE02CA257BF0001C6AAC/$File/guiding.pdf)
- ACSQHC website [http://www.safetyandquality.gov.au/our-work/medication-safety/medication-reconciliation/] accessed on 18th June 2015.
- Morgan T., Williamson M. et al. A national census of medicines use: a 24-hour snapshot of Australians aged 50 years and older *MJA* 2012; 196: 50-53.
- Runciman W., Hunt T., Hannaford N., et al; CareTrack: assessing the appropriateness of health care delivery in Australia <https://www.mja.com.au/journal/2012/197/2/caretrack-assessing-appropriateness-health-care-delivery-australia>
- Sample S, Roughead E. Medication safety in acute care in Australia: where are we now? Part 2: a review of strategies and activities for improving medication safety 2002-2008. *Australia and New Zealand Health Policy* 2009; 6(1): 24.
- Parry C, Min S-J, Chugh A, Chalmers S, Coleman EA. Further application of the care transitions intervention: results of a randomized controlled trial conducted in a fee-for-service setting. *Home Health Care Services Quarterly* 2009; 28(2-3): 84-99.
- Callen J, McIntosh J, Li J. Accuracy of medication documentation in hospital discharge summaries: A retrospective analysis of medication transcription errors in manual and electronic discharge summaries. *International Journal of Medical Informatics* 2010; 79(1): 58-64.