

Clinical Skills in Hospitals Project

Safe medication administration

Module 1: National Inpatient Medication Chart

Module 2: Therapy delivery pumps

Module 3: Drug administration

Module 4: Drug reactions and adverse events

Module 5: Error awareness

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Preface

In 2007 the Department of Human Services commissioned St Vincent's Hospital Melbourne, to design and develop simulation-based training packages for clinical skills trainers in Victorian hospitals.

The project provides Victorian health professionals—specifically, hospital clinical educators—with a resource to deliver simulation-based clinical skills training.

The information in this manual complements current training programs and should be considered as a resource in the workplace, rather than the definitive resource on the topic.

Every effort has been made to provide the most current literature references. Authors have consulted other health professionals and current programs when possible in development to ensure that the modules produced in this package are consistent with current health practices.



Course delivery in condensed form

Sample timetable for one-day workshop

This is an example of how the modules in *Safe medication administration* could be combined into a one-day workshop. A sample timetable is provided for a course consisting of Modules 1, 2, 3 and 4.

Course 1 (Modules 1, 2, 3, 4 and 5)

| Timing | Activity | | Objective |
|-----------------------|--|--------------|----------------------|
| 8.30 to 8.40 | Introduction to faculty and participants | | |
| 8.40 to 9.20 | Facilitated discussion | | Module 1: 3, 4 and 5 |
| 9.20 to 9.40 | Skills station 1 | | Module 1: 1–5 |
| 9.40 to 10.10 | Skills station 2 | | Module 1: 1—5 |
| 10.10 to 10.30 | Skills station 3 | | Module 1: 1—5 |
| 10.30 to 10.40 | Summary of main points from Module 1 | | Module 1: all |
| 10.40 to 10.55 | Morning tea | | |
| 10.55 to 11.25 | Facilitated discussion | | Module 2: 1, 2, 4, 5 |
| 11.25 to 12.10 | Skills stations | | Module 2: 2, 3, 6 |
| 12.10 to 12.30 | Summary of main points from Module 2 | | Module 2: all |
| 12.30 to 1.00 | Lunch | | |
| 1.00 to 1.50 | Facilitated discussion | | Module 3: 1 to 6 |
| 1.50 to 2.50 | Case studies | | Module 3: 1 to 6 |
| 2.50 to 3.10 | Summary of main points from Module 3 | | Module 3: all |
| 3.10 to 3.20 | Afternoon tea | | |
| 3.20 to 3.50 | Discussion | | Module 4: 1, 2 5 |
| 3.50 to 4.00 | Simulation 1 | Simulation 2 | Module 4: 3 |
| 4.00 to 4.20 | Debrief | Debrief | Module 4: 3 |
| 4.20 to 4.30 | Simulation 2 | Simulation 1 | Module 4: 3 |
| 4.30 to 5.00 | Debrief | Debrief | Module 4: 3 |
| 5.00 to 5.10 | Summary of main points from Module 4 | | Module 4: All |
| 5.10 to 5.25 | Facilitated discussion | | Module 5: 1 to 6 |
| 5.25 to 5.55 | DVD scenarios (three) | | Module 5: 1 to 6 |
| 5.55 to 6.05 | Summary of main points from Module 5 | | Module 5: 1 to 6 |



Safe medication administration

Introduction

Safe medication administration was developed as a teaching and learning tool for Victorian clinical educators. The information contained in each module was developed using evidence-based resources and examples of best practice. Where expert opinion varies, a discussion section is included. However, it is not within the scope of *Safe medication administration* to address the full spectrum of local variations. Variations can occur in several areas, including practices relating to types of equipment used, infection control processes, practice guidelines and so on. Therefore, educators should, where appropriate, adapt content to reflect their local policies, procedures and protocols. This will ensure the relevancy of the package content to your learners.

The modules are designed to be discrete courses in their own right. They are timetabled so they can be completed in a 1–2 hour timeframe. This timeframe was chosen after we received feedback from clinical educators requesting shorter courses, because health professionals often have limited time to educate away from patients. However, the packages may also be combined into a one- or two-day course, as described.

Safe medication administration should be used as an educational tool to assist in the teaching of clinical skills. It is structured as a guide to assist clinical educators, and uses many concepts taught in the *Clinical Skills in Hospitals Project* (Train-the-Trainer courses). Educators are encouraged to build on this resource by adding their own scenarios which incorporate health service protocols, policies and other resources. Each module is designed as a lesson plan to incorporate the simulations into the teaching of clinical skills.

Aims

Safe medication administration aims to increase participants' safety awareness through developing skills associated with prescribing, documentation and medication administration. This package is intended for use with medical, nursing and pharmacy participants.

Package structure

Safe medication administration contains five modules which provide learning opportunities for health professionals at all levels of experience and from medical, nursing and pharmacy disciplines. Modules 1 and 2 are regarded as fundamental. Modules 3 and 4 are more difficult and are regarded as intermediate. Module 5 is more advanced and is regarded as complex.

| Level of complexity | Package structure |
|---|--|
| <p>Complex For participants with more than 4 years experience or who have completed Modules 1–4</p> | <pre> graph TD Error[Error awareness] Admin[Drug administration] Reactions[Drug reactions and adverse events] Chart[National Inpatient Medication Chart] Pumps[Therapy delivery pumps] Admin <--> Reactions Chart <--> Pumps Chart --> Admin Pumps --> Reactions Admin --> Error Reactions --> Error </pre> |
| <p>Intermediate For participants in postgraduate years 3–4 or who have completed Modules 1 and 2</p> | |
| <p>Fundamental For participants in postgraduate years 1–2</p> | |

Skills in *Safe medication administration* include completing and interpreting the National Inpatient Medication Chart, taking patient history, using therapeutic delivery devices, appropriate therapeutic administration, and recognising adverse events and medication errors.

This package was designed to develop participants' knowledge, skills and behaviours in the safe administration of medication, and to expose them to increasingly complex skills and knowledge aimed at testing their ability to combine these individual skills, work as a team and problem solve in more difficult situations.

Educators delivering these modules should be aware of participants' level of experience and choose appropriate modules. Modules presume an increasing level of knowledge as they progress, ranging from a fundamental knowledge of anatomy and physiology for the fundamental modules, up to detailed knowledge of errors associated with drug administration for the complex modules. Novice participants (such as first-year graduates) are expected to start with the fundamental modules, and only move onto intermediate and more complex modules as they demonstrate proficiency. More experienced participants may start at the intermediate level if the educator is satisfied that they have the prior knowledge and skills. Individual educators are responsible for assessing each participant's baseline knowledge and determining which modules they should complete. More specific descriptions of presumed knowledge are outlined in each module.

The design of these packages presumes that the clinical educators using them have knowledge and expertise in current best practice regarding the teaching of clinical skills and conducting facilitated discussions. Knowledge and expertise are presumed commensurate with the Department of Human Services' basic and advanced Train-the-Trainer programs. Clinical educators are encouraged to refer to the Department of Human Services' *Clinical Skills Facilitators Manual* for theory on:

1. Peyton's model for teaching clinical skills
2. leading small group discussions
3. giving feedback
4. crisis resource management skills.



Module 1: National Inpatient Medication Chart

Introduction

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Module 1: National Inpatient Medication Chart

Authors: Mr Wayne Gregg, Ms Leanne Allen, Dr James Gome, Dr Robert O'Brien

Aims

This module teaches participants to identify the characteristics of a comprehensive medication history from a patient, and improves awareness of the correct use of the National Inpatient Medication Chart (NIMC) with the appropriate information.

Presumed knowledge

This module is targeted to health professionals with minimal experience in completing the National Inpatient Medication Chart and taking a patient history focusing on medications. However, participants are expected to have a basic knowledge of:

1. prescribing medications
2. interpreting a medical record:
 - a. medicine
 - b. nursing
 - c. pharmacy
3. effectively completing a patient history.

Objectives

By the end of this module, participants should have:

1. practised reading and interpreting a National Inpatient Medication Chart
2. practised completing a National Inpatient Medication Chart correctly
3. identified errors that may occur in completing the National Inpatient Medication Chart
4. identified the characteristics of taking a good medication history from a patient
5. identified common problems in taking a medication history from a patient.

Background information for educators

Medication errors occur in 5–20% of all drug administrations in Australian hospitals.² Some reports document that up to 43% of adverse drug events are preventable.³ The NIMC was implemented to help improve the critical process of communication of the prescriber's intentions.

Some of the perceived benefits of an NIMC include:

- standardisation of undergraduate training of health professionals
- reduced duplication of effort in designing medication charts
- elimination of the need to retrain health professionals when they move from one institute to another in the documentation of prescribing and the interpretation and use of a medication chart.

Pilot studies⁴ performed across 31 sites within Australia between January and April 2004 demonstrated improvements in several identified areas of potential concern, including:

| Item | Change |
|--|-------------------------|
| Documentation of adverse drug reaction details | Improved from 21 to 50% |
| Re-prescription of drugs to which a patient was allergic | Decreased 9 to 6% |
| Unclear or wrong drug dose | Decreased 7.4 to 3.9% |
| Unclear or wrong drug frequency | Decreased 7.2 to 4.8% |
| PRN prescription with the indication stated | Improved 13 to 26% |
| PRN prescription with a maximum dose stated | Improved 24 to 36% |
| Prescriber identifiable | Improved 41 to 79% |

The NIMC was developed under the Office of the Safety and Quality Council using several key principles, and it 'comes from having a greater awareness that the prescribing process can result in direct patient harm and a greater awareness of the strategies and processes to minimise this harm'. Key principles which have led to changes include:

- A medication chart should have a section to record adverse reaction information, including documentation if a reaction is unknown, the nature of the reaction (if one previously occurred), when that reaction occurred and signed accountability.
- Telephone orders should be discouraged, unless essential due to work practice restrictions. Where telephone orders are essential, the medication chart should contain a section that facilitates and encourages safe practice, where two staff independently receive the order and the order is read back to the prescriber. These orders should allow for up to four doses to be administered before countersigning.
- A medication chart should have a specific section for prescribing variable dose drugs. This section should facilitate the recording of and prompt for test results required to determine the next dose. It is recommended that this variable dose section be on the inside of the chart with other regular orders, to reduce risk of omissions.
- A medication chart should have a specific section for prescribing warfarin. Nearly 10% of the adult population is now on warfarin, and it is regularly a drug that causes adverse events. The warfarin section should have space for documenting INR (International Normalised Ratio) targets and results, as well as prompts to ensure the next dose is ordered in a timely fashion (for example, 4.00 pm, to ensure morning results are reviewed and the next dose ordered before the conclusion of the day's medical shift).

- A medication chart should have a specific section to allow for nurse-initiated medication in line with Victorian State regulations and hospital practices.
- The chart should encourage and facilitate the prescriber to record the times of administration, based on a hospital-agreed standard. This reduces the possibility of transcription errors by nurses in establishing the frequency for doses to be administered.
- The chart should have space for clinical pharmacist annotation to communicate information required for optimal administration.
- The chart should have space for the prescriber to clearly identify themselves and how they can be easily contacted (for example, page number).

Second and third page of NIMC

Variable dose medications

| VARIABLE DOSE MEDICATION | | | | Time of Dose: | Drug level | | | | | | | | | |
|---------------------------------|---|------------|--|---------------|---------------|------------------|--|--|--|--|--|--|--|--|
| Date | Medication (use Generic Name) Print | | | | Time of Dose: | Time level taken | | | | | | | | |
| Route | Frequency <small>Or to enter dose time and individual dose</small> | | | Dose | | | | | | | | | | |
| Pharmacy | | Indication | | Doctor | | | | | | | | | | |
| Prescriber Signature | Print Name | Contact | | Time given | | | | | | | | | | |
| | | | | Nurse | | | | | | | | | | |

Figure 1: Variable dose medications

This section should be used for prescribing medicines whose dose varies according to levels (for example, gentamicin) or as a reducing protocol (for example, steroids).

For each dose, the following information must be documented:

- dose
- doctor's initials
- actual time of administration (this may be different from the dose time)
- initials of nurse who administered the dose.

Warfarin

| | | | | | | | | | | | | | | | | | | | | |
|----------------------|---|---------|--------------------------------------|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Date | WARFARIN (Marevan/Coumadin) <small>select brand</small> | | DOSE TIME 1600 (4pm) | INR Result | | | | | | | | | | | | | | | | |
| Route | Target INR | | | Dose | | | | | | | | | | | | | | | | |
| Pharmacy | Indication | | | Doctor | | | | | | | | | | | | | | | | |
| Prescriber Signature | Print Name | Contact | | Nurse 1 | | | | | | | | | | | | | | | | |
| | | | | Nurse 2 | | | | | | | | | | | | | | | | |

Figure 2: Warfarin

The warfarin ordering section is printed in red as an extra alert to indicate that it is an anticoagulant (and a high-risk medicine).

A standard dose time of 1600 hours (4.00 pm) is recommended, because this allows the medical team caring for the patient to order the next dose based on INR results, rather than leaving it for after-hours staff.

The indication and target INR (based on *Guidelines for Anticoagulation using Warfarin*) should be included when warfarin is initially ordered.

For each day of therapy, the following information should be documented:

- INR result
- warfarin dose
- doctor’s initials
- initials of nurse who administered the dose and the checking nurse.

Medication orders

| | | | |
|----------------------|-------------------------------------|-----------------------------|----------------------|
| Date | Medication (use Generic Name) Print | | Tick if Slow-release |
| Route | Dose | Frequency & NOW enter times | |
| Pharmacy | Indication | | |
| Prescriber Signature | Print Name | Contact | |

Figure 3: Medication orders

A medication order is valid only if the prescribing medical officer enters all listed items.

| Element | Description | Example |
|------------------------------------|--|---|
| Date | The date that the medication order was started during this hospital admission is entered here. Not the date that the chart was written or rewritten. | Friday 8 October 2008 |
| Generic drug name | Because several brands of one agent are available, the generic name should be used if possible in lower case, unless combination preparations are ordered. The pharmacy department usually only stocks and supplies only one brand of each generic drug. | Timentin—a trademark name for the drug ticarcillin disodium Panadeine—a brand name of a paracetamol and codeine preparation (note capitalisation for brand names) verapamil SR (note lower case for generic drug names) diltiazem CD |
| The red 'tick if slow release' box | Prompts prescribers to identify whether the standard release or a slow release form of the drug is required. This box must be ticked to indicate a sustained or modified release form of an oral drug. If not ticked, then it is assumed that the standard release form is to be administered. | |
| Route | Only commonly used and understood abbreviations should be used to indicate the route of administration. Abbreviations such as BD, TDS or QID are unclear for PRN orders. | |
| Dose | Doses must be written using metric measurements and Arabic numerals. Never use Roman numerals (i, ii, iii, iv). | mg g (not gm) mL (not ml) L (not l) 1, 2, 3... |

| Element | Description | Example |
|------------------------------------|---|---|
| Dose (cont.) | <p>Always use zero (0) before a decimal point—otherwise the decimal point may be missed.</p> <p>Never use a terminal zero (.0), because it may be misread if the decimal point is missed (1.0 could be misread as 10).</p> <p>If possible, state the dose in whole numbers, not decimals.</p> | <p>0.5 g</p> <p>30 mg 5 µg</p> <p>500 mg instead of 0.5 g 125 µg (or 'mcg' for microgram) instead of 0.125 mg</p> |
| Units of measurement | <p>Do not use U or IU for units because it may be misread as zero—always write 'units' in full.</p> <p>For liquid medicines, always specify the strength and the dose in milligrams or micrograms (not millilitres).</p> | <p>6 units 12 units</p> <p>morphine mixture 10 mg give 2.5 g every 8 hours</p> |
| Frequency and administration times | <p>The ward/clinical pharmacist should clarify when the strength supplied is different from that ordered.</p> <p>The medical officer writing the order must enter the frequency and administration times to prevent the nurse misinterpreting the frequency and writing down the wrong times. If these details are not entered, the dose may not be administered by nursing staff.</p> <p>Enter times using the 24-hour clock (this nomenclature is the global standard).</p> | <p>For 10 mg, the pharmacist may write 'two 5 mg tablets', or for 25 mg, the pharmacist may write 'half (½) 50 mg tab'</p> <p>6 units every 2 hours 10 mg every 30 minutes</p> <p>2 mg at 0100, 0900 and 1700 hours give 500 mg at 1600 hours</p> |

| Element | Description | Example |
|--|---|--|
| Frequency and administration times (cont.) | <p>Unless drugs must be given at specific times, they should be administered according to the recommended administration times.</p> <p>The ward/clinical pharmacist or nurse will clarify the administration time (and annotate the chart) if necessary, to administer the drug correctly (in relation to food and so on).</p> | <p>give immediately after food on empty stomach with water</p> |
| Indication | <p>This section is for the medical officer to document the indication for use or pharmacist to add or clarify specific details. It may be used to specify administration methods or rates and so on.</p> | |
| Doctor's signature and print name | <p>The signature of the medical officer must be written to complete each medication order. For each signature (medical officer), the name must be written in print at least once on the medication chart.</p> | <p>Dr Louise Doctor</p> |
| Cessation and change of medication | <p>When stopping a medicine, the original order must not be obliterated. The medical officer must draw a clear line through the order in both the prescription and the administration record sections, taking care that the line does not impinge on other orders.</p> <p>The medical officer must write the reason for changing the order at an appropriate place in the administration record section.</p> <p>When a medication order is changed, the medical officer must not over write the order. The original order must be ceased and a new order written.</p> | <p>cease written in error increased dose</p> |

PRN documentation

Prescribing

PRN prescribing can be a continuing factor to problems with high—dose prescribing (Morgan et al., 1996) and potential source for over-prescribing.

