Medicines Use Evaluation Guideline

Linda Graudins BPharm, Dip Hosp Pharm, Dip PharmacoEpi, Adv Prac Pharm, FSHP 1,2, Kerry Fitzsimons BPharm MClInPharm MSHP 3 Elizabeth Manias RN BPharm, MPHarm, MN Stud, PhD MSHP 4, Sanja Mirkov BPharm, PGDipPH, MSHP 5,6, Nam-Anh Nguyen BPharm(Hons) GradDipHospPharm Adv.Prac.Pharm. MSHP 7 and Courtney Munro BPharm, GradCertPharmPrac, MPharmPrac, MSHP, AACPA, PhD 8

1 Pharmacy Department, Alfred Health, Melbourne, Victoria.
2 Monash University, Parkville, Victoria
3 Pharmacy Department, Fiona Stanley Hospital, Western Australia and Patient Safety and Clinical Quality, WA Department of Health
4 Deakin University, School of Nursing and Midwifery, Centre for Quality and Patient Safety Research, Institute for Health Transformation, Burwood, Victoria
5 School of Pharmacy, The University of Auckland, New Zealand
6 Ramsay Pharmacy Group, Australia
7 Sir Charles Gairdner Hospital, Perth, Western Australia, Australia
8 The Society of Hospital Pharmacists of Australia, Collingwood, Victoria, Australia

Address for correspondence:
Linda Graudins 1,2, c/o Medicines Use Evaluation Guideline Working Group, The Society of Hospital Pharmacists of Australia, Collingwood, Victoria, Australia.
Email: specialtypractice@shpa.org.au

Introduction

Australia’s National Medicines Policy defines quality use of medicines (QUM) as ‘selecting management options wisely; choosing the most appropriate medicine if a medicine is considered necessary and using medicines safely and effectively’. Medicines use evaluation (MUE), also known as Drug Use Evaluation (DUE), is carried out to improve the quality, safety, and cost-effectiveness of medicine use, and is an integral part of QUM.

Quality Use of Medicines (QUM)

QUM is a part of Australian National Medicines Policy and involves judicious selection of treatment options (including the choice between medicine, non-medicine, and no treatment), appropriate choice of medicines and safe and effective use of medicines.

Drug Use Evaluation (DUE)

DUE is an authorised, structured, ongoing quality improvement cycle of drug use within a healthcare organisation. Drug use is evaluated by using pre-determined standards and efforts are initiated to correct patterns of use which are not consistent with these same standards. It additionally includes a mechanism for measuring the effectiveness of any corrective actions. The purpose of DUE is to improve the quality and cost-effectiveness of the drug use and thereby improve patient care.

Medicines Use Evaluation (MUE)

MUE is similar to DUE, but focuses on clinical outcomes and emphasizes improvements in medicines use with a multidisciplinary approach.

Box 1 Terminology used

Ideally, MUE activities should be part of an overall QUM program, for example, conducted by the healthcare clinical governance team, the Medication Safety or QUM team, or the responsibility of the Drug and Therapeutics Committee (DTC). MUE should have leadership, sponsorship, and governance from the organisation. To improve patient care a well-designed and conducted MUE relies on effective inter-disciplinary working relationships and recognition of the usefulness of the MUE activity.

An MUE can estimate the extent of the appropriate use of medicines; the utilisation pattern of a group of medicines and their use in certain disease(s); and help to identify the target population for educational interventions to improve medicines use. MUE can also:

- compare patterns of use with guidelines for the treatment of a certain disease or local formulary restrictions
- help to generate hypotheses regarding discrepancies
- determine whether educational or another type of intervention is required, or identify if clinical guidelines need to be reviewed in light of actual practice.

The capacity of many hospitals to undertake MUEs can be limited, however, National and multidisciplinary MUE programs have previously been implemented across Australian hospitals using a collaborative approach in clinical practice research, training, and funding. Collaboration between academic and clinical
pharmacy settings support MUE activities by facilitating the design and development of evidence-based quality improvement and research. The SHPA Specialty Practice Streams and the SHPA Residency Program are also a resource for networking and potential collaborative MUEs.

A driver diagram was adapted from NSW Therapeutic Advisory Group, to visually present how collaboration works to improve MUE activity (Figure 1).

Figure 1 Drivers for an MUE, adapted from NSW Therapeutic Advisory Group

Objectives of this MUE Guideline

The objectives of this MUE Guideline are to provide pharmacists with a process to implement an MUE within a healthcare organisation or hospital. It is based on previous SHPA publications, while taking into account the National Safety and Quality Health Service (NSQHS) Standard for Medication Safety.

The objectives of an MUE are to assess medicines use including; medicine selection, prescribing, administration, monitoring, medicines management, and control, and patient/carer and healthcare staff education pertinent to the safe use of medicines. The aims of MUE include; to optimise treatment outcomes, improve patient safety and experience of care by reducing adverse drug events, such as avoidable medicines-induced hospitalisation. MUE may also result in cost minimisation.

The Medicines Use Evaluation Cycle

MUE is a cyclical process. (Figure 2) To be effective all steps should be performed:

- Best practice guidelines are first established and facilitated by multidisciplinary consensus and DTC/governance approval
- Actual medicine use is then measured against best-practice guidelines and evaluated
- Interventions are made to change patterns of use to be consistent with the aim of the MUE, e.g. comply with standards or guidelines, improve outcomes, or decrease costs
- The effectiveness of any changes needs to be objectively measured

MUE applies to all parts of, and all people involved in, the medication management pathway.
The following ten steps (Figure 2) support a successful MUE:

1. Identify MUE aims and objectives
2. Gain support and establish an MUE team
3. Evaluate literature, define criteria and establish measures
4. Select study design
5. Collect data
6. Evaluate data
7. Provide feedback to stakeholders
8. Identify and implement changes
9. Evaluate change outcomes and repeat the MUE cycle
10. Prepare, publish and present findings

**Step One: Identify MUE aims and objectives**

Identify the aims and objectives of the MUE. Specify whether the evaluation pertains to an individual medicine, a medicine class, or a disease state. An MUE may be performed soon after a medicine is added to a formulary or in the context of policy, procedure, or guideline review. Suggestions for MUE may arise from medicine usage trends, adverse event reports or at the request of health-service staff. Examples of MUE for medicine/medicine classes and areas of practice are shown in Table 1.

<table>
<thead>
<tr>
<th>Medicines characteristics</th>
<th>Areas of practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>the trend of detected adverse events e.g. linezolid long-term use</td>
<td>significant local or national concern, e.g. narcotic prescribing, polypharmacy</td>
</tr>
<tr>
<td>high-risk /APINCH medicines e.g. antibiotics, potassium, insulin, narcotics, and neuromuscular blocking agents, cytotoxics, heparin and anticoagulants</td>
<td>where there is a gap between practice and current evidence, e.g. the use of antipsychotics for delirium</td>
</tr>
<tr>
<td>medicines with a high rate of inappropriate use (from a literature review, or from local incident reports)</td>
<td>areas of concern, e.g. antibiotic resistance</td>
</tr>
<tr>
<td>medicines with a high per unit or high total volume cost</td>
<td>high-risk settings e.g. intensive care unit</td>
</tr>
<tr>
<td></td>
<td>high-risk patient groups, e.g. paediatrics, frailty, multiple comorbidities</td>
</tr>
<tr>
<td></td>
<td>surgical</td>
</tr>
</tbody>
</table>

Figure 2 The MUE cycle
### Table 1: Examples of MUE for medicine, medicine classes and areas of practice

<table>
<thead>
<tr>
<th>Medicines where suboptimal use may have a negative effect on patient outcomes</th>
<th>Ven thromb oembolism (VTE) prophylaxis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signs of treatment failure e.g. antibiotic resistance</td>
<td>New practices such as de-prescribing in the elderly</td>
</tr>
<tr>
<td>Where there is a significant change in protocol</td>
<td>At transitions of care</td>
</tr>
</tbody>
</table>

### Step Two: Gain Support and Establish an MUE Team

- Create a sense of urgency, by starting with executive leadership. Obtain on-going support for the MUE from the relevant body such as the hospital DTC, clinical governance committee, or medication safety committee. Human Research Ethics Committee (HREC) approval may be required. The HREC process is also an opportunity to gain input from other health professionals and researchers before beginning the MUE. The medicolegal implications of accessing, using and storing patient data by third parties under the Freedom of Information and the Privacy Act may need to be considered. Multidisciplinary consultation in establishing the MUE team is essential.