Feedback from the NIMC pilot data was that only few drugs prescribed PRN, but more doses were administered. Prescribers should review the medication therapy and consider whether the dose should be increased.

Abbreviations such as BD, TDS or QID are considered unclear for PRN orders.

Rationale

PRN frequencies are often unclear to the attending nurse, for example, 'metoclopramide prescribed 10–20 mg TDS' may result in administration of doses every 8 hours. However, medications can often be given more frequently, and the nursing staff need adequate guidelines, for example, '10–20 mg 4–6 hourly'.

Document maximum dose

Rationale

Some PRN medications should be given frequently, but some drugs also have a maximum dose for any 24-hour period. For example, if diazepam 5–10 mg is ordered every 2–3 hours for agitation, the prescriber might want to limit a patient to 40 mg in every 24-hour period to prevent adverse effects such as respiratory depression.

Duration

Concerns about the quality of PRN prescriptions and the duration of use of PRN medications (Aloa, 1995).

Rationale

'As required' drugs are intended as a short-term measure, and the physician has a duty to review short-term prescriptions and transfer medication given to regular prescription.

Indication

Prescriptions should give clear indication for a recognised symptom treatable by the drug. For example, the use of 'agitation' as an indication should be avoided due to confusion with side-effects to other drugs. Preferred indications are sedation, psychotic thoughts and symptoms, disturbed behaviour and violence (M.F. Bowden).

Rationale

Nurses must be able to assess the appropriateness of PRN medications for a particular patient, because numerous medications have multiple indications. For example, diazepam may be prescribed for anxiety, conscious sedation, seizures, muscle spasm, pre-medication or alcohol and opioid withdrawal, but the maximum dose varies according to the indication.

PRN orders are intended to allow nurses to administer medications when required by patients to manage specific clinical states (for example, pain relief, nausea and vomiting). Doses or frequencies that are not specified (for example, morphine 2.5 mg PRN) or are inflexible (for example, oxycodone 5 mg QID PRN) may lead to suboptimal symptom control or adverse drug events.

Other potential risks

Prescribers need to recognise PRN medication as potentially problematic for several reasons:

- PRN medications are often prescribed by junior doctors out of hours, and may be more likely to be omitted from multidisciplinary team discussions.
- A high usage of ranged doses can place a burden on the administrator for which they are not trained, or lead to higher doses administered than necessary. However, clinicians valued the flexibility of ranged doses and felt that a high standard of multidisciplinary work within in-patient areas meant that the nurse could be highly skilled in the use of ranged medication administration (M.F. Bowden).
- The potential for 'max daily dose' to be confused with individual dose exists, which could lead to 24 hours' dose given at one time—refer to local organisation policy.
- PRN doses may be missed, due to not being in direct sight: education/policy issue.
- Multiple charts and the need for separate ancillary charts per patient raised concerns about the increase risk of dose omission. The 'number of charts in use' section is in some cases underutilised, which becomes an issue in the case where multiple charts are used per patient.

Findings

- While improvement in PRN prescribing documentation has occurred, further improvement could be made specifically to these areas and therefore enhancing patient safety; (a recorded increase of 41%); documentation of indication improved from 13.1% pre to 26.2% post and documentation of maximum dose per 24 hours for PRN medications improved from 24% pre to 36% post.

Results suggest that the recording of indication and maximum dose per 24 hours was not a common feature at the pre-implementation stage.

Objective

A medication chart should have a specific section for 'when required' (PRN) medications to distinguish from and not clutter the regular medication section, and thus minimise the risk of being administered regularly.

PRN orders should be unambiguous and prescribed in a structured manner of dose or range of doses (for example, metoclopramide 10–20 mg), with minimum hourly frequency to be administered (for example, 3–4 hourly), and a recommended maximum dose in 24 hours and recording of indication.

Prescriber

As-required (PRN) medicines

The prescriber must document the dose and hourly frequency. Recording 'PRN' is inadequate. Indication and maximum daily dose (for example, maximum dose in twenty four hours) must be documented to ensure safe and appropriate administration and to minimise the risk of overdose. Where appropriate, the prescriber may indicate the maximum number of doses to be administered or maximum duration for the order by crossing out parts of the administration section.

Insulin prescribing

Evidence suggests that the use of insulin sliding scales is not best practice. Insulin should be prescribed and reviewed daily, supplemented with 'PRN' doses. Some health services use the PRN section of the NIMC for prescribing variable doses of insulin; while others have developed ancillary charts to document both blood glucose levels and variable doses of insulin. Examples of insulin charts are on the NIMC website: www.health.vic.gov.au/vmac/projects/nimc/ancillary.htm

Insulin prescribing guidelines are developed on behalf of the Australian Commission on Safety and Quality in Healthcare. This will be coordinated by the Victorian Medicines Advisory Committee (VMAC).

Prescribing

The medical officer **must**:

- write the dose and hourly frequency—'PRN' (pre-printed) alone is not sufficient
- write the indication and maximum daily dose (that is, maximum dose in 24 hours) for example, paracetamol 4 g every 24 hours.
- write clearly
- complete all the boxes
- use a reputable drug data resource
- use accepted, safe abbreviations
- listen when someone raises concerns.

Recording of 'indication' and 'hourly frequency' for PRN medications gives clear administration instructions and maximum daily dose.

| | | | | | | |
|----------------------|-------------------------------------|------------------|----------|-----------------|-------|------|
| Date | Medication (use Generic Name) Print | | | | Date | 1/10 |
| 1/10/04 | Paracetamol | | | | | |
| Route | Dose | Hourly frequency | PRN | Max dose/24 hrs | Time | 1400 |
| O | 1g | 4/24 | | 4g | | |
| Pharmacy | | Indication | | | Dose | 1g |
| | | Febrile | | | Route | O |
| Prescriber Signature | Print Name | | Contact | Sign | | |
| | J Good | | Page 000 | | | |

Figure 4: Recording of 'indication' and 'hourly frequency' for PRN medications

Administration

Staff administering medication must document the actual dose given. The person administering each dose is responsible for checking that the maximum daily dosage is not exceeded.

The administrator must clearly complete all sections as indicated.

| | | | | | | |
|----------------------|-------------------------------------|------------------|----------|-----------------|-------|------|
| Date | Medication (use Generic Name) Print | | | | Date | 1/10 |
| 1/10/04 | Paracetamol | | | | | |
| Route | Dose | Hourly frequency | PRN | Max dose/24 hrs | Time | 1400 |
| O | 1g | 4/24 | | 4g | | |
| Pharmacy | | Indication | | | Dose | 1g |
| | | Febrile | | | Route | O |
| Prescriber Signature | Print Name | | Contact | Sign | | |
| | J Good | | Page 000 | | | |

Figure 5: Clearly complete all sections

Documentation in progress notes

Documentation of the administration of PRN medications along with response/effect over time in the progress notes.

Background criteria to once-only, pre-medication and nurse-initiated medicines

The NIMC includes a separate section for once-only, pre-medication and nurse-initiated medicines to distinguish them from regular medicines and therefore minimise the risk of unnecessary administration. This section must be included on the NIMC—rather than forming a separate chart—to minimise the risk of omission and duplication and to provide a complete medication history.

| Medicines taken Prior to Presentation to Hospital (Prescribed, over the counter, complementary) | | | Own medications brought in? <input type="checkbox"/> Y <input type="checkbox"/> N Administration Aid (specify) | | |
|--|------------------|----------|--|------------------------------------|----------|
| Medication | Dose & frequency | Duration | Medication | Dose & frequency | Duration |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| GP: | | | Community Pharmacy: | | |
| Documented by: | | (Sign) | (Date) | Medicines usually administered by: | |

Figure 8: Drugs taken before admission

The admitting medical officer, a pharmacist or other clinician trained in medication history documentation may complete this section. The following must be documented:

- a complete list of all medicines taken normally at home (prescription and non-prescription), including drug identification details (generic name, strength and form), dose and frequency, and duration of therapy/when therapy started.
- whether the patient has their own medicines with them
- whether the patient uses a dose administration aid (for example, Webster pack, blister pack)
- contact details for patient's community health providers (GP and community pharmacist)
- whether the patient usually receives assistance to administer/manage their medicines.

Any discrepancies noted by the person documenting the medication history must be brought to the attention of the attending medical officer.

The medication chart provides space for the **minimum** information that should be documented. It is also helpful to document the indication for use, and use a checklist as a prompt to ensure a comprehensive history is obtained. For more information about medication history documentation, refer to local health service policy.

This section is included in the medication chart to facilitate quick and effective documentation of and access to medication history information. At local levels, facilities may choose to implement a more comprehensive approach to documentation.

Patient history

Significant risks attend drug prescribing in a hospital-based population. Patients at highest risk include those on multiple medications. The highest prevalence of drug use in a large US-based population study was in women over 65 years of age. Twelve per cent of this demographic took ten or more medications; 23% took at least five prescribed therapies (Kaufman DW et al. 2002 *JAMA* 287(3): 337–44). These data are confirmed in an Australian population: polypharmacy, and the associated risks, are positively correlated to increasing age and hospitalisation (Atkin PA, Stringer RS, Duffy C et al. 1998 The influence of patient provided information on the accuracy of medication records [published erratum appears in *Med. J. Aust.*, 169: 468]. *Med J Aust.* 169: 85–8).

Prescription of medicines is a central component to quality patient care. Aspects of this include appropriate use of indicated medications, avoidance of inappropriate medications, assessment for side-effects, avoidance of drug interactions and assessment of efficacy.

To enable this, safe prescription of drugs requires a thorough assessment of the patient to determine the most suitable drug, route of administration, frequency of administration and so on. In order to do this safely, a detailed medical history and examination needs to occur before the prescribing of medications. This is essential to ensure that the risk of prescribing error is minimised to an acceptable level.

The section outlines particular areas that should be assessed to ensure that drug prescription is performed safely.

Patient history

Symptoms of current illness

Prescription of medications is often focused at relief of symptoms that are distressing to the patient. This can be elicited from the patient (for example, 'What is the problem that is causing you most distress today?'). If a patient is not able to answer such questions, adjunctive history and observations of family/carers can be useful, including:

- past medical history
- family history
- drug history
- current medications, including herbals, supplements and OTC (over-the-counter) medications.

Patients may be unaware of the need to discuss non-prescription medications with their doctors—this should be specifically asked for.

Consumers Health Forum 1999 *Choosing your medicine*. Canberra: Consumers Health Forum of Australia

Previous adverse reactions

- including nature of reaction

Vaccination

Patient examination

Identity of patient

Confirmation of underlying disease process (clinical diagnosis that therapy will be directed towards)

Consideration of potential adverse outcomes from therapy

For quality-use of medications, consideration and anticipation of any adverse effect associated with a prescription should be made. For example, the bradycardic effects of beta-blocking agents mean that cardiac monitoring should be used when these are given intravenously.

The likely efficacy of each prescription of a new medication should be balanced against the potential side-effects. A detailed history and physical examination allow the prescriber to establish a therapeutic plan incorporating the safe prescription of medications. Given the clinical scenario, the detail of the history taken may be limited by necessity (for example, when emergency treatment is required and therapy is time critical). Despite these time pressures, the aspects of a patient's history and examination should be reviewed and interpreted to allow for safe prescription of medications.

Learning activities

Suggested learning activities and timetable are outlined below.

| Timing | Activity | Objective |
|------------|---|-------------------------|
| 40 minutes | Facilitated discussion | 3, 4 and 5 |
| 60 minutes | Skills stations (three): <ul style="list-style-type: none"> ■ completing National Inpatient Medication Charts ■ identifying errors in completing National Inpatient Medication Charts ■ DVD on taking and effective patient drug history | 1 and 2 3 4 and 5 |
| 10 minutes | Summary | All |
| 10 minutes | Evaluation | |

Total time = 2 hours

Facilitated discussion

The facilitator should lead a discussion amongst participants about the issues covered in the background information. The facilitator should not give a didactic lecture, but instead promote open discussion and knowledge sharing amongst participants. Participants should be encouraged to describe any real-life experiences they have encountered.

Major issues which the facilitator should ensure are covered include:

- errors that may occur in completing the National Inpatient Medication Chart
- the background and structure of the National Inpatient Medication Chart
- characteristics of taking a good medication patient history
- common problems in taking a medication history from patient.

PowerPoint slides are available for the facilitator to use to summarise these main points at the end of the discussion, or as triggers if participants have not identified the major issues.

Skills stations

The skills stations allow participants to practise completing the National Inpatient Medication Chart, interpreting the National Inpatient Medication Chart, and taking a comprehensive medical history focusing on medications, while receiving feedback in a structured format from peers and/or facilitators. Participants should be guided through each of the three skills using Peyton's four-step model.⁵ Feedback should be provided at the completion of the skill.

The program and resources required assume three facilitators for every 12 participants, a ratio of 1:4. Each group of participants should rotate through three 20-minute skills stations. Each participant should have five minutes of hands-on experience at each station while observing three colleagues for 15 minutes.

Depending on the professional mix of the group (medical and nursing), appropriate emphasis should be placed on those 'assisting' and 'doing' as deemed appropriate for individual institutions.

Skills station 1: Completing the National Inpatient Medication Chart

Participants have a short case history of a patient. As a group, the participants should identify information to be added to the patient's medication chart, onto a whiteboard holding a copy of the chart. Participants should also add this information to their own medication chart that they are developing for that patient. At the completion of the station, participants will have completed a medication chart for the scenario provided and compiled the information on to the chart on the whiteboard.

See page 27 for scenario.

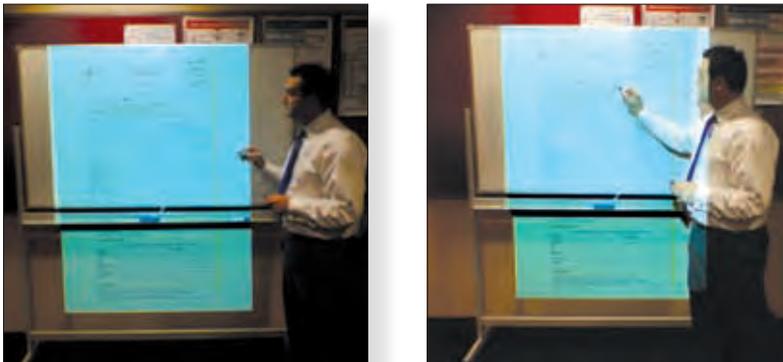


Figure 9: Using a whiteboard to complete the National Inpatient Medication Chart

Skills station 2: Identifying errors in the National Inpatient Medication Chart

Participants have short patient case studies with brief medication histories containing several errors. Participants should identify these errors and rewrite the charts correctly.

Skills station 3: Taking a patient history

Watch the first section of the DVD on taking a patient history, which asks participants to:

- identify what the doctor did well
- list the information that the doctor collected
- identify possible areas or things that the doctor may have missed.

Create a list of the information collected from the participants. Discuss what was done well and what could have been done better.

Watch the second snippet of film from the DVD, in which a comprehensive patient history is taken. The participants should identify what was been done well and what was done differently from the first history.

Summary

The summary session reinforces content covered in the learning activities, and is an opportunity for participants to reflect on what they have covered. No new material should be introduced.

Major points to recap in the summary include:

- completing the National Inpatient Medication Chart
- interpreting the National Inpatient Medication Chart
- techniques for taking a comprehensive patient medication history.

Participants should be offered access to equipment and educators in the future to allow them to practise these skills if they need to improve their skill level or confidence. Participants may be encouraged to observe or assist experienced colleagues performing these skills in controlled settings to put these skills into a clinical context.

Resource list

The following resource list assumes three facilitators for every 12 participants, a ratio of 1:4. As a minimum, the following resources are needed to conduct this module.

| Resource | Quantity | Additional comments |
|-------------------------------------|----------|---------------------------------------|
| Facilitators | 3 | Allows 1:4 ratio with 12 participants |
| PowerPoint presentation | 1 | Provided with module |
| DVD—Patient history | 1 | Used in Skills station 3 |
| Data projector | 1 | Used for Skills station 1 |
| Whiteboard | 1 | Used for Skills station 1 |
| National Inpatient Medication Chart | 24 | Used for Skills stations 1 and 2 |
| Patient history scenario | 6 | Used in Skills station 1 |
| Feedback sheets | 3 | As a prompt for each facilitator |
| Evaluation forms | 12 | One for each participant |

Evaluation

A formal evaluation has been specifically developed for this module. It incorporates the objectives of the module and the perceptions of the participants about whether they have increased their understanding by working through the module. It is highly recommended that this formal evaluation be copied and completed by all participants at the completion of the module.

A range of informal evaluation tools may also be used in conjunction with this evaluation throughout the module, including those available in the *Department of Human Services' Clinical Skills Facilitators Manual* from the basic course conducted in 2007.