### Assembling the Medicines Use Evaluation Team

As MUE activities are multidisciplinary activities, the team should ideally involve medical, nursing and pharmacy staff. The MUE team must be made of people whom leadership trusts, and ideally include an opinion leader and/or manager. Consider enlisting the assistance of pharmacy and/or medical students, a medical fellow, pharmacy resident, staff educators, staff trained in change management and a representative from the communications team.

### Evaluate Literature

To formulate a strategic vision and develop change initiatives, it is essential to conduct a comprehensive literature review. A strong and timely knowledge base will provide confidence and authority when communicating with others about the MUE.

### Define Criteria and Establish Measures

- Write a summary of the literature evaluation, identifying a few key current papers in the chosen area. It may be relevant to check evidence-based Australian publications such as the Therapeutic Guidelines. This helps define the criteria for the MUE. A structured approach, such as the Patient, Intervention, Comparator, Outcomes, Timeline (PICOT) template is recommended.
- Audit criteria may be developed locally, nationally or internationally, but should be valid, explicit, pre-determined, easily measured, and relevant to practice.
- Criteria for ‘best practice’ should be explicitly agreed by the project team, with input from expert clinicians, before starting data collection.

### Examples:

<table>
<thead>
<tr>
<th>Medicines where suboptimal use may have a negative effect on patient outcomes</th>
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</tr>
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<td>Where there is a significant change in protocol</td>
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</tr>
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</table>

TIP: When defining the objectives of the MUE, consider for each case:
- Other medicines in the same therapeutic class e.g. all DOACs (direct-acting oral anticoagulants) or apixaban only.
- The patient population e.g. for the prescribing of antibiotics (e.g. all patients or only renal dialysis patients).
• a comparison of intravenous (IV) iron infusion formulations causing adverse drug reactions may also include as an outcome indicator the cost of the formulations, against the time taken for administration in a day-medical or day-procedure setting.

• a review of VTE prophylaxis rates may include therapeutic goals, such as no embolic events and/or avoidance of adverse medicine effects such as unexpected bleeding.

TIP: Have Specific, Measurable, Achievable, Realistic and Timely (SMART) criteria.

TIP: Consider direct expenditure vs indirect expenditure. Direct expenditure includes the cost of inpatient admissions, emergency department visits, outpatient clinics visits, and prescription medicines. Indirect expenditure includes the cost of absenteeism and short-term disability.

Step Four: Select MUE study design, consider data sources and submit the MUE for review

Study design

The study design will depend on the nature of the MUE and should be discussed prior to starting the MUE. It may be quantitative, qualitative, or combine both elements.

Retrospective reviews are performed after patient discharge (or patient separation). This method is the most convenient, and therefore most commonly used. The collection of data is limited by the accuracy and completeness of documentation. A retrospective review may benefit future patients but has no direct impact on the patient being reviewed.

Concurrent/prospective reviews involve identifying patients at the time the medicine is being prescribed. Data is collected as it becomes available.

Prospective reviews should be considered where possible, as data collection is more robust, but adds time to daily activities. Prospective data collection provides opportunities for direct patient and staff interaction and has a greater potential of benefit for current patients, as interventions can be made. The disadvantages of this method include greater resources and time required. Intervention and awareness of the study may also bias baseline data. On the other hand, if the aim is to improve practice, this may be achieved simply by performing the MUE, but bias needs to be considered.