References

1. Peyton J. 1998 *Teaching and Learning in Medical Practice*. Manticore Europe Ltd, Great Britain
2. Australian Council for Safety and Quality in Health Care 2002 *Second national report on patient safety: improving medication safety*. Canberra: Commonwealth of Australia
3. Wilson RM, Runciman WB, Gibberd RW, Harrison BT, Newby L and Hamilton JD 1995 The quality in healthcare study. *Med J Aust* 163: 458–71
4. Commonwealth Department of Health and Ageing 2004 Joint communiqué. *Health Ministers agree to reform agenda*. Canberra
5. www.health.vic.gov.au/vmac/projects/nimc/ancillary.htm
6. National In-patient Medication Chart Pilot 2005 Change Register: www.health.vic.gov.au/vmac/downloads/change_register.pdf
7. [www.health.gov.au/internet/safety/publishing.nsf/Content/80A0EF37F281A8D7CA25718F000CCC2F/\\$File/nimc%20Guidelines%20for%20LM.pdf](http://www.health.gov.au/internet/safety/publishing.nsf/Content/80A0EF37F281A8D7CA25718F000CCC2F/$File/nimc%20Guidelines%20for%20LM.pdf)
8. [www.health.gov.au/internet/safety/publishing.nsf/Content/80A0EF37F281A8D7CA25718F000CCC2F/\\$File/chguide.pdf](http://www.health.gov.au/internet/safety/publishing.nsf/Content/80A0EF37F281A8D7CA25718F000CCC2F/$File/chguide.pdf)
9. [www.health.gov.au/internet/safety/publishing.nsf/Content/80A0EF37F281A8D7CA25718F000CCC2F/\\$File/chcommun.pdf](http://www.health.gov.au/internet/safety/publishing.nsf/Content/80A0EF37F281A8D7CA25718F000CCC2F/$File/chcommun.pdf)
10. [www.health.gov.au/internet/safety/publishing.nsf/Content/80A0EF37F281A8D7CA25718F000CCC2F/\\$File/chratio.pdf](http://www.health.gov.au/internet/safety/publishing.nsf/Content/80A0EF37F281A8D7CA25718F000CCC2F/$File/chratio.pdf)
11. [www.health.gov.au/internet/safety/publishing.nsf/Content/80A0EF37F281A8D7CA25718F000CCC2F/\\$File/chagggreg.pdf](http://www.health.gov.au/internet/safety/publishing.nsf/Content/80A0EF37F281A8D7CA25718F000CCC2F/$File/chagggreg.pdf)
12. [www.health.gov.au/internet/safety/publishing.nsf/Content/80A0EF37F281A8D7CA25718F000CCC2F/\\$File/nimc%20Guidelines%20for%20LM.pdf](http://www.health.gov.au/internet/safety/publishing.nsf/Content/80A0EF37F281A8D7CA25718F000CCC2F/$File/nimc%20Guidelines%20for%20LM.pdf)

13. National Inpatient Medication Chart Victorian Evaluation August 2007: www.health.vic.gov.au/vmac/downloads/nimc_evaluation.pdf
14. Implementation of the NIMC in Victoria: www.health.vic.gov.au/vmac/downloads/nimcimplementationworkshop.ppt
15. Implementation of the National Inpatient Medication Chart (NIMC)—where are we now? www.health.vic.gov.au/vmac/downloads/nimc_news_apr07.pdf
16. How to Prescribe Safely: www.health.vic.gov.au/vmac/downloads/how_to_prescribe_safely.pdf
17. Audit: prescription of ‹as required› (p.r.n.) medication in an in-patient setting: pb.rcpsych.org/cgi/reprint/23/7/413.pdf
18. Medication Chart: Documentation Audit Tool: www.safetyandquality.sa.gov.au/DesktopModules/SSSA_Documents/LinkClick.aspx?tabid=58&mid=611&table=SSSA_Documents&field=ItemID&id=139&link=User+Guide++Final+compared+to+5.0+January+2006.pdf
19. 4.2 Sample policy and procedure for medication management: www.health.vic.gov.au/dpu/downloads/medication/42_policy_procedure_medication_mgt.doc

Resources

Facilitator feedback form

The following form should be used to assist you in giving feedback after each participant has practised their National Inpatient Medication Chart and Patient history skills at the skills station.

Feedback using the Pendleton model

Pendleton’s model of feedback assists learners to maximize their potential at different stages of training, raise their awareness of strengths and areas for improvement, and identify actions to be taken to improve performance. Pendleton’s rules are structured in such a way that the learner identifies the positives first, in order to create a safe environment. This is followed by the facilitator or group reinforcing these positives and discussing skills to achieve them. Different techniques are then suggested. The advantage of this method is that the learner’s strengths are discussed first. Avoiding a discussion of weaknesses right at the beginning prevents defensiveness and allows reflective behaviour in the learner.

Below is a series of questions to assist you in this technique:

1. Ask the learner how they feel.
2. Ask the learner what went well and why (this can be combined with question 1 and 3).
3. Tell the learner what went well and why.
4. Ask the learner what could have been done better and why.
5. Tell the learner what could have been done better and why.
6. Summarise the learner’s strengths and identify up to three things to concentrate on.

Note: This form does not need to be given to the participant — it is a guide for you, the group facilitator.

Skills station 3

| Patient details | |
|----------------------------|---|
| Name | John Citizen |
| Sex | Male |
| Age | 70 |
| Past history | Smoker, hypertension, Type II diabetes, hypercholesterolaemia, gastro-oesophageal reflux, benign prostatic hypertrophy, allergies: penicillin—rash, cephalexin—GI upset |
| Social history | Married, lives at home |
| History of present illness | <p>Unwell for a few days with increased breathlessness</p> <p>Symptoms worse in evenings—needing to sleep in chair for past two nights</p> <p>No chest pain</p> <p>Visited by daughter at home today—she was concerned and arranged ambulance transfer to ED</p> <p>Patient was reviewed in ED, including blood tests and CXR: diagnosed with CCF; medical registrar suggested using diuretics and GTN therapy, but cannot admit the patient in ED and has asked for a drug chart to be written for the patient before transfer to the ward</p> |
| Medications | <p>Usual (oral unless otherwise stated):</p> <p>metformin 1 g bd</p> <p>Gliclazide 80 mg bd</p> <p>omeprazole 20 mg od</p> <p>simvastatin 40 mg nocte</p> <p>irbesartan 150 mg od</p> <p>amlodipine 10 mg od</p> <p>hydrocortisone cream 1%—topical PRN for eczema</p> <p>aspirin (150 mg od—non-prescribed)</p> <p>multivitamin tablet (T od—non-prescribed)</p> <p>Medical registrar</p> <p>frusemide 80 mg IV stat</p> <p>frusemide 40 mg od</p> <p>GTN patch 5 mg stat (on now, off 2200)</p> |

Module 1: National Inpatient Medication Chart—evaluation

Thank you for participating in this module. As part of our commitment to quality improvement the following questionnaire will be used to plan future implementation of this module. We appreciate your time completing this evaluation.

1. Overall

How would you rate this module?

poor fair good very good outstanding

2. Learning objectives

Please consider whether this module was successful in meeting the following learning objectives:

| <i>Safe medication administration</i> Learning objectives of Module 1: National Inpatient Medication Chart | Strongly disagree | Disagree | Slightly agree | Agree | Strongly agree |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Practised reading and interpreting a National Inpatient Medication Chart | <input type="checkbox"/> |
| Practised correctly completing a National Inpatient Medication Chart | <input type="checkbox"/> |
| Identified errors that may occur in completing the National Inpatient Medication Chart | <input type="checkbox"/> |
| Identified the characteristics of taking a good medication history from a patient | <input type="checkbox"/> |
| Identified common problems in taking a medication history from a patient | <input type="checkbox"/> |

3. Important learning outcomes

What are the three most important things you have learned from this module?

4. Module implementation

Please indicate to what extent you agree or disagree with each of the following statements in relation to the implementation of the module.

| | Strongly disagree | Disagree | Slightly agree | Agree | Strongly agree |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| The facilitator respected my experience | <input type="checkbox"/> |
| The facilitator encouraged my participation | <input type="checkbox"/> |
| I was able to ask the facilitator questions | <input type="checkbox"/> |
| The facilitator was able to answer my questions | <input type="checkbox"/> |
| The feedback I received was clear | <input type="checkbox"/> |
| The feedback I received will assist me in my future performance | <input type="checkbox"/> |
| There was adequate time for the skills stations | <input type="checkbox"/> |
| There was adequate time for the facilitated discussions | <input type="checkbox"/> |
| I have increased my confidence in completing the National Inpatient Medication Chart | <input type="checkbox"/> |
| I have increased my confidence in interpreting the National Inpatient Medication Chart | <input type="checkbox"/> |
| I have increased my confidence in performing a patient history | <input type="checkbox"/> |
| I have identified future learning needs in this topic area | <input type="checkbox"/> |

5. Future module implementation

Do you think the module should be altered in any way? yes no

If yes, what recommendations do you have?

Thank you

PowerPoint presentation

1. **Clinical Skills in Hospitals Project**

Safe Medication Administration

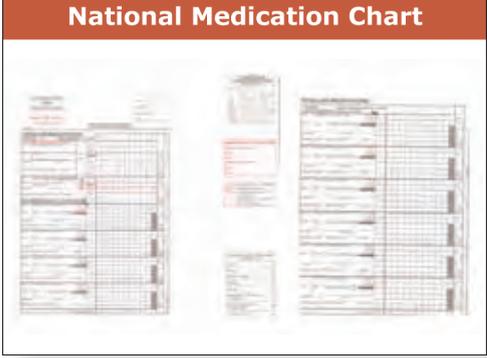
MODULE 1
'National Medication Chart'


2. **National Medication Chart**

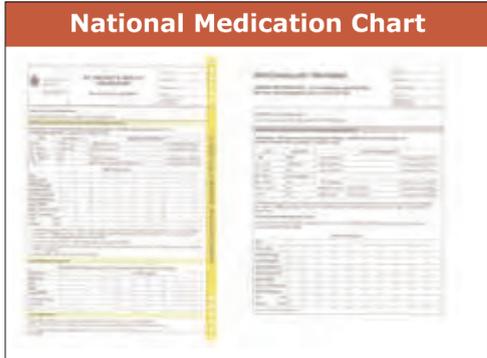
COMPLETING THE NMC

 - Errors that may occur in completing the National Medication Chart (NMC)
 - Information about the background and structure of the NMC
3. **National Medication Chart**


4. **National Medication Chart**


5. **National Medication Chart**


6. **National Medication Chart**


7. **National Medication Chart**

PATIENT MEDICATION HISTORY

 - Characteristics of taking a good patient medication history
 - Common problems in taking a medication history from a patient

AS REQUIRED "PRN" MEDICATIONS

Attach ADR Sticker

See front page for details

UR No.: _____

Surname: _____

Given Name: _____

D.O.B.: _____

1st Prescriber to Print Patient Name and Check Label Correct: _____

Year 20 _____

REGULAR MEDICATIONS

| YEAR 20 _____ | | DATE & MONTH → _____ | | | | | | | | | | | | | | | | | | |
|---|---|-----------------------------|------------|-------------------------------|------------------|------------|------------|--|--|--|--|--|--|--|--|--|--|---|--|--|
| VARIABLE DOSE MEDICATION | | | | | | | | | | | | | | | | | | | | |
| Date | Medication (Print Generic Name) | | | Time of Dose | Drug level | | | | | | | | | | | | | Continue on discharge? Yes/No Disposal? Yes/No Dustbin? Yes/No | | |
| Route | Frequency | | | | Time level taken | | | | | | | | | | | | | | | |
| Or to enter dose time and individual dose | | | | | Dose | | | | | | | | | | | | | | | |
| Indication | | Pharmacy | | | | Prescriber | | | | | | | | | | | | | | |
| Prescriber Signature | | Print Your Name | | Contact | | Time given | | | | | | | | | | | | | | |
| N/A | | | | | | | | | | | | | | | | | | | | |
| Date | WARFARIN (Marevan/Coumadin) <small>solid tablet</small> | | | DOSE TIME 1600 (4pm) | INR Result | | | | | | | | | | | | | Continue on discharge? Yes/No Disposal? Yes/No Dustbin? Yes/No | | |
| Route | Prescriber to enter individual doses | | Target INR | | Dose | | | | | | | | | | | | | | | |
| Indication | | | | | | Pharmacy | | | | | | | | | | | | | | |
| Prescriber Signature | | Print Your Name | | | Contact | | Prescriber | | | | | | | | | | | | | |
| Nurse 1 | | | | | | | | | | | | | | | | | | | | |
| Nurse 2 | | | | | | | | | | | | | | | | | | | | |
| DOCTORS MUST ENTER administration times | | | | | | | | | | | | | | | | | | | | |
| Date | Medication (Print Generic Name) | | | Tick if Slow release | → | | | | | | | | | | | | | Continue on discharge? Yes/No Disposal? Yes/No Dustbin? Yes/No | | |
| Route | Dose | Frequency & NOW enter times | | | | | | | | | | | | | | | | | | |
| Indication | | | | | | Pharmacy | | | | | | | | | | | | | | |
| Prescriber Signature | | Print Your Name | | | | Contact | | | | | | | | | | | | | | |
| Date | Medication (Print Generic Name) | | | Tick if Slow release | → | | | | | | | | | | | | | Continue on discharge? Yes/No Disposal? Yes/No Dustbin? Yes/No | | |
| Route | Dose | Frequency & NOW enter times | | | | | | | | | | | | | | | | | | |
| Indication | | | | | | Pharmacy | | | | | | | | | | | | | | |
| Prescriber Signature | | Print Your Name | | | | Contact | | | | | | | | | | | | | | |
| Date | Medication (Print Generic Name) | | | Tick if Slow release | → | | | | | | | | | | | | | Continue on discharge? Yes/No Disposal? Yes/No Dustbin? Yes/No | | |
| Route | Dose | Frequency & NOW enter times | | | | | | | | | | | | | | | | | | |
| Indication | | | | | | Pharmacy | | | | | | | | | | | | | | |
| Prescriber Signature | | Print Your Name | | | | Contact | | | | | | | | | | | | | | |
| Date | Medication (Print Generic Name) | | | Tick if Slow release | → | | | | | | | | | | | | | Continue on discharge? Yes/No Disposal? Yes/No Dustbin? Yes/No | | |
| Route | Dose | Frequency & NOW enter times | | | | | | | | | | | | | | | | | | |
| Indication | | | | | | Pharmacy | | | | | | | | | | | | | | |
| Prescriber Signature | | Print Your Name | | | | Contact | | | | | | | | | | | | | | |
| Date | Medication (Print Generic Name) | | | Tick if Slow release | → | | | | | | | | | | | | | Continue on discharge? Yes/No Disposal? Yes/No Dustbin? Yes/No | | |
| Route | Dose | Frequency & NOW enter times | | | | | | | | | | | | | | | | | | |
| Indication | | | | | | Pharmacy | | | | | | | | | | | | | | |
| Prescriber Signature | | Print Your Name | | | | Contact | | | | | | | | | | | | | | |
| Pharmaceutical Review: _____ | | | | | | | | | | | | | | | | | | | | |

Figure 11: PRN – National inpatient medication chart.

| RECOMMENDED ADMINISTRATION TIMES GUIDELINES ONLY | | | | | |
|--|----------|------|------|--------------|------|
| Morning | Once | 0800 | | | |
| Night | Once | | | 1800 or 2000 | |
| Twice a day | BD | 0800 | | 2000 | |
| Three times a day | TDS | 0800 | 1400 | 2000 | |
| Regular 6 hourly | 6 hourly | 0600 | 1200 | 1800 | 2400 |
| Regular 8 hourly | 8 hourly | 0600 | 1400 | 2200 | |
| Four times a day | QID | 0600 | 1200 | 1800 | 2200 |

WARFARIN EDUCATION RECORD

Patient Educated by:

Sign:

Date:

Given Warfarin Book:

Sign:

Date:

Tip: If Scored Medication

SR= Sustained or modified release formulation. If scored tablet, then half can be given. Dose must be swallowed without crushing.

| REASON FOR NURSE NOT ADMINISTERING | |
|---|-----|
| Codes MUST be circled | |
| Absent | (A) |
| Fasting | (F) |
| Refused - notify Dr | (R) |
| Vomiting | (V) |
| On leave | (L) |
| Not available - obtain supply or contact Dr | (N) |
| Withheld - Enter reason in Clinical Record | (W) |
| Self Administering | (S) |

Figure 12: Administration – National inpatient medication chart.

| | | |
|---|---|---|
|  <p>ST VINCENT'S HEALTH Continuing the Mission of the Sisters of Charity</p> | <p>ST. VINCENT'S HEALTH, MELBOURNE</p> <p>ANTICOAGULANT TREATMENT</p> | UR No.: _____ Surname: _____ Given Name: _____ D.O.B.: _____ <small>*1st Prescriber to Print Patient Name and Check Label Correct</small> |
| <p>Indication for anticoagulation</p> <p>Currently proposed date of cessation of anticoagulation _____</p> | | |
| <p>INTRAVENOUS UNFRACTIONATED HEPARIN (HEPARIN SODIUM)</p> | | |
| <p>Medication: Unfractionated Heparin (heparin sodium) – 25,000 units per 500ml infusion¹ of: - Sodium Chloride 0.9% or Glucose 5% (Please circle)</p> | | |
| APTT | STAT BOLUS | CHANGE TO INFUSION RATE |
| <60 sec | 5000 units | + 5000 units/24 hours = increase by 4 ml/hour |
| 60 - 64 sec | 2500 units | + 2500 units/24 hours = increase by 2 ml/hour |
| 65 - 100 sec | NIL | NIL |
| 101 - 120 sec | NIL | - 2500 units/24 hours = decrease by 2 ml/hour |
| > 120 | NIL | STOP 1 hours & - 5000 units/24 hours = decrease by 4 ml/hour |
| <p>HMO & RN to sign</p> | | |
| Date | | |
| Time of APTT | | |
| APTT Result (sec) | | |
| Stat dose (units) | | |
| Infusion Volume ml | | |
| Infusion Rate ml/hr | | |
| Signed (HMO) | | |
| Nurse 1 Administered RN | | |
| Nurse 2 Checking RN | | |
| Time Start | | |
| Infusion Finish | | |
| <ul style="list-style-type: none"> • Immediately give IV bolus of 5000 units of heparin sodium and commence a continuous IV infusion of heparin at a rate of 25000 units per 24 hours (in 500mls sodium chloride 0.9% or glucose 5%). This is equivalent to 21 ml/hour. AN INFUSION PUMP MUST BE USED • Aim to achieve an APTT of 65-100 seconds in less than 24 hours. • Check the APTT after 6 hours and then every 4-6 hours, adjusting the infusion dose rate as shown, until target APTT is attained. • When APTT is 65 –100 seconds check daily | | |
| <p>SUBCUTANEOUS HEPARIN</p> | | |
| <p>Low Molecular Weight Heparin or Unfractionated Heparin (heparin sodium)</p> | | |
| Medication: | | Patient's weight: |
| Medication: | | |
| Dose | | |
| Date | | |
| Signed (HMO) | | |
| Time Administered and Initials | | |
| <p>ORAL WARFARIN</p> | | |
| <p>(available as Marevan®, 1mg, 3mg, 5mg tablets OR Coumadin®, 1mg, 2mg, 5mg tablets) Administration Time for Warfarin is 1600 hours. See variable dose section on Medication Chart.</p> | | |
| <small>¹ Refer to Hospital Administration Protocol: "Anticoagulation Management with IV Heparin, (25,000 Units/ml 500ml)" (Delivered 2004)</small> | | |
| SV 644 03/06 | | |

ST. VINCENT'S HEALTH, MELBOURNE - ANTICOAGULANT TREATMENT

Figure 15: Anticoagulant treatment – National inpatient medication chart.

ANTICOAGULANT TREATMENT

CARDIOLOGY PROTOCOL – For Cardiology patients Only
4th Floor and Emergency Care Centre Use Only

UR No.: _____

Surname: _____

Given Name: _____

D.O.B.: _____

*1st Prescriber to Print
Patient Name and
Check Label Correct!

Indication for anticoagulation _____

Currently proposed date of cessation of anticoagulation _____

INTRAVENOUS UNFRACTIONATED HEPARIN (HEPARIN SODIUM)

Medication: Unfractionated Heparin (heparin sodium) – 25,000 units per 100 ml infusion² of: -
Sodium Chloride 0.9% or Glucose 5% *(Please circle)*

| APTT | STAT BOLUS | CHANGE TO INFUSION RATE | |
|---------------|-----------------|----------------------------------|---------------------------|
| < 40 | 5000 | + 200 units/hour | = increase by 0.8 ml/hour |
| 41 - 50 sec | 2500 units | + 200 units/hour | = increase by 0.8 ml/hour |
| 51 - 54 sec | NIL | + 100 units/hour | = increase by 0.4 ml/hour |
| 55 - 85 sec | NIL Therapeutic | | |
| 86 - 100 sec | NIL | - 100 units/hour | = decrease by 0.4ml/hour |
| 101 - 120 sec | NIL | STOP 30 minutes - 200 units/hour | = decrease by 0.8ml/hour |
| > 121 | NIL | STOP 1 hour - 200 units/hour | = decrease by 0.8ml/hour |

Immediately give IV bolus of 5000 units of heparin sodium and commence a continuous IV infusion of heparin at a rate of 25000 units per 24 hours (in 100mls sodium chloride 0.9% or glucose 5%). This is equivalent to 4.2ml/hour.

AN INFUSION PUMP MUST BE USED

Check the APTT after 6 hours and then every 4-6 hours, adjusting the infusion dose rate as shown above, until target APTT is attained.

HMO & RN to sign

| | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|
| Date | | | | | | | | | |
| Time of APTT | | | | | | | | | |
| APTT Result (sec) | | | | | | | | | |
| Stat dose (units) | | | | | | | | | |
| Infusion Volume ml | | | | | | | | | |
| Infusion Rate ml/hr | | | | | | | | | |
| Signed (HMO) | | | | | | | | | |
| Nurse 1 Administered RN | | | | | | | | | |
| Nurse 2 Checking RN | | | | | | | | | |
| Time Start | | | | | | | | | |
| Infusion Finish | | | | | | | | | |

² Refer to CT4 Drug Protocol February 2004.

Figure 16: Anticoagulant treatment – National inpatient medication chart (Cardiology Protocol).



Module 2: Therapy delivery pumps

Introduction

Safe medication administration was developed as a teaching and learning tool for Victorian clinical educators. The information contained in each module was developed using evidence-based resources and examples of best practice. Where expert opinion varies, a discussion section is included. However, it is not within the scope of *Safe medication administration* to address the full spectrum of local variations. Variations can occur in several areas, including practices relating to types of equipment used, infection control processes, practice guidelines and so on. Therefore, educators should, where appropriate, adapt content to reflect their local policies, procedures and protocols. This will ensure the relevancy of the package content to your learners.

The modules are designed to be discrete courses in their own right. They are timetabled so they can be completed in a 1–2 hour timeframe. This timeframe was chosen after we received feedback from clinical educators requesting shorter courses, because health professionals often have limited time to educate away from patients. However, the packages may also be combined into a one- or two-day course.

Safe medication administration should be used as an educational tool to assist in the teaching of clinical skills. It is structured as a guide to assist clinical educators, and uses many concepts taught in the *Clinical Skills in Hospitals Project* (Train-the-Trainer courses). Educators are encouraged to build on this resource by adding their own scenarios which incorporate hospital/health service protocols, policies and other resources. Each module is designed as a lesson plan to incorporate the simulations into the teaching of clinical skills.

Aims

Safe medication administration aims to increase participants' safety awareness through developing skills associated with prescribing, documentation and medication administration. This package is intended for use with medical, nursing and pharmacy participants.

Package structure

Safe medication administration contains five modules which provide learning opportunities for health professionals at all levels of experience and from medical, nursing and pharmacy disciplines. Modules 1 and 2 are regarded as fundamental. Modules 3 and 4 are more difficult and are regarded as intermediate. Module 5 is more advanced and is regarded as complex.

| Level of complexity | Package structure |
|---|---|
| <p>Complex For participants with more than 4 years experience or who have completed Modules 1–4</p> | <pre> graph TD Error[Error awareness] Admin[Drug administration] Reactions[Drug reactions and adverse events] Chart[National Inpatient Medication Chart] Pumps(Therapy delivery pumps) Admin <--> Reactions Chart --> Admin Pumps --> Admin Pumps --> Reactions Admin --> Error Reactions --> Error style Pumps stroke:#f00,stroke-width:2px </pre> |
| <p>Intermediate For participants in postgraduate years 3–4 or who have completed Modules 1 and 2</p> | |
| <p>Fundamental For participants in postgraduate years 1–2</p> | |

Skills in *Safe medication administration* include completing and interpreting the National Inpatient Medication Chart, taking patient history, using therapeutic delivery devices, appropriate therapeutic administration, and recognising adverse events and medication errors.

This package was designed to develop participants' knowledge, skills and behaviours in the safe administration of medication, and to expose them to increasingly complex skills and knowledge aimed at testing their ability to combine these individual skills, work as a team and problem solve in more difficult situations.

Educators delivering these modules should be aware of participants' level of experience and choose appropriate modules. Modules presume an increasing level of knowledge as they progress, ranging from a fundamental knowledge of anatomy and physiology for the fundamental modules, up to detailed knowledge of errors associated with drug administration for the complex modules. Novice participants (such as first-year graduates) are expected to start with the fundamental modules, and only move onto intermediate and more complex modules as they demonstrate proficiency. More experienced participants may start at the intermediate level if the educator is satisfied that they have the prior knowledge and skills. Individual educators are responsible for assessing each participant's baseline knowledge and determining which modules they should complete. More specific descriptions of presumed knowledge are outlined in each module.

The design of these packages presumes that the clinical educators using them have knowledge and expertise in current best practice regarding the teaching of clinical skills and conducting facilitated discussions. Knowledge and expertise are presumed commensurate with the Department of Human Services' basic and advanced Train-the-Trainer programs. Clinical educators are encouraged to refer to the Department of Human Services' *Clinical Skills Facilitators Manual* for theory on:

1. Peyton's model for teaching clinical skills
2. leading small group discussions
3. giving feedback
4. crisis resource management skills.



Module 2: Therapy delivery pumps

Authors: Leanne Allen, Katie Cunningham, Julian Van Dijk

Aims

This module gives participants opportunities to practise the use of therapeutic delivery devices which they would use in their clinical setting.

Presumed knowledge

Participants should have completed *Safe medication administration—Module 1: National Inpatient Medication Chart*, and should come to this session having identified the most common therapeutic pumps in their clinical settings.

Objectives

By the end of this module, participants should have:

1. identified commonly used therapeutic infusion pumps used in clinical areas
2. relevant to the machines in each participant's clinical workplace, identified and demonstrated safe:
 3. system setup
 4. setting alarm limits
 5. rate adjustment procedures
 6. demonstrated troubleshooting procedures
7. identified and practised the use of IV therapy rate calculations
8. discussed safe operating practices and procedures for the safe administration of simultaneous IV therapies
9. participated in clinical skills stations developing safe practices for therapeutic infusion pumps.

Background information for educators

Infusion pumps are commonly used in today's health services. Although they provide an accurate and reliable delivery method (if set up correctly), considerable risk is still associated with their use.

This module considers three common infusion pumps currently in use within Victorian hospitals. The information provided does not constitute a textbook for each device, but instead presents an approach to review the use of pumps located in a clinical educator's health service.

The three pumps considered have a range of uses, such as patient-controlled analgesia and continuous infusions, which are seen commonly in the clinical setting. The infusion pumps discussed are:

- Imed pump (Gemini PC–1)
- Grasby® MS16A syringe driver
- Gemstar yellow.

General guide to instruction on pumps and their uses

Instruction on the use of pumps should identify and explore the following topic areas:

Orientation to the pump

Participants should understand what the pump looks like and where the major functional areas of the pump are located. This section can be divided into two areas:

1. pump items—the machine and its orientation
2. lines and tubing used specifically with this pump.

1. Pump items:

- on/off switch
- power supply connections
- locks
- control panels
- sensors, such as the air sensors
- IV line loading or docking points and mechanisms.

2. Lines and tubing:

- connection point to therapy (IV flask) and patient
- section of the line that engages or docks with the pump
- section of the line the engages with sensors
- flow locks that are manually controlled and/or automatically controlled when the line is engaged into the pump (this is normally two locks on most IV lines).

Priming the IV line or tubing

Identify how a line is primed. Some manufactures have a specific method so that air bubbles are not trapped in the air sensor chambers.

Loading or removing the therapy line into the pumps

Observe how the IV lines dock with the pump so that it can function normally.

Pay particular attention to how the line is seated or docked so that relevant sensors (for example, air in the line sensor) function as designed.

Identify how the flow lock is activated if the line is removed from the pumping dock.

Setting up and starting an infusion

There are three stages to setting up and starting an infusion:

1. calculating the correct drug concentration to volume to meet required orders and therapeutic use policies
2. calculating the correct rate for that infusion to be infused over, as per therapeutic orders
3. entering the relevant data on the pump control panel and starting the infusion.

Altering an infusion rate once commenced

When a therapy order changes, the rate may need to be adjusted. Identify how to stop the infusion, adjust the rate and restart.

Accessory infusion modes

Some pumps allow secondary infusion function. Where relevant, these should be identified. Provide instruction on their use.

Particular attention is required to operating policies with these functions in the clinical educator's environment.

Alarms

Identify and/or demonstrate the sound and reasons for alarm activation.

Provide instruction on correcting the issues that triggered the alarm.

Troubleshooting

A range of issues can occur which require troubleshooting at the bedside.

Product manuals generally have significant tables on this subject. Clinical educators should consider the most common troubleshooting point and provide instruction and demonstration to address these issues.

Common issues may include:

- power failure
- battery changes
- air in line
- control panel lock-up
- error messages.

IMED pumps (Gemini PC-1)

The Imed PC-1 pump is a single-line infusion pump, common in many hospitals. Several models are available, and the second-most common is the PC-2 version, which is a dual-line system. However, the information provided here relates specifically to the PC-1.

The Gemini Imed pump derives its name from its capacity to run two infusions from the same line. In practical terms, this enables the setting up of a background infusion rate, for example, of 42 mL per hour, but then set the second infusion function to deliver 100 mL per hour for 2 hours. The pump would then infuse the 100 mL per hour for 2 hours and then return to the background infusion rate of 42 mL per hour once the secondary function was completed.

Pump orientations

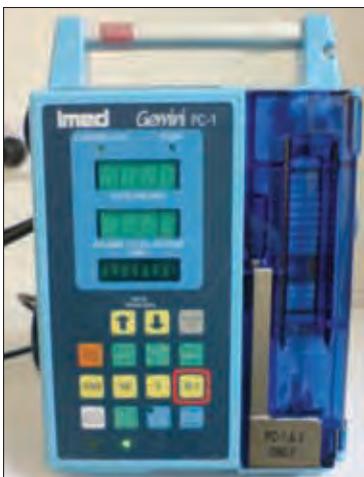


Figure 1: Front



Figure 2: Right side



Figure 3: Back

Instructions for use

Loading a line

The Imed pump requires the specific Imed IV line. Although this line functions in the same way as a normal IV line, it has several distinct features. When unpacked, the line has a stiff blue sleeve surrounding the middle section. The sleeve is left in place while priming the line, because the tubing below this is very soft and tends to collapse without support. However, this is normal, because in operation, this soft section is placed in direct contact with the caterpillar drive of the Imed pump.

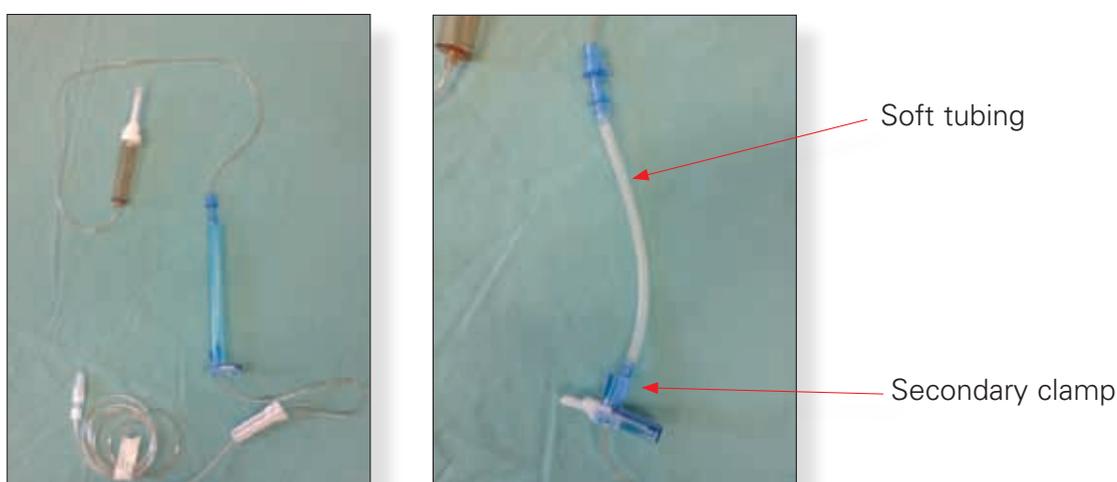


Figure 4: Imed IV line unpacked

The other noticeable feature is a double clamp system. One clamp looks the same as a normal IV flow regulator. The other, less obvious clamp is set at the bottom of the soft tubing. This second clamp is activated when the IV line is taken out of the Imed pump. This provides a secondary backup if the line is removed quickly, to minimise the risk of unintentional uncontrolled infusion rate.

The Imed IV lines have several variations. The two that are commonly used are the standard IV flask line and a syringe driver line, used with 50 mL lure lock syringes.

Loading

The IV line is loaded into the pump section of the Imed, concealed on the right-hand side behind a blue door.

Once opened, the line is placed to cover the caterpillar pump drive, and seated in the tubing 'fitment' point, both at the top and bottom of the pump. The bottom section also seats the secondary clamp (flow stop recess), and is also the pump's air sensor.

With the line primed and set in place, the door, once closed, opens the secondary clamp (although the IV cannot run until the **[START]** button is activated on the Imed).

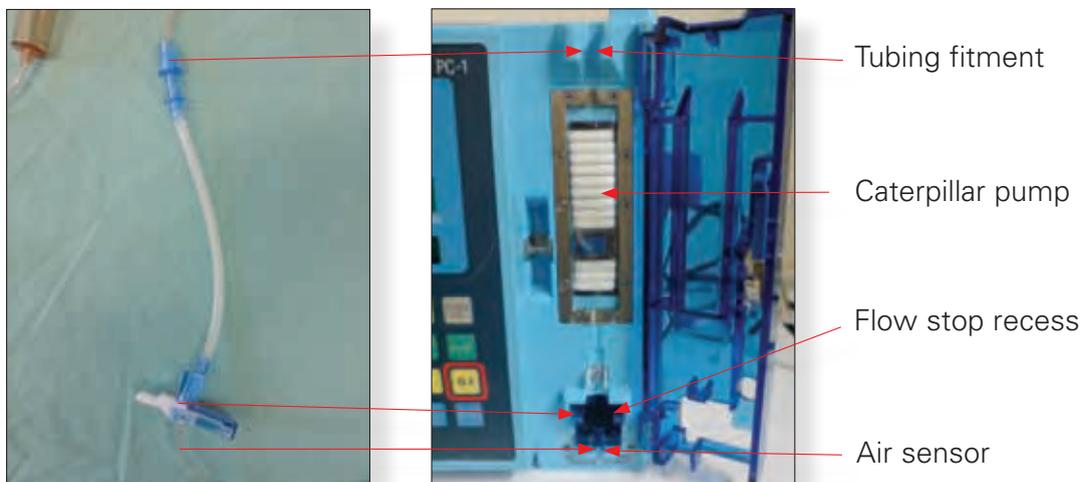


Figure 5: Imed pump with IV line loading points identified

Power on and off

To turn on the Imed pump:

1. Press the grey **[POWER ON]** button.

To turn off the Imed pump:

2. Press the orange **[PAUSE/STOP]** button twice. You will then see a countdown to off in the functions screen.

The Imed pump can be powered either by direct wall socket electricity or by battery. The amount of battery life (depending on age of the machine) is approximately 8 hours. Should the batteries run flat, the Imed will beep every 2 minutes and indicate LOW BATTERY on the activity screen, until it is again plugged into the wall.