For both retrospective and prospective reviews ensure an adequate sample size is feasible to achieve and is suitable to detect a significant difference. If available, consult a colleague with experience in statistical methods and audit activities, or a statistician.

The final MUE study design should be reviewed by an expert in the area.

Consider data sources

The data sources required depend on the objectives of the MUE and the criteria or outcome measures.

Sources for clinical outcomes of an MUE may include medical records, prescriptions, medication charts, electronic medical records (EMR), pathology results, medical record clinical coding (ICD 11) and observational charts.

Sources for medicines review outcomes of an MUE may include dispensing records, prescriptions/medication charts, discharge summaries, pharmacy procurement records, DTC reports, imprest reports, hospital decision support services (case-mix), patient medical record (including electronic medical record [EMR] where available), Health Roundtable or coding data.

Sources for cost analysis outcomes of an MUE may include health expenditure and productivity-related cost burden. For example, the direct expenditure includes the cost of inpatient admissions, emergency department visits, outpatient clinics visits, and cost of medicines; whereas the indirect expenditure is related to the cost associated with absenteeism and short-term disability.

TIP: Standardisation of medicines utilisation metrics is particularly important to compare outcomes of studies. Tools such as Drug Utilisation Metrics include a searchable version of the complete Anatomical Therapeutic Chemical (ATC) index with Defined Daily Doses (DDDs), available via the WHO Collaborating Centre for Drug Statistics Methodology. Definitions and general considerations about DDDS are also available.

Submitting the project for review

The MUE should be submitted to and endorsed by the Drug and Therapeutics, Human Research and Ethics Committee and/or other relevant committees before the commencement of data collection.

The report outline should include: background, aim/s, patient selection, sampling and data collection methods, and the proposed method of analysis. A well-written outline can serve as the basis of a final report once the project is complete.

The project supervisor should have regular updates in order to keep them informed of progress.

TIP: Your local research group or Ethics Committee may have a research protocol template or tools that you can adapt for MUE use. For general guidance for writing the MUE protocol consider using:

- the CONSORT statement www.consort-statement.org
- the SPIRIT statement www.spirit-statement.org/
- the EQUATOR network www.equator-network.org/

Step Five: Collect data

Data Collection

When selecting the data collection method consider; how the data will be analysed; what type of data will be presented; and ensure data input and retrieval are as efficient as possible. A data dictionary (definition of terms), should accompany the collection form to ensure consistency of data collected.

Ensure the competency of the data collector, as data must be consistent over the MUE cycle. It is advisable to conduct random checks of data collected to ensure competency and consistency.
Data collected should include only relevant demographic, clinical or therapy information as per defined audit criteria to meet the aims and objectives of the MUE. The confidentiality of data must be ensured. The MUE team must be mindful of ethical and privacy considerations.

TIP: Ensure the data collection form is user-friendly and has been robustly tested, so that data collection follows a logical route, e.g. if collecting pathology, the data collection form should match the order of results on the local system.

Perform a Pilot Audit

A pilot audit will refine the methodology and allow amendment of the data collection form to most effectively capture the information required. Always allow space on the data collection form for comments. Data collection tools can be an Excel spreadsheet or a database such as REDCap, which can be used on a tablet device.

Ethical issues must be addressed prior to any pilot data collection, for example, possible reidentification of patient-specific data.

TIP: A pilot audit is worth every second of the time dedicated to it. Be critical when reviewing pilot audit data. Confirm that the data collected provides all the information needed to adequately complete the MUE and that the MUE aims and objectives are met.

TIP: As data collection takes a significant amount of staff time, acknowledge and encourage their assistance. Provide regular project updates and celebrate milestones.

Step Six: Evaluate data

Audit results should be compared with pre-determined criteria and evaluated using statistical analysis, e.g. % patients with a clearly identified indication for use, Defined Daily Dose.

Areas of divergence are then identified and documented. Consider the reasons for this divergence, which may include outdated procedures, guidelines, and policies. Address by review of new indications/methods/medications. For example, if only one prescriber or team shows divergence, check with the team if there is a valid clinical justification. Consult with other staff working in the area of the study (specialist pharmacists, medical and nursing staff). Having sought multidisciplinary involvement early in the process will make this step easier.