Should the Imed run critically short of power, it will beep continuously and loudly until plugged in.

Setting a rate and volume

After pressing the grey Imed **[POWER ON]** button:

1. Press the **[RATE]** button and enter the rate in mL per hour required.
2. Press the **[VOLUME]** button and enter the volume to be infused over that time.
3. Enter the values and recheck them against the written order and calculations made.
4. Press the **[START]** button to run the infusion.
5. Document the infusion start time and details (according to the local health service policy).

To determine the rate per hour use the following calculation:

Equation to determine mL per hour (rate)

$$\frac{\text{Volume}}{\text{Time}} = \text{mL per hour (rate)}$$

Making an alteration to either rate or volume

1. Press the orange **[PAUSE/STOP]** button.
2. Select either the rate or volume that requires alteration.
3. Recheck these values against the written order and calculations made.
4. Enter the changes required.
5. Press the **[START]** button to run the infusion.
6. Document the infusion start time and details (according to the local health service policy).

Special note regarding infusion rates

Although the pump can deliver a large amount of fluid, the Imed company dose not recommend infusions above 500 mL per hour.

Piggyback function

This function can be used to run loading doses or volume bolus from the same infusion or IV flask, and then revert back to the original settings when required.

To set up the piggyback, first determine that the therapeutic agent or health service policy allows the use of this function.

1. Press the blue **[PIGGYBACK]** button. Once this is selected, a green light in the top left-hand corner activates to identify that the pump is running in a piggyback mode.
2. Press the **[RATE]** button and enter the rate in mL per hour required.
3. Press the **[VOLUME]** button and enter the volume to be infused over that time.
4. Enter the values and recheck these values against the written order and calculations made.
5. Press the **[START]** button to run the infusion.
6. Document the infusion start time and details (according to the local health service policy).

Once the secondary infusion is complete, the machine will beep three times and revert back to the previous infusion setting.

Although this function can be extremely useful, the proper documentation must be recorded regarding its use. Clear handover instructions to other health care providers who may manage the patient are essential.

Micro mode

Due to the need for precise dose administration for a variety of infusions (due to small doses or doses titrated to patient weight), the rate and volume setting can be set to operate in a micro mode.

When activated, the micro mode allows increments of 0.1 mL per hour. This compares to macro settings, which allow increments of 1.0 mL per hour. The setting of the macro to micro, and micro back to macro, requires the user to turn off the pump to initiate the conversion.

To set the micro function:

1. Press and hold the **[MICRO]** button (surrounded by the red border).
2. While holding the **[MICRO]** button, press the grey **[ON]** button to activate the pump.
3. Continue holding the **[MICRO]** button until you hear a single beep, which indicates that the lmed is now in micro mode.
4. Set the required micro rate and volume as per normal function.

To turn the mode back to macro:

1. Turn off the pump.
2. Press and hold the **[100 YELLOW]** button.
3. While holding the **[100 YELLOW]** button, press the grey **[ON]** button to activate the pump.
4. Continue holding the **[100 YELLOW]** button until you hear a single beep, which indicates that the lmed is now in macro mode.
5. Set the required micro rate and volume as per normal function.

This function can cause some confusion, because the pump lacks instructions on the unit for how to change between these modes.

Some health services always leave the pump in a macro mode so that the pump can be set up quickly to deliver large amounts of fluid without delay. However, this depends on the health service.

Locking the key pad

If you are required to lock the control panel:

1. Go to the back of the Imed pump and locate the silver **[VOLUME]** control on the left-hand side.
2. Press this control and hold until you hear a single beep.
3. The activity screen on the front on the Imed will continually scroll the message 'locked'.

To reverse the lock, perform exactly the same procedure until you hear a single beep and the message reads 'unlocked'.

Syringe drivers

The syringe driver is a battery-operated device designed to deliver an infusion of medications over a period of time. They commonly deliver medications subcutaneously and continuously over a 24-hour period, for example, using a Grasby® syringe driver. They are commonly used in palliative care, with the indication being the inability to maintain delivery of medications by the oral route, for example, with increasing weakness, a decrease in consciousness, profound nausea/vomiting, bowel obstruction or dysphagia. Syringe drivers are often used for a combination of medications.

The initiation of medication delivery via a syringe driver infusion is by prescription by a medical officer. The medical order for syringe driver contents must be documented on the NIMC, or alternative special analgesia chart, including diluent.

Some organisations require specific accreditation to use a syringe driver.

Models of syringe drivers

Different models of drivers are useful, depending on the rate of medication delivery required. For example, the Grasby® MS16A delivers medication in millimetres per hour and does not have a boost function; whereas the Grasby®MS26 model delivers medication in millimetres per 24 hours and has a boost function. Your organisation may have only one model available. The information provided in this learning package is based on the Grasby® MS16A model, because it is the most commonly used in the inpatient setting.

Instructions

Resources for the syringe driver setup and operation, and the requirements for checking procedures during the infusion are found in the instruction manual of the syringe driver used and the health service's policy and procedures manual.

Medications infused subcutaneously are subject to the same legal and health service requirements as for any other route, including the legal requirements for Schedule 8 and 11 substances when these are prescribed.

The general principles in using a syringe driver are outlined below.

Preparing the syringe driver for use

Check the battery by placing it in the syringe driver and pressing the **[START]** button. The light will flash in the indicator lamp every second if the battery is functioning. The alarm sounds for approximately 15 seconds after the battery is fitted or until the **[START]** button is pressed.



Figure 6: Start button location

Medication preparation

Some medications are commonly used in syringe drivers, including:

- opioids
- anti-emetics
- sedatives, anxiolytics and anticonvulsants
- corticosteroids
- anticholinergic.

It is recommended that no more than two compatible drugs are placed in a single syringe driver. Information on drug compatibilities is available in *Therapeutic Guidelines Palliative Care Version 2* (2005, pp. 328–329).

1. Draw up the prescribed medications as per the medication order.
2. Carefully place the adhesive additive/measurement label on the syringe.
3. Add diluent to make up to 48 mm in length, as per the measuring label on the syringe. Accuracy is paramount, because excess drug solution cannot be discarded after adding the diluent.

Loading medication into syringe driver

1. Calculate the rate for infusion using the following formula as a guide:

$$\frac{\text{Length of liquid (mm)}}{\text{Infusion time (hours)}} = \text{rate of infusion (mm per hour)}$$

2. Set the rate on the syringe driver, before priming the infusion line, ensuring both numbers are:
 - a. centred in the rate setting window
 - b. can be seen clearly in full
 - c. are in alignment
 - d. checked with syringe driver lying flat and held at an angle.



Figure 7: Setting the rate correctly

3. Prime the infusion line:
 - a. Attach extension tube, interlink equipment and needle for insertion (if required) to the syringe, and prime the line using the syringe contents.
 - b. Calculate how much earlier the syringe will be due through as a result of priming the line, using the following formula:

x = volume length in mm
 y = volume length in mm after priming
 z = volume length in mm lost in priming
 r = rate (mm per hour)

$x - y = z$; then z/r = lost time in hours due to priming

For example, $48 - 44 \text{ mm} = 4 \text{ mm} / 2 \text{ mm} = 2 \text{ hours lost}$

Based on this example, the syringe driver will finish in 22 hours.

4. Place the syringe in the driver, fitting it securely under the fastening band and ensuring that the plunger of the syringe is aligned in the correct position.
5. Insert subcutaneous needle (if not already in situ) following the health service's policy and procedures manual for safe and effective insertion.



Figure 8: Loaded syringe driver

Starting the syringe driver

1. Check the rate is set correctly.
2. Press the **[START]** button and ensure the light is flashing.
3. Cover the syringe driver with the clear plastic protective cover or lockbox.
4. Monitor the infusion according to the health service's checking procedures, paying attention to the insertion site, patient symptoms and the correct functioning of the syringe driver.

Documentation

1. Sign and document the date and starting time of the infusion on the NIMC or special analgesia chart.
2. Document the rate in mm, amount of medication remaining in mm in the syringe, location of insertion site, expected completion time and contents. Print your name and sign on the health service administration and checking record document, along with any other requirements.

Checking procedures

The procedures for checking medication administration via a syringe driver differ between health services, so refer to the local health service's policy and procedures manual for advice. Generally, the progress of the syringe driver infusion, condition of the insertion site and the integrity of the system should be checked 30 minutes after commencement of every syringe, and thereafter, every hour, at the beginning of each shift and more frequently if indicated. Use an administration and checking record to document observations.

Safety principles

Safety principles for using a syringe driver are outlined on the following page.

Rate settings

Previously, confusion between drivers in relation to rate setting (for example, the Grasby® MS16A and MS26) led to fatal errors. It is important to check the model of driver used and over what timeframe medications are normally delivered. In some health services only one model is available to reduce the risk of this confusion resulting in errors.

Take care when setting the rate on syringe drivers, particularly the Grasby® models. A misjudgement in setting the rate can easily result in overdose. The rate window must be carefully observed before and during use. The clear plastic protective cover or lockbox can protect from deliberate or accidental tampering of the rate during the infusion.



Figure 9: Incorrect rate setting—notice the non-centred 3 mm per hour

Battery charge

If the light in the indicator lamp on the front of the syringe driver does not flash (Grasby® MS26 every 25 seconds or MS16A every second), the battery requires replacement.

Boost function on Grasby® MS26

The Grasby® MS26 has a boost function. Using this is not recommended for several reasons:

- there is no lockout period
- the dose administered cannot be titrated to requirements
- drugs other than analgesics are usually present, and boost doses of these should not be given
- boost doses can cause pain at the injection site
- the overall duration of the infusion is reduced.

Stability of medications

Protect the contents of the syringe and giving set from direct sunlight to maintain stability of the mixtures.

Patient-controlled analgesia (PCA) pumps

Patient-controlled analgesic (PCA) infusion pumps allow patients to self-administer narcotic analgesics within the set limits prescribed by the physician. PCA therapy is typically used for postoperative, obstetric, terminally ill and trauma patients. PCA pumps deliver solutions intravenously, subcutaneously or via epidural administration. The pump allows the patient to trigger the administered dose by means of a pendant button on a cord connected to the pump or a button directly on the pump.

The aim of PCA is enhanced pain control. Immediate delivery of pain medication is administered without the need for a nurse to administer it. The patient controls the timing of administration. PCA enables frequent, but smaller doses of medication, thus providing improved levels of medication within the patient's body. Syringe-injected analgesia administration by a nurse requires larger doses of medication given at prescribed intervals. Larger doses peak shortly after administration, frequently resulting in undesirable side-effects such as nausea and respiratory depression. Their pain relief effects frequently subside before the next scheduled dose.

For the purpose of this section, the Abbott GemStar pain management pump was selected for discussion. For ALL alternative delivery pumps, refer to individual operating manuals.

Abbott GemStar pain management pump

Background

The Abbott GemStar is a small volumetric pump designed to deliver analgesic or anaesthetic drugs for patient-controlled pain management either in ward situations or at home. A simple peristaltic pumping action gives notable flow accuracy.

The GemStar can be powered by AC mains adaptor, rechargeable battery pack, docking station or two disposable AA alkaline batteries. Powering by batteries is ideal for ambulatory patients (see the *Abbott GemStar System Operating Manual*). The maximum continuous flow rate is limited to 25 mL per hour. The *Operating Manual* includes instructions on this priming procedure. The front panel is small, but a clear, four-line LCD display is used to show appropriate data, and the buttons are clear and appropriately worded. LEDs are also provided to emphasise alarms and indicate power supply status.

Infusion pump programming follows commonsense steps, and requires the operator to review set parameters to reduce the chance of error. A full range of alarms is provided, combining an audible signal with an appropriate display message. The operating manual is well written and clear. Instructions are not provided on the pump casing, but a help key is provided to give guidance for each phase of the pump programming procedure.

GemStar infusion pump administration set

Due to problems of freeflow, GemStar infusion pump administration sets without an anti-siphon valve have not been available in Australia since 2001. Only sets with an anti-siphon valve have been available from Abbott. Since then, reports have been made where the operator has removed the anti-siphon valve to prime the line. Subsequently, the valves have not been replaced and when the administration set has been placed incorrectly into the pump, free flow has occurred. The problem occurs only with general-purpose GemStar administration sets. Abbott GemStar **patient-controlled analgesia and epidural sets do not have a removable anti-siphon valve.**

'If the cassette in the administration set is not placed into the pump correctly, or if the cassette flow control switch is not set to STOP or OFF after priming, the patient may receive an overdose.'

Recommendations

Avoid removing the anti-siphon valve for priming, or for any other reason.

If the anti-siphon valve is removed, additional checks should be used to prevent freeflow. Specific checks should include ensuring that the cassette flow control is set to stop or is off, that the cassette has been installed correctly and a check of all connections and clamps during setup and before connecting to the patient.

Both the pump and the setup instructions for use should be followed at all times during setting up.

Compact and portable

The GemStar Yellow unit is dedicated to a single therapy: **pain management.**



Figure 10: GemStar Yellow unit

Instructions

Refer to the GemStar system operating manual and the local health service's policies and procedures manual for pump setup and operation and checking procedure requirements during infusion.

Medications infused via PCA are commonly opioids, which are subject to the same legal and health service requirements for Schedule 8 and 11 substances when prescribed. When preparing medication for PCA, a legal prescription is required; the 'five rights' of medication administration should also be adhered to.

Basic equipment

The basic equipment required for using the Abbott GemStar pump includes:

- Abbott GemStar pump
- appropriate power source
- appropriate Abbott GemStar pump set
- appropriate fluid container
- patient access device.

Overview/operation

To start a therapy (also refer to the Abbott GemStar System Operating Manual):

1. Determine the program settings.
2. Select a power source.
3. Prime the pump set.
4. Load the cassette into the pump.
5. Power on the pump and go to the programming menu.
6. Select the appropriate optional system components, such as a bolus cord.
7. Select the delivery mode and enter a program.
8. Press **[START]** to begin delivery.

Preparing for use

Selecting a power source

| Power source | Description | Ambulatory | Hospital | Home | Note | Caution |
|---|---|------------|----------|------|--|---|
| Abbott GemStar AC mains adaptor (universal) | Tabletop adaptor plugs into a 100–240 VAC mains supply. | | * | * | The green LED on the pump remains lit when connected to AC mains. | ALWAYS connect to a grounded mains power source. USE ONLY AC mains adaptors specifically labelled for use with the Abbott GemStar pump. |
| Abbott GemStar docking station | Plugs into a 100–240 VAC volt mains supply while mounted on an IV pole. Internal rechargeable batteries power the Abbott GemStar pump during periods of transport. | * | * | * | Docking station light is yellow while the docking station is charging. When the docking station is fully charged, the light is green. | |
| Abbott GemStar battery pack | The rechargeable nickel metal hydride batteries power the Abbott GemStar pump during periods of transport or when use of AC power is not desirable. | * | * | * | A fully charged battery pack will last approximately 24 hours when the pump is infusing at rates less than 125 mL per hour. | When removing the cord from the bottom of the pump, firmly grasp the connector and pull straight out—DO NOT twist or bend the cord or connector. |
| Disposable batteries | Two disposable AA alkaline batteries. | * | * | * | | To ensure proper pump operation, ALWAYS replace BOTH batteries with fresh, disposable AA batteries when charge is required. Use of rechargeable batteries in the battery compartment is NOT recommended. Install two fresh, disposable AA batteries for backup power when using an external power source. The pump will continue to operate on backup power if the external power source fails. |

Powering on the pump

CAUTION: If the pump does not display the self-test, or if beeps do not sound at power on, check all power connections and install two fresh disposable AA batteries. If the problem continues, contact Abbott customer support before using the pump.

If the cassette is not correctly loaded, the pump will alarm after the power on test is complete.

The self-test takes 30 seconds to complete. For pump checks for available power sources, refer to the *Abbott GemStar System Operating Manual*.

Abbott GemStar pump set

- The pump set is a sterile, single-use, disposable set.
- ALWAYS prime the pump set to remove air from the cassette, tubing and injection sites before connecting to the patient.
- ALWAYS disconnect the pump set from the patient before priming or purging.
- Arrange tubing to minimise risk of strangulation or entanglement.

Priming Abbott GemStar pump sets

For instructions on priming GemStar pump sets, refer to the *Abbott GemStar System Operating Manual* be resourced.

For ALL GemStar pump sets:

CAUTION: Ensure all four cassette latches are clearly visible after the cassette is installed.

When priming is complete, ensure no fluid flows at the distal end of the pump set. If flow is observed, DO NOT use the pump set.

WARNING: Failure to use the anti-siphon valve may result in unrestricted flow.

- priming Abbott GemStar pump sets WITHOUT a drip chamber
- priming Abbott GemStar pump sets WITHOUT a drip chamber using the PURGE key
- priming Abbott GemStar pump sets WITH a drip chamber
- priming Abbott GemStar pump Sets WITH a drip chamber using the PURGE key
- priming Abbott GemStar pump sets using pre-filled vials
- priming Abbott GemStar pump sets with extensions.

The table below gives specific cautions and warnings.

| Pump set | Caution | WARNING |
|--|--|---|
| Priming Abbott GemStar pump sets WITHOUT a drip chamber | The PURGE function is only available if there is a program in the pump | |
| Using the PURGE key | Purge rate is 250 mL per hour. The pump purges for up to 2 minutes each time you press and hold. | |
| Priming Abbott GemStar pump sets WITH a drip chamber | | When using a vented chamber, ALWAYS use an air-eliminating filter OR set the air sensitivity to either ON or 2 mL. |
| Priming Abbott GemStar pump sets WITH a drip chamber using the PURGE key | The purge function is only available if there is a program in the pump. Purge rate is 250 mL per hour. The pump purges for up to 2 minutes each time you press and hold. | When using a vented chamber, ALWAYS use an air-eliminating filter OR set the air sensitivity to either ON or 2 mL. |
| Priming Abbott GemStar pump sets using pre-filled vials | When using pre-filled vials, the system may under-deliver at low flow rates. Make sure all four retainer clips are clearly visible after the cassette is installed. Close ALL slide clamps before removing the cassette from the pump. | |

Loading and releasing pump set

| Pump operation | Instruction | Caution |
|-------------------------------------|--|--|
| Loading the GemStar cassette | <p>Insert the cassette into the cassette pocket by pushing firmly along the entire cassette until it is firmly seated.</p> <p>Place the tubing in the tubing channel.</p> | Make sure the cassette is properly installed. When properly installed, all four cassette latches visibly hold the cassette securely in the cassette pocket. |
| Releasing the cassette | <p>Close the clamp or slide clamp on the distal line.</p> <p>Push down on the cassette release (large black button) on the top of the pump.</p> <p>Remove the cassette.</p> <p>When the cassette is released from the pump, the cassette flow stop automatically closes, preventing free flow.</p> | |

Programming the pump

Programming overview

The menu provides a guide to take the operator through all the programming steps.

1. Select the therapy of choice.
2. Respond to messages displayed and enter values.
3. Entries can be changed any time before completion of program review. Press **[BACK-UP]** to return to the previous display and make necessary changes.
4. To review the program. Press  to begin review. Press **[YES/ENTER]** when finished.
5. SAVING PROGRAM displays. The pump will store the entered program and then enters STOP mode.

Pain management programming

1. Select the delivery mode. For continuous and bolus selection, the rate or dose can be set to zero via the CHANGE menu without pump reprogramming.
2. Select the unit of measure and concentration required.

3. Set the continuous delivery rate. The pump only delivers in increments of 0.1 mL. For example, at a concentration of 15 mg/mL, a rate of 5 mg rounds to 4.5 mg. For example: 5 mg = 0.333 mL; 4.5 mg = 0.3 mL. When a value is rounded, the pump sounds four quick beeps, displays ROUNDING for a few seconds, the rounded value is then displayed. Press **[YES/ENTER]** to accept the rounded value and continue to the next step.
4. Program a loading dose as required.
5. Program a bolus dose with lockout time and dose limit as required.

Regarding a one-hour or a four-hour dose limit

The hour dose limit is the maximum volume (continuous plus bolus or bolus only amount) which can be delivered over the selected period. When the programmed dose limit is reached, the continuous delivery stops and a new bolus is not allowed. If programmed once the one-hour or a four-hour time limit is reached, continuous delivery or bolus requests resume.

If a one-hour or a four-hour limit is programmed, a bolus in progress will stop when the amount infused reaches the dose limit.

Loading doses are included in a one-hour or a four-hour dose limit. A dose limit in effect could prevent the delivery of a loading dose.

6. If programmed in units of μg (mcg, micrograms) or mg, the line displaying the units flashes. Enter the container size in proper unit measure. To enter the total in mL when programming a concentration, press  to move to the mL line. Enter the mL value when mL flashes on the display.
7. Select the air sensitivity, if requires.
8. Review the program. Press  to begin review.
9. If using the **[PURGE]** key to prime the pump set, press **[PURGE]** now.

WARNING: If cassette is removed from the pump, ALWAYS disconnect the pump set from the patient and purge the line before restarting therapy.

Bolus delivery

Bolus doses are delivery limits are set when programming. For pain management, 125 mL per hour is the default for bolus dose delivery rate.

Attach a bolus cord for patient bolus request.

Delivering a bolus dose

Using the RUN mode, press either the bolus button **[+]** on the top of the pump or the button on the end of the bolus cord. This will begin delivery of the bolus dose. The pump will flash BOLUS DELIVERY on the display and the amount infused accrues as the delivery progresses.

When the bolus dose is complete, the pump:

- records the bolus request and amount delivered at that request and logs bolus history
- adds bolus delivered to the total bolus amount
- resets the bolus lockout time (if applicable)
- continues with programmed infusion.

If bolus delivery does not commence, it could be locked out due to the following:

- bolus lockout period
- loading dose delivery in progress
- bolus dose delivery in progress
- bolus per-hour limit
- one-hour or four-hour dose limit.

Bolus dose interruptions

It is possible for bolus delivery to be interrupted by:

- pressing **[STOP]**
- an alarm condition.

To continue bolus delivery after interruption:

1. Press **[START]**. The pump displays COMPLETE BOLUS NOW?
2. Respond as follows.

| To do this: | Press this key: | Bolus lockout time is set to: |
|------------------------------------|--------------------|------------------------------------|
| Deliver the remaining bolus amount | [YES/ENTER] | the time of delivery completion |
| Clear the undelivered bolus amount | [NO] | the time the bolus was interrupted |

Loading dose delivery

A loading dose is set during programming and can be delivered once programming and priming are complete.

Loading dose amounts are inclusive of the one-hour or a four-hour dose limit.

Delivering a loading dose

After priming and programming, press **[START]**.

The pump displays DELIVER THE LOADING DOSE NOW? Press **[YES/ENTER]** to begin loading dose.

When the loading dose is complete, the pump:

- automatically commences the programmed infusion
- records dose amount in the history log
- resets the bolus lockout time (if applicable).

Loading dose interruptions

It is possible for loading dose delivery to be interrupted by:

- pressing **[STOP]**
- an alarm condition.

To continue loading dose delivery after interruption:

1. Resolve the interruption.
2. Press **[START]**. The pump will display COMPLETE THE LOADING DOSE?
3. Respond as follows:

| To do this: | Press this key: |
|---|--------------------|
| Deliver the remaining loading dose amount | [YES/ENTER] |
| Clear the remaining loading dose amount | [NO] |

Review program

1. Press **[OPTIONS]** and select REVIEW PROGRAM.
2. The pump displays PROGRAM REVIEW.
3. Press  to begin review.
4. Press **[YES/ENTER]** or **[BACK-UP]** when done to exit OPTIONS.

REVIEW HISTORY

HISTORIES
KEYPAD LOCK
PUMP SETTINGS
SET CLOCK
PRINT
SPEED CONTROL

Changing a pain management program

| Can be changed at any time | Cannot be changed |
|---|--|
| <ul style="list-style-type: none"> ■ delivery rate ■ bolus ■ bolus lockout ■ container size ■ air sensitivity ■ dose limit amount | <ul style="list-style-type: none"> ■ delivery mode ■ unit of measure ■ concentration ■ dose limit type |

When the pump is in FULL or CONTAINER lock the program cannot be changed. A RATE CHANGE lock allows the continuous delivery rate or bolus amount to be changed within the set ranges.

Delivery mode cannot be changed. However, a continuous rate or bolus volume can be altered to zero unless there has been a minimum value set with a RATE CHANGE lock.

To change a program:

1. From the STOP mode, press **[CHANGE]** and select CHANGE PROGRAM.
2. Make the changes as each message is displayed or press **[YES/ENTER]** to accept the current setting.
3. Review the program. Press  to begin review.
4. Press **[START]** to begin delivery.

Change pump settings (ALARMS)

1. Press **[OPTIONS]** and select PUMP SETTINGS.
2. Press the number key for desired pump setting.
3. Follow messages displayed and refer to chosen pump setting instructions for additional information.

Press [HELP] for additional information during programming and alarm conditions.

| |
|----------------------|
| REVIEW HISTORY |
| HISTORIES |
| KEYPAD LOCK |
| PUMP SETTINGS |
| SET CLOCK |
| PRINT |
| SPEED CONTROL |

Documentation

Sign and document the date and starting time of the infusion on the NIMC/special analgesia chart.

Histories*

1. Press **[OPTIONS]** and select HISTORIES.
2. Select the number key for the desired function.
3. Complete the appropriate steps for selected function.

Using the HISTORIES selection to gather infusion data document on the health service special analgesic nursing observation chart.

| |
|------------------|
| REVIEW HISTORY |
| HISTORIES |
| KEYPAD LOCK |
| PUMP SETTINGS |
| SET CLOCK |
| PRINT |
| SPEED CONTROL |

Checking procedures

The procedure for checking medication administration via a PCA pump varies between health services. Refer to local health service policy and procedures manual. However, the following are a guide:

- The infusion flask and the rate of the infusion should correspond to the written order on the NIMC/health service analgesia infusion treatment sheet.
- The rate of the infusion corresponds with the 'hourly volume' recorded on the local health service special analgesia nursing observation chart.
- All extra boluses have been recorded on the local health service special analgesia nursing observation chart and health service analgesia infusion treatment sheet.
- The cumulative total has been recorded accurately on the local health service special analgesia nursing observation chart.
- The checking and administration process for a bolus dose or rate adjustment is the same for all S8 drugs (refer to local policy).

Troubleshooting

| Alarm display message | Remedy |
|---|--|
| AIR IN LINE Pump automatically enters STOP mode. | Press [SILENCE] to quiet the alarm for 1 minute. Press [STOP] to clear the alarm. Disconnect the patient from the pump set. Press and hold [PURGE] . Reconnect the pump set to the patient-access device. Press [START] to begin delivery. |
| CHANGE BATTERIES | Replace both AA batteries and press [POWER] button on pump to restart the pump. Alternatively, connect the pump to the AC mains adaptor to restart the pump automatically. Replace batteries as soon as possible. After power on, resume current program. |
| CHECK CASSETTE-X | Press [SILENCE] to quiet the alarm for 1 minute. Press [STOP] to place the pump in the STOP mode. Reinstall the cassette. Press [START] to commence delivery. |
| CALL 1.800.XXX.XXXX CODE: NN/MMM/TTT | Write down the telephone number and code. Power off the pump. If pump fails to power off, disconnect external power and remove batteries. Call the telephone number displayed. |
| DIST. OCCLUSION | Press [SILENCE] to quiet alarm for 1 minute. Press [STOP] to place pump in STOP mode. Check for causes of distal occlusion: <ul style="list-style-type: none"> ■ kinked tubing below the pump ■ clamped patient access device ■ clogged IV filter ■ other obstructions. If the problem continues, remove and reinstall cassette. Press [START] to commence delivery. |
| LOW BATTERIES | Press [SILENCE] to quiet alarm for 1 minute. Press [STOP] to place the pump in the STOP mode. Connect pump to AC mains adaptor, rechargeable battery pack, OR replace AA batteries with new. Press [START] to commence delivery. |
| POWER LOSS | Connect the pump to AC mains adaptor rechargeable battery pack, OR replace AA batteries with new. Power on the pump. Review program and press [START] to commence delivery. |

Troubleshooting (cont.)

| | |
|----------------------------------|---|
| PROX. OCCLUSION | <p>Press [SILENCE] to quiet alarm for 1 minute.</p> <p>Press [STOP] to place the pump in the STOP mode.</p> <p>Check for causes of proximal occlusion:</p> <ul style="list-style-type: none"> ■ kinked tubing above pump ■ blockage in the bag and in the spike ■ empty bag ■ high torque syringe ■ other obstructions. <p>If the problem continues, clamp the distal line and reinstall the cassette.</p> <p>Press [START] to commence delivery.</p> |
| USING BATTERIES | <p>When powering on the pump:</p> <ul style="list-style-type: none"> ■ Press [YES/ENTER] to confirm disposable batteries as the only power source. <p>When switching from AC mains:</p> <ul style="list-style-type: none"> ■ Press [SILENCE] to clear the alarm. |
| USING EXT BATT | <p>When powering on the pump:</p> <ul style="list-style-type: none"> ■ Press [YES/ENTER] to confirm external battery power source. <p>When switching from AC mains:</p> <ul style="list-style-type: none"> ■ Press [SILENCE] to clear the alarm. |
| ALMOST EMPTY | <p>Press [SILENCE] to quiet alarm for 1 minute.</p> |
| CHECK PRINTER | <p>Press [SILENCE] to quiet alarm for 1 minute.</p> <p>Ensure the printer is connected properly:</p> <ul style="list-style-type: none"> ■ printer powered on and in ONLINE mode ■ cable is plugged in to both pump and printer ■ cable part number and printer settings are correct. <p>If problem continues select STOP PRINT to cancel jobs.</p> |
| EMPTY CONTAINER | <p>Press [SILENCE] to quiet alarm for 1 minute.</p> <p>Press [STOP] to place the pump in the STOP mode and clear the alarm.</p> <p>Use the NEW CONTAINER function to repeat current program.</p> |
| Line four of the display flashes | <p>Follow instructions to clear the alarm.</p> |
| PROGRAMMING INCOMPLETE | <p>Press any key to clear alarm.</p> <p>Complete programming.</p> |
| START flashes | <p>Press [SILENCE] to quiet alarm for 3 minutes.</p> <p>Follow instructions.</p> |
| OTHER DISPLAY MESSAGES | <p>See <i>Abbott Gemstar System Operating Manual</i>.</p> |

Learning activities

Suggested learning activities and timetables are outlined below.

| Timing | Activity | Objective |
|------------|------------------------|-----------|
| 30 minutes | Facilitated discussion | |
| 45 | Skills stations | |
| 10 | Summary | |
| 5 | Evaluation | |

Total time = 1 hour 25 minutes

Facilitated discussion

The facilitator should lead a discussion amongst participants about the issues covered in the background information. The facilitator should not give a didactic lecture, but instead promote open discussion and knowledge sharing amongst participants. Participants should be encouraged to describe any real-life experiences they have encountered.

Major issues which the facilitator should ensure are covered include:

- normal operation of each pump used
- setup
- alteration in doses
- troubleshooting tips
- potential risks associated with the use of these devices.

Skills stations

Each health service is different regarding what pumps are used. Therefore, the skills stations focused on the three pumps discussed. Although clinical educators will use the pumps that they use in their health services, we recommend setting up skills stations to practise normal uses.

Set up for each skills station for each pump. The station should have an IV pole or device stand so that normal operation can be practised.

Consumables such as IV line and fluid bags are required.

Each skills station should run for 15 minutes and then rotate to a new station.

Each station should provide the participants with the opportunity to:

- turn the pump on and off
- identify the power source
- if batteries are required, then practise how to change them
- prime and load the relevant IV Line
- set both the rate and volume
- increase and decrease the rate once the pump is activated
- set alarm limits
- identify how to lock and unlock the pump
- troubleshoot common problems such as air in the line
- identify any unique functions of the pump and how to use them—if relevant to the participant's clinical setting
- identify and practise relevant documentation.

Resource list

The following resource list assumes three facilitators for every 12 participants, a ratio of 1:4. As a minimum, the following resources are needed to conduct this module.

| Resource | Quantity | Additional comments |
|-------------------------------|----------|---------------------------------------|
| Facilitators | 3 | Allows 1:4 ratio with 12 participants |
| PowerPoint presentation | 1 | |
| IV poles | 3 | One for each |
| Pumps for the session | 3 | 1 for each skills station |
| IV fluid | 3 | 1 bag per table |
| Relevant documentation charts | 5 | |
| Evaluation forms | 12 | One for each participant |

Evaluation

A formal evaluation has been specifically developed for this module. It incorporates the objectives of the module and the perceptions of the participants about whether they have increased their understanding by working through the module. It is highly recommended that this formal evaluation be copied and completed by all participants at the completion of the module.

A range of informal evaluation tools may also be used in conjunction with this evaluation throughout the module, including those available in the *Department of Human Services' Clinical Skills Facilitators Manual* from the basic course conducted in 2007.

References

Abbott GemStar System Operating Manual.

Resources

Facilitator feedback form

The following form should be used to assist you in giving feedback after each participant has practised utilisation of therapeutic pumps skills at the skills station.

Feedback using the Pendleton model

Pendleton's model of feedback assists learners to maximize their potential at different stages of training, raise their awareness of strengths and areas for improvement, and identify actions to be taken to improve performance. Pendleton's rules are structured in such a way that the learner identifies the positives first, in order to create a safe environment. This is followed by the facilitator or group reinforcing these positives and discussing skills to achieve them. Different techniques are then suggested. The advantage of this method is that the learner's strengths are discussed first. Avoiding a discussion of weaknesses right at the beginning prevents defensiveness and allows reflective behaviour in the learner.

Below is a series of questions to assist you in this technique:

1. Ask the learner how they feel.
2. Ask the learner what went well and why (this can be combined with question 1 and 3).
3. Tell the learner what went well and why.
4. Ask the learner what could have been done better and why.
5. Tell the learner what could have been done better and why.
6. Summarise the learner's strengths and identify up to three things to concentrate on.

Note: This form does not need to be given to the participant — it is a guide for you, the group facilitator.