Step Seven: Provide feedback to stakeholders

Providing feedback of results to stakeholders should be undertaken constructively with improved patient care as the primary motive, and in a manner that engenders on-going support. It is important not to personalise results. It is valuable to communicate results to all involved: administrators, prescribers, those who helped collect data, pathology departments, clinical coding staff, and consumers.

Communication of findings is fundamental to the success of an MUE. The engagement of frontline staff is achieved through strong vision and support of the local leaders (informal change agents). The new behaviour is spread by relevant staff to their professional networks. Identifying the central people in professional networks and engaging them is the most important for the spread of behaviour.

The MUE team should use systems that rely on engagement and a sense of common purpose to ensure lasting systems change.

Feedback can be undertaken in a variety of ways. Involve the Communications team or Public Relations in the design and development of communication strategy and branded promotional materials (e.g. posters, videos, screen savers) for promotional campaigns and social media coverage. If possible, consider launching the campaigns to coincide with relevant national or international events.

Acknowledge and celebrate the progress of the MUE to date. Present peer comparisons in a positive way and do not blame or label underperformers.

Reporting baseline data can form the start of any improvement intervention. Consider short articles in the pharmacy or DTC bulletins, presentation at medical grand rounds and other meetings.

In general, the following report types are recommended:

- written summarised reports to the supervising body (e.g. DTC) or other policymakers. The report must be well presented, well-reasoned, with relevant graphs, tables, and figures. It is important to prepare a scientific argument, rather than a value or subjective judgment.
- findings and recommendations to clinical teams, specialty (or craft) groups;
- resulting actions or protocols to end-users, affected parties e.g. pharmacists, nursing staff; and, if relevant, to patient groups.

TIP: Tailor the complexity and detail of your report to the target audience, e.g. DTC may prefer a concise report (e.g. executive summary) in point form with progress and suggestions. Bulletins require simple graphs of results rather than text. A report to a governance body may require an emphasis on practical recommendations for improvements or budget analyses.

Step Eight: Identify and implement changes

Recommended changes must be clearly defined, supported by the results of the MUE and endorsed by the Head of Department and/or DTC.

Several intervention strategies are usually required for sustained impact. Approaches may include; changes to the formulary, addition to pharmacy services, implementation of new or changed therapeutic guidelines with relevant educational activities, alerts embedded in decision support technologies. Regular feedback, encouragement and positive reinforcement should be given to support sustainability of changes.

Expect to receive some resistance to change. Staff may not see any problems with the current practice. Be prepared to give a good account of the reasons for change and the expected benefits for patient care. Persist with the message and choose your language carefully so as not to offend or isolate any person or group. To make the MUE a success staff engagement is essential. Ongoing communication of a sense of urgency, keeping the momentum going and celebrating small wins are key until the initiative has been implemented. The message should be conveyed to health professionals of all discipline/specialty (craft) groups.

An example is the way infection prevention professionals have used the following three approaches to achieve behavioural change: the educational approach ("Wash your hands and your patient will have fewer nosocomial infections"), the policy/law approach ("If you fail to wash your hands before performing an aseptic procedure, an incident report will be filed with the safety committee") and social marketing, a middle way that solicits "customer" perceptions, desires and needs to design attractive welfare exchanges that promote desired behaviors ("Caring doctors wash their hands").
The following intervention strategies may be considered alone, simultaneously or sequentially:

1. **Persuasive** - bring about change through reasoning, urging and inducement e.g. memoranda, academic detailing, rewards or incentives, small group educational activities.

2. **Facilitative** - recruit the services of others to assist in changing the behaviour of an individual or group, e.g. endorsement by key opinion leaders.

3. **System-based** - change medicines management processes, e.g. automated dispensing machines, EMR, formulary restrictions, automatic stop orders, forcing functions.

4. **Educational** - unbiased presentation of facts provides an impetus for change e.g. circulating guidelines, distributing bulletins, reminders at the point of prescribing.