Module 2: Therapy delivery pumps—evaluation

Thank you for participating in this module. As part of our commitment to quality improvement the following questionnaire will be used to plan future implementation of this module. We appreciate your time completing this evaluation.

1. Overall

How would you rate this module?

poor fair good very good outstanding

2. Learning objectives

Please consider whether this module was successful in meeting the following learning objectives:

| <i>Safe medication administration</i> Learning objectives of Module 2: Therapy delivery pumps | Strongly disagree | Disagree | Slightly agree | Agree | Strongly agree |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Identified commonly used therapeutic infusion pumps used in clinical areas | <input type="checkbox"/> |
| Identified and demonstrated safe: <ul style="list-style-type: none"> ■ system setup ■ setting alarm limits ■ rate adjustment procedures —relevant to machine in each participant's clinical workplace | <input type="checkbox"/> |
| Demonstrate troubleshooting procedures | <input type="checkbox"/> |
| Identified and practised the use of IV therapy rate calculations | <input type="checkbox"/> |
| Discussed safe operating practices and procedures for the safe administration of simultaneous IV therapies | <input type="checkbox"/> |
| Participated in clinical skills stations developing safe practices for therapeutic infusion pumps | <input type="checkbox"/> |

3. Important learning outcomes

What are the three most important things you have learned from this module?

4. Module implementation

Please indicate to what extent you agree or disagree with each of the following statements in relation to the implementation of the module.

| | Strongly disagree | Disagree | Slightly agree | Agree | Strongly agree |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| The facilitator respected my experience | <input type="checkbox"/> |
| The facilitator encouraged my participation | <input type="checkbox"/> |
| I was able to ask the facilitator questions | <input type="checkbox"/> |
| The facilitator was able to answer my questions | <input type="checkbox"/> |
| The feedback I received was clear | <input type="checkbox"/> |
| The feedback I received will assist me in my future performance | <input type="checkbox"/> |
| There was adequate time for the introduction | <input type="checkbox"/> |
| There was adequate time for the simulations | <input type="checkbox"/> |
| I have increased my confidence in managing therapeutic delivery pumps | <input type="checkbox"/> |
| I have identified future learning needs in this topic area | <input type="checkbox"/> |

5. Future module implementation

Do you think the module should be altered in any way? yes no

If yes, what recommendations do you have?

Thank you

PowerPoint presentation

- Clinical Skills in Hospitals Project**

Safe Medication Administration
MODULE 2
'Therapeutic Pumps'


- Module Outline**

 - Facilitated discussion
 - Therapeutic Pump Skill Stations
 - Summation
 - Evaluation
- Imed Pumps**

 - Normal operation of each pump used
 - Set up
 - Alteration in doses
 - Trouble shooting tips
 - Potential risk associated with the use of these devices
- Grasby®**

 - Normal operation of each pump used
 - Set up
 - Alteration in doses
 - Trouble shooting tips
 - Potential risk associated with the use of these devices
- Gemstar Yellow**

 - Normal operation of each pump used
 - Set up
 - Alteration in doses
 - Trouble shooting tips
 - Potential risk associated with the use of these devices
- Skill Station**

 - Imed pump
 - Grasby syringe driver
 - Gemstar Yellow

Module 3: Drug administration

Introduction

Safe medication administration was developed as a teaching and learning tool for Victorian clinical educators. The information contained in each module was developed using evidence-based resources and examples of best practice. Where expert opinion varies, a discussion section is included. However, it is not within the scope of *Safe medication administration* to address the full spectrum of local variations. Variations can occur in several areas, including practices relating to types of equipment used, infection control processes, practice guidelines and so on. Therefore, educators should, where appropriate, adapt content to reflect their local policies, procedures and protocols. This will ensure the relevancy of the package content to your learners.

The modules are designed to be discrete courses in their own right. They are timetabled so they can be completed in a 1–2 hour timeframe. This timeframe was chosen after we received feedback from clinical educators requesting shorter courses, because health professionals often have limited time to educate away from patients. However, the packages may also be combined into a one- or two-day course.

Safe medication administration should be used as an educational tool to assist in the teaching of clinical skills. It is structured as a guide to assist clinical educators, and uses many concepts taught in the *Clinical Skills in Hospitals Project* (Train-the-Trainer courses). Educators are encouraged to build on this resource by adding their own scenarios which incorporate hospital/health service protocols, policies and other resources. Each module is designed as a lesson plan to incorporate the simulations into the teaching of clinical skills.

Aims

Safe medication administration aims to increase participants' safety awareness through developing skills associated with prescribing, documentation and medication administration. This package is intended for use with medical, nursing and pharmacy participants.

Package structure

Safe medication administration contains five modules which provide learning opportunities for health professionals at all levels of experience and from medical, nursing and pharmacy disciplines. Modules 1 and 2 are regarded as fundamental. Modules 3 and 4 are more difficult and are regarded as intermediate. Module 5 is more advanced and is regarded as complex.

| Level of complexity | Package structure |
|---|-------------------|
| <p>Complex For participants with more than 4 years experience or who have completed Modules 1–4</p> | |
| <p>Intermediate For participants in postgraduate years 3–4 or who have completed Modules 1 and 2</p> | |
| <p>Fundamental For participants in postgraduate years 1–2</p> | |

Skills in *Safe medication administration* include completing and interpreting the National Inpatient Medication Chart, taking patient history, using therapeutic delivery devices, appropriate therapeutic administration, and recognising adverse events and medication errors.

This package was designed to develop participants' knowledge, skills and behaviours in the safe administration of medication, and to expose them to increasingly complex skills and knowledge aimed at testing their ability to combine these individual skills, work as a team and problem solve in more difficult situations.

Educators delivering these modules should be aware of participants' level of experience and choose appropriate modules. Modules presume an increasing level of knowledge as they progress, ranging from a fundamental knowledge of anatomy and physiology for the fundamental modules, up to detailed knowledge of errors associated with drug administration for the complex modules. Novice participants (such as first-year graduates) are expected to start with the fundamental modules, and only move onto intermediate and more complex modules as they demonstrate proficiency. More experienced participants may start at the intermediate level if the educator is satisfied that they have the prior knowledge and skills. Individual educators are responsible for assessing each participant's baseline knowledge and determining which modules they should complete. More specific descriptions of presumed knowledge are outlined in each module.

The design of these packages presumes that the clinical educators using them have knowledge and expertise in current best practice regarding the teaching of clinical skills and conducting facilitated discussions. Knowledge and expertise are presumed commensurate with the Department of Human Services' basic and advanced Train-the-Trainer programs. Clinical educators are encouraged to refer to the Department of Human Services' *Clinical Skills Facilitators Manual* for theory on:

1. Peyton's model for teaching clinical skills
2. leading small group discussions
3. giving feedback
4. crisis resource management skills.



Module 3: Drug administration

Authors: Ms Leanne Allen, Mrs Katie Cunnington, Mr Julian Van Dijk

Aims

This module allows participants to identify common drug administration errors and identify procedures for safe drug administration within the participant's clinical setting.

Presumed knowledge

This module is targeted to health professionals with minimal experience in drug administration and practice using the National Inpatient Medication Chart. They are expected to have a basic knowledge of:

- how medications are prescribed
- how to interpret a medication history, including information documented by:
 - a. medicine
 - b. nursing
 - c. pharmacy
- how to access additional resources for safe administration of unfamiliar medication, including:
 - a. online medication resources, for example, MIMS
 - b. the health service's drug administration protocols manual
 - c. other health care professionals, for example, the pharmacist
 - d. manufacturer/pharmaceutical company instructions.

Objectives

By the end of this module, participants should have:

1. identified common drug administration errors seen in the participants' clinical setting
2. identified the 'five rights' of safe drug administration
3. identified and discussed common drug administration interpretation errors
4. considered prescription preparation for administration to reduce these errors
5. identified and discussed the use of double-checking procedures in participants' clinical settings
6. participated in case-based scenarios.

Background information for educators

To facilitate safe prescription administration of medications for patients, and to ensure that medications are administered in accordance with legislative requirements.

The objectives are to ensure that medications are administered in a safe manner, consistent with the principles of recognised evidence-based practice.

Drug administration **Administration errors**

Introduction

Medication interventions save lives and reduce lengths of stays, admissions and costs. Medication administration is a multidisciplinary process, beginning when the medical practitioner decides to prescribe medication, continuing with the writing of the prescription and the provision of the medication by the pharmacist, and ending with the preparation and administration of the medication to the patient.

Medication administration forms a major part of inpatient care; however, errors may occur if a breakdown occurs at any stage in the system, such as the writing of an incorrect dose by the doctor or the provision of the wrong format of the medication by the pharmacist.

Rates of errors

The rate of medication administration errors reported in the literature varies, but the Australian Council for Safety and Quality in Health Care (2002) reports that drug therapy errors occur in 5–20% of drug administrations in Australian hospitals, and that 43% of adverse drug events are preventable. The Australian Incident Monitoring System reports that 26% of 27,000 hospital-related incidents are medication related (Runciman, 2003). Error rates vary, depending on the medication administration system used. For example, errors occur in 15–20% of drug administrations when ward stock systems are used, and 5–8% when individual patient systems (for example, bedside) are used (Runciman et al., 2003).

Types of error

The types of error that can occur during medication administration include those in the following table:

| | |
|-------------------------------------|---|
| Omission error | Failure to administer an ordered dose to a patient |
| Unauthorised drug error | Administration to the patient of a non-prescribed medication |
| Wrong dose error | Administration to the patient of a dose that is greater or less than the amount prescribed |
| Wrong time error | Administration to the patient of a medication at a different time from the prescribed or predefined time (+/- 1 hour) |
| Wrong route error | Administration to the patient a medication via a route not prescribed |
| Wrong administration technique | Inappropriate procedure or improper technique in the administration of a medication (use of a different technique from one prescribed, injection in the wrong part of body, crushing extended-release forms) |
| Wrong drug—preparation error | Drug product incorrectly formulated or manipulated before administration (incorrect reconstitution or dilution, physiochemical incompatibility of drugs mixed in the same container, wrong pharmaceutical form) |
| Wrong rate administration error | Inappropriate rate of administration by intravenous route of a medication to the patient, whatever the technique (direct intravenous, perfusion by gravity or infusion) |
| Physicochemical compatibility error | Simultaneous administration to the patient of two or more incompatible medications via the same manifold |

Medications associated with error

Anticoagulant, anti-inflammatory and cardiovascular drugs feature predominantly as preventable, high-impact problems, and these collectively make up over half of all adverse drug events (Runciman, 2003). Administration errors are clinically significant in one-fifth of cases, and potentially clinically significant in two-thirds (Runciman, 2003).

Factors contributing to error

Numerous factors can contribute to medication administration errors, including:

- calculating skills
- knowledge of medications (including actions, side-effects and correct dosage)
- experience
- working conditions (type and length of shift)
- workload and staffing levels
- nursing care systems
- medication delivery systems (functional and primary medication system)
- lack of policies and procedures
- adherence to policies and procedures
- distractions and interruptions
- failure to check patient identification
- quality of prescriptions (illegibility or difficulty in reading a medication order)
- communication (oral and written miscommunication)
- days of week and time of day.

(adapted from O'Shea, 1999; Tissot et al., 2003)

There may be some variations in the process and system for medication administration between health services. Therefore, the risk of errors in medication administration may differ. Practitioners must be aware of the above factors during the medication administration process.

Background—errors in the clinical setting

Legal implications of prescribing, interpreting and administering drugs

The ‘five rights’ of drug administration

1. patient
2. drug
3. dose
4. route
5. time.

Always check the identification of the patient. Do not rely on room numbers, bed numbers, diagnosis or your memory.

- Check that the patient is the right patient.
- Check the ID bracelet.
- Before administering medication, make sure that the patient’s name matches the name on the medication order.
- Always ask the patient to state their name and do not provide the name for them.
- If positive identification cannot be made, the medication should be withheld until you have obtained positive identification.
- In some situations, a patient may not have an ID bracelet.
- Medication charts should also accompany the nurse to the patient. The patient should be asked to identify themselves.
- Some areas have ID cards with a photo of the client attached. Nurses should then be able to check the medication against the ID cards before administering the drug.

The right drug

Is the patient receiving the correct drug? Before administering or dispensing a drug, always consider whether the drug prescribed makes sense for that patient; consider the condition being treated.

- Double-check the generic and brand name of the drug before dispensing, preparing or administering the drug.
- Check that the drug matches the patient’s condition.
- If the drug requires preparation or reconstitution, ensure that it has been prepared correctly.

Several factors contribute to wrong drug errors

- look-and-sound-alike drugs
- poor handwriting
- poor verbal communication (see the section ‘Verbal misinterpretation’ below).

If any doubt about the interpretation of handwriting relating to a medication exists, check with the prescriber. Asking for the generic and brand name can help to clarify the order.

Look-and-sound-alike drugs

Drug names often sound and look alike, labels contain visually confusing information and packages are not always designed for practice conditions.

For example:

- ephedrine and epinephrine
- Plaxil and Paxil.

Particular care should be taken when interpreting written and verbal prescriptions.

Recommendations

Prescribers

Adapted from NCC MERP Recommendations to Correct Error-Prone Aspects of Prescription Writing:

- Provide instructions and indications for the use of the drug
- Lasix (frusemide) 20 mg PO BID for *diuresis*
- Creates an extra safety check in the process of prescribing and dispensing a medication.
- To differentiate look-and-sound-alike drug names. Do not use vague instructions such as 'take as directed' or 'take/use as needed' as the sole direction for use.
- Use generic names, rather than brand names, except for combination products. Alternatively, include the brand and generic name.
- Do not use abbreviations. For example, AZT may be interpreted as zidovudine, azathioprine or aztreonam.

Pharmacists

The following recommendations are adapted from Safety First Alert (a publication of the Massachusetts Coalition for the Prevention of Medical Errors).

- System recommendation:
 - Separate look-alike drug packages in storage areas and dispensary shelves.
 - Repackage products in a different outer wrapper to differentiate products.
 - Evaluate the drug entry screen and suggest changes for preventing picking errors, such as minimising the number of drugs that appear on the screen.
 - Adopt what has been learned in industry: emphasise the difference in drug name, for example, DOPamine versus DoBUTamine.
- Check the diagnosis before dispensing medications that have been identified as having the potential for mix-up.
- Check the appropriateness of the dose for the drug dispensed.

Nurses

The following recommendations are adapted from Safety First Alert (a publication of the Massachusetts Coalition for the Prevention of Medical Errors).

- Selection errors from a patient/ward storage system that uses a matrix or open-drawer setup is an opportunity for error.
- Ask for products to be repackaged or warning labels be added for look-alike drug names and packages.
- Ensure that look-alike packaging is stored separately.
- Collaborate with pharmacy to design a better label for pharmacy-prepared products if the current label is a problem.
- Involve the patient. Educate the patient regarding their medication, increasing the chance that an error will be intercepted.
- Check patient diagnosis before administering, in order to identify medications that have the potential for mix-up because of look-alike names.
- Check the appropriateness of dose for the drug to be administered.

Handwritten prescription misinterpretation

Poor handwriting compounds the potential for confusion at all stages in the medication process. Illegible handwriting on medication charts and prescriptions is a widely recognised cause of medication errors, delay administration of medication. [ref, ref ref] Work flow is interrupted when staff are required to clarify orders. In turn, this can affect performance and further increase the chance of errors in the system.

Verbal misinterpretation

Verbal drug orders have greater potential for error because of problems in interpreting what someone else is saying. Contributing factors include incomplete knowledge about the drugs, noise and distractions, or different pronunciations of drug names. [ref] Additionally, verbal orders are then transcribed, posing another potential source of error.

Recommendations

- Verbal orders should be stated slowly, distinctly and calmly.
- Potentially confusing or difficult drug names should be spelled out.
- The recipient should write down the order immediately and read it back to the prescriber.
- It may also be useful to ask for both the brand and generic name of the drug.
- Because of the potential for misinterpretation, verbal medication orders should be limited to urgent situations where written or electronic communication is not possible.

- Health care organisations should establish policies that describe situations when verbal orders may be used, who can send and receive orders and what elements should be included for completeness.

Abbreviations and medication errors

Prescribers should avoid using any nonstandard abbreviations. Some abbreviations are consistently misunderstood and should never be used.

Route errors

Some wrong route errors may not result in significant harm; others can have serious consequences, including death.

Route: oral medications given intravenously

Oral products are not suitable for intravenous use

The abbreviation 'IU' (international units) on a prescription for Vitamin E 100 IU daily may be misinterpreted as IV (intravenous). The route of administration should be included on the prescription (for example, Vitamin E 100 IU orally, daily).

Prescribers must remember always to include the route of administration on the prescription.

Special situation—oral compared to intravenous syringes

At times the contents of oral capsules are drawn into a syringe for administration via a nasogastric tube. In these situations, an **oral** syringe must be used. The use of an intravenous syringe to measure a dose of oral medication sets up for wrong route error. [3]

LABEL: 'NOT FOR INTRAVENOUS USE'.

Special situation—using intravenous medications orally

Sometimes an intravenous preparation is used to provide a dose of oral medication. This usually occurs because there is no other alternative available that meets the needs of the particular situation.

This special situation requires additional care to ensure the intravenous formulation is not given intravenously. Oral doses may not be the same as intravenous doses.

It is important that pharmacy prepare the dose and that the medication is repackaged. Labelling should be changed to ensure that the product is no longer labelled as an intravenous product. Oral syringes should be clearly labelled for the oral route only.