The Hierarchy of Intervention Effectiveness (Table 2) rates interventions related to human behaviour toward the bottom of its scale in favour of culture change and technological interventions, which are viewed as more reliable (Institute for Safe Medication Practices 1999). This view reinforces that no single strategy will eliminate errors and a mixture of strategies will likely be more successful.
Table 2 Hierarchy of effectiveness of different intervention strategies and their perceived advantages and disadvantages (Developed from sources: 21,26)

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Intervention</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persuasive and Facilitative</td>
<td>Culture change and change leadership</td>
<td>Has greater and longer-lasting effects than education and policies</td>
<td>Require highest effort to achieve</td>
</tr>
<tr>
<td>System-based</td>
<td>Forcing functions/equipment redesign /automation/computerization e.g. electronic medication management</td>
<td>Have greater and longer-lasting effects than education and policies</td>
<td>Cost</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Includes decision support, alerts, standardise medicines ordering sentences, dose checking</td>
<td>Major practice change</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increases data accessibility</td>
<td>Requires technological competence of individuals and organisations</td>
</tr>
<tr>
<td></td>
<td>Formulary restrictions</td>
<td>Widespread conformity and impact</td>
<td>May not re-educate</td>
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<tr>
<td></td>
<td></td>
<td>Readily accessible</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Provides a forcing function</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prescribing guidelines and Policy</td>
<td>Maybe medicines-specific or therapeutic approach</td>
<td>Maybe restrictive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Can incorporate local information</td>
<td>Time-consuming to develop</td>
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<tr>
<td></td>
<td></td>
<td>Useful for junior medical staff</td>
<td>May not be used</td>
</tr>
<tr>
<td></td>
<td></td>
<td>May be educational</td>
<td>Requires updating</td>
</tr>
<tr>
<td>Educational</td>
<td>Medicines bulletin</td>
<td>Large circulation</td>
<td>Passive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provides an opportunity to discuss the benefits and reasons for the change</td>
<td>May not be read</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marketing tool</td>
<td>Information overload</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Educational</td>
<td></td>
</tr>
<tr>
<td>One to one (academic detailing)</td>
<td></td>
<td>Can be very effective if delivered well</td>
<td>Time-consuming</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Allows for discussion</td>
<td></td>
</tr>
<tr>
<td>Strategy</td>
<td>Intervention</td>
<td>Advantages</td>
<td>Disadvantages</td>
</tr>
<tr>
<td>---------------</td>
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<td>---------------------------------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time-efficient</td>
<td>May need reminders or follow-up to maintain the change</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Allows for discussion</td>
<td>The effect depends on the skill of the messenger</td>
</tr>
<tr>
<td>Group presentation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Posters</td>
<td>Frequent reminder, time-efficient, large audience</td>
<td>Passive</td>
</tr>
<tr>
<td>Social media</td>
<td></td>
<td></td>
<td>May not be read</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Short life-span</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Requires technological competency</td>
</tr>
</tbody>
</table>
TIP: Use different strategies to communicate the message. Try to identify any new barriers that prevent staff from implementing the changes and help find ways to overcome them.

Step Nine: Evaluate change outcomes and repeat the MUE cycle
As MUE is a cyclical process, lessons learned from one cycle of study should be incorporated into subsequent cycles to assess if changes are being sustained, and evaluate the effectiveness of interventions, such as changes in expenditure or clinical outcomes achieved.

The timing of the process will depend on the focus of the MUE. For example, if a review of the management of catheter-related infections showed improvement after an initial intervention, the next review could be undertaken in twelve to eighteen months to document whether there is sustained improvement and change in practice. If the intervention involved a major change in prescribing, such as electronic medication management introduction, then repeating data collection with evaluation every three to six months would be appropriate to enable detection of errors, and workarounds before they become widespread.

TIP: Initial concordance with guidelines or other interventions may be high, but often decreases over time. The cycle should be repeated until a sustained change is evident. Continue to communicate the benefits of the changes and the results.

Step Ten: Prepare, publish and present findings
Local requirements include presenting a final report and saving documentation as a record of the MUE outcomes. Sharing and publishing the results of an MUE cycle ensures that clinicians and patients more widely benefit from the MUE. The medical, nursing and pharmacy staff on the MUE team who have provided substantive input should be invited co-authors on resulting publications. Formats include a publication in a relevant journal, or presentation as a poster or oral platform at local, state or national conferences.

TIP: The MUE report also provides evidence for medication safety hospital accreditation requirements.
References


### Appendix 1. Medicines Usage Evaluation Glossary

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>APINCH</td>
<td>Antimicrobials/Antipsychotics, Potassium and concentrated electrolytes, Insulin, Narcotics, Chemotherapy, Heparin and anticoagulants</td>
</tr>
<tr>
<td>DDDs</td>
<td>Daily Defined Doses</td>
</tr>
<tr>
<td>DOACs</td>
<td>Direct Acting Oral Anticoagulants</td>
</tr>
<tr>
<td>DTC</td>
<td>Drug and Therapeutics Committee</td>
</tr>
<tr>
<td>DUE</td>
<td>Drug Use Evaluation</td>
</tr>
<tr>
<td>EMR</td>
<td>Electronic Medical Record</td>
</tr>
<tr>
<td>HREC</td>
<td>Human Research Ethics Committee</td>
</tr>
<tr>
<td>ICU</td>
<td>Intensive Care Unit</td>
</tr>
<tr>
<td>MUE</td>
<td>Medicines Use Evaluation</td>
</tr>
<tr>
<td>NSQHS</td>
<td>National Safety and Quality in Health Service</td>
</tr>
<tr>
<td>QUM</td>
<td>Quality Use of Medicines</td>
</tr>
<tr>
<td>SMART</td>
<td>Specific Measurable Achievable Realistic Timely</td>
</tr>
<tr>
<td>VTE</td>
<td>Venous Thromboembolism</td>
</tr>
</tbody>
</table>
## Appendix 2. Worked examples of MUE

### E.g. 1. Levetiracetam in seizure prophylaxis

<table>
<thead>
<tr>
<th>Step One: Identify MUE aims and objectives</th>
<th>Background: The clinical team noticed that about half of neurosurgical patients prescribed seizure prophylaxis after head injury were using levetiracetam, although phenytoin was in the hospital guideline. Issues with phenytoin included; subtherapeutic levels, adverse effects, ineffective in preventing some seizures and interaction with enteral feeds. <strong>Aim:</strong> To compare oral levetiracetam with oral phenytoin for seizure prophylaxis in patients with head trauma. <strong>Objectives:</strong> To decrease adverse effects and increase the efficacy of seizure prophylaxis.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step Two: Gain support and establish an MUE team</td>
<td>The MUE team comprised of a neurology consultant, neurosurgery consultant, formulary manager, medication safety pharmacist, and neurology pharmacist.</td>
</tr>
<tr>
<td>Step Three: Evaluate literature, define criteria and establish measures</td>
<td><strong>P:</strong> neurosurgical patients with head trauma. <strong>I:</strong> phenytoin. <strong>C:</strong> levetiracetam. <strong>O:</strong> safety (adverse reactions); efficacy (number of seizures); cost analysis; dosing determination. <strong>T:</strong> over a 12-month period.</td>
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<td>Step Four: Select MUE study design</td>
<td>A prospective cohort of patients prescribed an anticonvulsant for seizure prophylaxis. Patient selection criteria, dosing protocol and outcome definitions established by literature review and consensus of the MUE team. The team submitted the MUE to the hospitals DTC.</td>
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| Step Five: Collect data | Data collected included:  
- Demographics  
- Indication for seizure prophylaxis  
- The severity of head trauma  
- Levetiracetam dose and duration  
- Additional anticonvulsants required  
- Adverse effects  
- Discontinuation rates  
- Number of seizures within 7 days of starting levetiracetam |
| Step Six: Evaluate data | Collate data. Comparison with outcomes in the literature for phenytoin. Levetiracetam is equally effective as phenytoin in seizure prophylaxis with less adverse reactions. |
| Step Seven: Feedback results to stakeholders | Feedback of result to the neurology and neurosurgery teams, pharmacy and the DTC. |
| Step Eight: Identify and implement changes | Neurosurgery updated seizure prophylaxis guideline, using levetiracetam as first-line treatment, ratified at DTC. |
| Step Nine: Evaluate change outcomes and repeat the MUE cycle | Compliance with guideline audited including; choice of anticonvulsant, dose and duration evaluated. Targeted interventions to improve compliance with new guideline and repeat MUE. |
| Step Ten: Prepare, publish and present findings | Report to DTC. Poster presented at SHPA meeting. |
### E.g. 2. Prescription of VTE prophylaxis

| Step One: Identify MUE aims and objectives | Background: On review of patient incidents relating to hospital-acquired VTE, it was found that the changeover to EMR had resulted in an overall decrease in VTE prophylaxis prescription.  
Aim: To collect data to compare with pre-EMR prescribing and inform interventions for improvement.  
Objective: To increase appropriate VTE prophylaxis in order to decrease hospital-acquired VTE |
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<td>Step Two: Gain support and establish an MUE team</td>
<td>The MUE team comprised of haematologists, haematology pharmacist, anticoagulation stewardship program staff, a surgeon, medication safety pharmacist, electronic medication pharmacist, and hospital IT staff.</td>
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</table>
| Step Three: Evaluate literature, define criteria and establish measures | P: All inpatients with a stay >24hours  
I: charting of VTE prophylaxis in the EMR era  
C: charting of VTE prophylaxis prior to EMR  
O: VTE prophylaxis risk assessed within 24 hours of admission. Target >90% patients; VTE prophylaxis appropriate/according to hospital guidelines. Target > 85% patients; Documentation if VTE prophylaxis not prescribed. Target 100%.  
T: 6 months pre and 6 months post EMR introduction |
| Step Four: Select MUE study design | A retrospective review of a random sample of patients pre and post-intervention. |
| Step Five: Collect data | Data collected by chart review included:  
• % VTE prophylaxis risk assessed within 24 hours of admission  
• % VTE prophylaxis appropriate/according to hospital guidelines  
• % anticoagulants prescribed therapeutically and for prophylaxis  
• % documentation of contraindication if anticoagulation not prescribed |
| Step Six: Evaluate data | Collate MUE data. Compare with the pre- EMR era.  
Discuss it with the MUE team. |
| Step Seven: Feedback results to stakeholders | Reduction in anticoagulant prescribing and VTE prophylaxis assessment were noted and data presented and discussed at relevant stakeholder meetings e.g. medication safety committee, anticoagulation stewardship committee, operations leadership. |
| Step Eight: Identify and implement changes | Changes to the EMR were made. These included; reminders for prescribers when opening the EMR for each new admission, adding a drop-down menu of non-taskable orders for when VTE prophylaxis is contraindicated, an electronic VTE risk assessment form built into the medical workflow page. |
| Step Nine: Evaluate change outcomes and repeat the MUE cycle | Once the prescribing support and alerts were implemented into EMR, medical and pharmacy staff were advised via in-services and newsletters.  
Monthly audits were carried out and results fed back to target specific wards/teams. Data on coded hospital-acquired VTE was reviewed over time. |
| Step Ten: Prepare, publish and present findings | Improvements in VTE prophylaxis and anticoagulant prescribing were noted.  
Relevant audit results circulated.  
Manuscript prepared for submission for publication to inform other centres moving to an EMR, to help prepare for change management. |
### Appendix 3: Resources

#### Recommended texts for Medicines Use Evaluation

- Pulver LK, Wai A, Maxwell DJ et al. Implementation and evaluation of a multisite drug usage evaluation program across Australian hospitals - a quality improvement initiative

#### Discretionary texts

- The Society for Healthcare Epidemiology of America: An example of the Drug use evaluation form