Route: intravenous medication administered intrathecally**FATAL IF GIVEN INTRATHECALLY.****FOR INTRAVENOUS USE ONLY.****DO NOT REMOVE COVERING UNTIL MOMENT OF INJECTION****Recommendations**

- **Wrap intrathecal drugs** in a sterile bag labelled for intrathecal use. Unwrap only immediately before injection and perform an independent check and document.
- **Dispense IV and intrathecal medications at separate times to different locations.**
 - Pharmacy could prepare intrathecal medications immediately before they are needed and deliver the drugs to a specific location that is different from the delivery time and location of the patient's remaining therapy.
- **Administer intrathecal medications in a designated location.**
 - Consider administering intrathecal medications in a designated location (for example, a treatment room) at a standard time (for example, early morning or late evening).
- **Establish a list of drugs that can be administered intrathecally** (or epidurally) and ban all other injectable drugs from rooms where lumbar punctures are performed. The list of intrathecal drugs that are administered for any disease is very small. Cytarabine, methotrexate, thiotepa, gentamicin, vancomycin and hydrocortisone are among those used for cancer patients.
- Require at least **two health professionals to independently verify and document** the accuracy of all intrathecal doses before administration.
- Accrediting and regulatory bodies should provide oversight to assure that facilities where chemotherapy is given. **Have policies and procedures in place** which are followed to prevent accidental intrathecal injection of IV drugs.

Route: intramuscular and intravenous mix-up**Intramuscular medication given intravenously**

System errors. Poor handwriting on the prescription resulted in a misinterpretation of the order.

Route: enteral compared to parenteral**Enteral feeds**

- Do not interchange enteral tubing and intravenous tubing.
- Use tubing and bags designed for enteral feed administration only. Use tubing connections that prevent connecting enteral lines to intravenous lines.
- Ensure training and education, including information on what can and cannot be given through each type of line.
- Develop protocols for non-standard procedures, particularly where medications are used for non-registered indications. Using medications in an unusual way or for a non-approved indication may increase the potential for error. If a product is to be used in any unusual way, a protocol should be developed, and staff should be educated appropriately.
- Use large, bold auxiliary labels that state 'WARNING! For enteral use only—NOT for IV use'.
- Use a rubber band to attach an appropriate enteral administration set to all enteral feedings before distribution to (or storage in) patient care units.

Route: multiple lines

It is important to label each line at the connecting end to facilitate identification of the appropriate line. Colour-tinted tubing may also be used for epidural lines.

Topical medications

Communication is the key—these types of medication error are discussed further in the section on Communication errors.

Patient communication

Educate and include patients. Common problems include difficulty in understanding medication labels, confusion about trade and generic names of the same medication, and storing and taking medication past their expiry dates.

The right dose

The 'right dose' includes ensuring the dose has been interpreted and calculated correctly, and that individual variations have been taken into account.

Decimal point errors

Avoid trailing zeros:

- A trailing zero is a unit measurement ending with a decimal point followed by a zero, for example, 5.0 mg. Do not use a trailing zero after a decimal (5.0).
- Always use leading zeros:
 - Place a zero *before* a decimal, for example: 0.5 units. Without the zero, the decimal point could be interpreted as 5 units and result in the patient receiving a tenfold overdose.

The right dose—checklist

- Is there a naked decimal point (not preceded by a zero) for a dose that is less than 1?
- Is there a zero following a decimal point that should not be there?
- Does the name of the drug and the dose run together, or are they separate?
- Are there any abbreviations (such as 'U' for units) that could be misinterpreted?
- Does the dose make sense for the patient? (Take into account age, weight, renal and liver function.)
- Are the calculations you have performed correct?
- If the dose is a portion of a tablet, can that particular dose form be cut in half?
 - Splitting slow-release or sustained-release dose forms. Some medications should never be chewed, cut, crushed, or diluted.

The right route

Causes of wrong route errors are similar to those that cause drug and dose errors. Poor handwriting, poor communication and distractions can lead to misinterpretation of the intended route. See the section 'Abbreviations and medication errors', above.

The right route—checklist

- Was the handwriting interpreted correctly?
- Was the verbal order understood correctly?
- Were confusing abbreviations used?
- Is the drug available in a form that can be given by the route ordered?
- If the dose should be split, can it be done with the dose form that has been ordered?
- Is the dose form appropriate for the patient? Can the patient swallow oral medications? Does the patient have good peripheral perfusion for subcutaneous or intramuscular injection?

- Have you reviewed the correct technique for administering the drug by this route? For example, NG. Is it appropriate to crush the medication? Consider if there is an alternative medication preparation.

The right time

Before administering a drug, consider whether:

- the drug is given at the right time
- the time conflicts with the presence of another drug or food that could interfere with the drug's effects
- the drug is delivered within the timeframe that will provide its greatest therapeutic effect.

The right time—checklist

- Check the frequency ordered. Have any abbreviations been interpreted correctly?
- Is the drug given at the appropriate time in relation to food and other drugs?
- Is the drug administered at intervals that will give the greatest therapeutic effect?
- Is the drug spaced correctly throughout the day?
- Are missed doses made up correctly?

See www.medsafety.net/doc/rhh/issues/rights/new_topic2.htm for further details.

Clinical setting—double-checking/checking procedures

The 'five rights' do not reflect the significant contribution of human factors to errors. 'Confirmation bias' causes practitioners to ill-perceive important information in their environment. We 'see' with both our eyes and our mind. The ability to filter information and locate or recognise items using a picture in our mind is vital to correct performance. Yet it contributes to errors when our fallible minds make corrections for what our eyes actually see. For further information, see www.ismp.org/newsletters/acutecare/articles/19990407.asp

Single-checking requires the clinician to review the drug, preparation, dose, route and time before administering it to the patient. Double-checking is the same process performed by two clinicians independently.

See www.mihsr.monash.org/cce/pdf/ers/singleordoublechecking.pdf for further details.

An independent double-check occurs when a second check is performed by another, independent person who should arrive at their own conclusion without verbal or visual clues from the initial decision maker.

See www.mihsr.monash.org/cce/pdf/ers/singleordoublecheckingmedicalprocedures.pdf for further details.

Verification can be performed in the presence or absence of the first practitioner. In each case, the most critical aspect is to maximise independence of the double-check procedure by ensuring that the first practitioner does not communicate what they expect the second practitioner to see, which would create bias and reduce the visibility of an error. For example, an error in calculation is more likely to be detected if the second person performs all calculations independently, without knowledge of (without seeing) any prior calculations. See www.ismpcanada.org/hmssa/hmssadef.htm for further details.

Follow the checking and preparing medication ‘must do’s’ systematic check of chart:

- allergies
- weight/age/surface area
- right patient
- right medicine
- right time
- right route
- right dose
- signed by a prescriber
- drug commence date completed
- expiry
- double-checking—this must occur from start to finish
- check the prescription is clearly and correctly written and is signed and dated by the prescriber
- check the medication is required and has not already been given
- ensure any preliminary checks and observations have been carried out if necessary before administration (for example, blood pressure monitoring before administration of anti-hypertensives).

Stop, check then double check

Healthcare professionals should be reminded to:

- Never rely on colour as a solitary indicator to distinguish product identity.
- Always vigilantly read the product label to confirm that the correct product name and strength have been selected.
- Always cautiously review both the drug name and dose on the label before dispensing and administering drugs.

- Double-check your stock to ensure that sound-alike and look-alike drugs are separated.
- Notify all staff of the potential for errors in dispensing and administering products that look and sound alike. It is recommended that you provide colour photographs (see below) to staff to assist in their understanding of the product similarities.



Learning activities

Suggested learning activities and timetable are outlined below.

| Timing | Activity | Objective |
|------------|---|--|
| 40 minutes | Facilitated discussion | All |
| 60 minutes | Case studies: <ul style="list-style-type: none"> ■ identifying errors in prescription National Inpatient Medication Charts ■ identifying incomplete prescribing and variances in drug composition/brands ■ safe medication administration ■ identifying the 'five rights' of drug administration ■ safe medication administration using 'five rights' and double-checking principles | 1, 2 and 3 2 and 4 2, 4 and 5 2 and 5 2, 3 and 5 |
| 10 minutes | Summary | All |
| 10 minutes | Evaluation | All |

Total time = 2 hours

Facilitated discussion

The facilitator should lead a discussion amongst participants about the issues covered in the background information. The facilitator should not give a didactic lecture, but instead promote open discussion and knowledge sharing amongst participants. Participants should be encouraged to describe any real-life experiences they have encountered.

Major issues which the facilitator should ensure are covered include:

- errors that may occur with drug administration in the participants' clinical settings
- information about safe practice guidelines for administration of medication
- common interpretation, prescription and preparation errors
- issues relating to double-checking procedures.

PowerPoint slides are available for the facilitator to use to summarise these main points at the end of the discussion, or as triggers if participants have not identified the major issues.

Case studies

The case studies allow participants to practise interpreting the National Inpatient Medication Chart and identify errors in prescription and safe administration of medications while receiving feedback in a structured format from peers and/or facilitators. Participants should be guided through each of the five case studies using Peyton's four-step model⁵. Feedback should be provided at the completion of the skill.

The program and resources required assume three facilitators for every 12 participants, a ratio of 1:4. The case studies are intended to be run in small group of 3—4 persons. Each group should attempt all five case scenarios presented.

Case study 1 Wrong patient

During the medical patient round, the resident medical officer collects all patients' drug charts. The medical officer then replaces the charts after the round, attaching them to each patient's bed chart folder. At 1000 hours you commence your drug round. You commence dispensing Mrs June Smith's medications. What checks will you make to ensure safe administration of her medications? Use attached NIMC for this case study.

Case study 1—Questions

- Discuss the 'five rights' of drug administration.
- Discuss additional system processes to prevent drug error; consider risk management.

Case study 2 National Inpatient Medication Chart—identifying errors

You are starting a drug round for a patient that you have not met before. You find this patient's drug chart to commence the drug round.

Case study 2—Questions

- Using the 'five rights' of drug administration, identify the errors as seen on the NIMC below.

| REGULAR MEDICATIONS | | | | 11 | 12 | 13 | 14 | 15 | | | | | | |
|--|---------------------------------|-----------------------------|---------|------------------|-----------|-----------|-----------|-----------|---|--|--|--|--|--|
| YEAR 20 <u>08</u> DATE & MONTH → | | | | <u>11</u> | <u>12</u> | <u>12</u> | <u>12</u> | <u>12</u> | | | | | | |
| VARIABLE DOSE MEDICATION | | | | Drug level | | | | | | | | | | |
| Date | Medication (Print Generic Name) | | | Time level taken | | | | | | | | | | |
| 11/12 | PLAVIX | | | Dose | | | | | | | | | | |
| Route | Frequency | Time of Dose: | | Prescriber | | | | | | | | | | |
| PO | 75 mg/d | 2000 | | First given | | | | | | | | | | |
| Indication | | | | Name | RP | RP | W | W | W | | | | | |
| Prescriber Signature | | Print Your Name | Contact | | | | | | | | | | | |
| | | PHILLIPS | 1377 | | | | | | | | | | | |
| Date | Medication (Print Generic Name) | | | DOSE TIME | | | | | | | | | | |
| 11/12 | WARFARIN (Marevan/Coumadin) | | | 1600 (4pm) | | | | | | | | | | |
| Route | Frequency | Target INR | | Prescriber | | | | | | | | | | |
| | | | | Nurse 1 | | | | | | | | | | |
| Indication | | | | Nurse 2 | | | | | | | | | | |
| Prescriber Signature | | Print Your Name | Contact | | | | | | | | | | | |
| | | PHILLIPS | 1377 | | | | | | | | | | | |
| DOCTORS MUST ENTER administration times | | | | | | | | | | | | | | |
| Date | Medication (Print Generic Name) | | | Tick if given | | | | | | | | | | |
| 11/12 | BENZYL PENICILLIN | | | checkbox | 0200 | W | W | W | | | | | | |
| Route | Dose | Frequency & NOW enter times | | checkbox | 0600 | W | W | W | | | | | | |
| IV | 1.8g | QID | | checkbox | 1000 | W | W | | | | | | | |
| Indication | | | | checkbox | 1400 | RP | W | | | | | | | |
| Prescriber Signature | | Print Your Name | Contact | checkbox | 1800 | RP | W | | | | | | | |
| | | PHILLIPS | 1377 | checkbox | 2200 | RP | W | | | | | | | |
| Date | Medication (Print Generic Name) | | | Tick if given | | | | | | | | | | |
| 11/12 | VANCOMYCIN | | | checkbox | 0800 | RP | W | W | W | | | | | |
| Route | Dose | Frequency & NOW enter times | | checkbox | | | | | | | | | | |
| IV | 1gm | 125gm QD | | checkbox | | | | | | | | | | |
| Indication | | | | checkbox | 2000 | W | W | W | W | | | | | |
| Prescriber Signature | | Print Your Name | Contact | | | | | | | | | | | |
| | | PHILLIPS | 1377 | | | | | | | | | | | |
| Date | Medication (Print Generic Name) | | | Tick if given | | | | | | | | | | |
| 11/12 | DIGOXIN | | | checkbox | 0800 | RP | W | W | W | | | | | |
| Route | Dose | Frequency & NOW enter times | | checkbox | | | | | | | | | | |
| PO | 800 mg | D | | checkbox | | | | | | | | | | |
| Indication | | | | checkbox | | | | | | | | | | |
| Prescriber Signature | | Print Your Name | Contact | | | | | | | | | | | |
| | | PHILLIPS | 1377 | | | | | | | | | | | |
| Date | Medication (Print Generic Name) | | | Tick if given | | | | | | | | | | |
| 11/12 | ACTRAPRO | | | checkbox | 0800 | RP | W | W | W | | | | | |
| Route | Dose | Frequency & NOW enter times | | checkbox | | | | | | | | | | |
| S/C | 100 U/S | TOS | | checkbox | | | | | | | | | | |
| Indication | | | | checkbox | 2000 | W | W | | | | | | | |
| Prescriber Signature | | Print Your Name | Contact | | | | | | | | | | | |
| | | PHILLIPS | 1377 | | | | | | | | | | | |

Case study 2: Medication chart

Case study 3 Wrong drug, incorrect preparation, double-checking

You are a registered nurse caring for Mr Ng. Yesterday Mr Ng was diagnosed with tuberculosis and is commenced on rifampicin 600 mg daily. At the commencement of your shift you note that Mr Ng's BP is 190/110. There is no mention of hypertension in Mr Ng's history and his family are unaware of a medical diagnosis of hypertension. You contact the medical officer covering the respiratory unit. Over the phone, the RMO orders Adalat (nifedipine) 10 mg stat orally. You go to the local impress and dispense Adalat OROS 20 mg tablets with the intention of administering $\frac{1}{2}$ a tablet to Mr Ng. See Resources MIMS.

Case study 3—Questions

- Identify the issues and potential errors.
- Discuss health service processes that are in place to ensure that *safe medication administration* occurs.
- What additional processes can be put in place to improve *safe medication administration*?

AS REQUIRED "PRN" MEDICATIONS

Attach ADR Sticker

See front page for details

UR No.: _____
 Surname: _____
 Given Name: _____
 D.O.B.: _____

1st Prescriber to Print Patient Name and Check Label Correct:

Year 20 08

| REGULAR MEDICATIONS | | | | DATE & MONTH | | 12/6 | |
|--|--------------------------------------|-----------------------------|--|-------------------|------------|------|--|
| VARIABLE DOSE MEDICATION | | | | | | | |
| Date | Medication (Print Generic Name) | | | Drug level | | | |
| Route | Frequency | | | Time (last taken) | | | |
| Indication | | | | Dose | | | |
| Pharmacy | | | | | Prescriber | | |
| Prescriber Signature | | Print Your Name | | Time given | | | |
| Contact | | | | Nurse | | | |
| Date | WARFARIN (Marevan/Coumadin) | | | INR Result | / | | |
| Route | Prescriber to enter individual doses | | | Dose | 2 | | |
| Indication | Pharmacy | | | Prescriber | A | | |
| Prescriber Signature | | Print Your Name | | Nurse 1 | LA | | |
| Contact | | 588 | | Nurse 2 | CJ | | |
| DOCTORS MUST ENTER administration times | | | | | | | |
| Date | Medication (Print Generic Name) | | | Time of Day | | | |
| Route | Dose | Frequency & NOW enter times | | | | | |
| Indication | | | | | | | |
| Prescriber Signature | | Print Your Name | | | | | |
| Contact | | 588 | | | | | |
| Date | Medication (Print Generic Name) | | | Time of Day | | | |
| Route | Dose | Frequency & NOW enter times | | | | | |
| Indication | | | | | | | |
| Prescriber Signature | | Print Your Name | | | | | |
| Contact | | 588 | | | | | |
| Date | Medication (Print Generic Name) | | | Time of Day | | | |
| Route | Dose | Frequency & NOW enter times | | | | | |
| Indication | | | | | | | |
| Prescriber Signature | | Print Your Name | | | | | |
| Contact | | 588 | | | | | |
| Date | Medication (Print Generic Name) | | | Time of Day | | | |
| Route | Dose | Frequency & NOW enter times | | | | | |
| Indication | | | | | | | |
| Prescriber Signature | | Print Your Name | | | | | |
| Contact | | 588 | | | | | |
| Pharmaceutical Review: | | | | | | | |

AD

WARFARIN Patient Sign: _____ Date: _____ Given Name Sign: _____ Date: _____

Reasons for Admission:

- Allergic
- Fasting
- Refused
- Vomiting
- On leave
- Not available or contact
- Withheld Clinical Practice
- Self Admin

Case study 3: Medication chart

Case study 4 Wrong drug/composition/brand

Mr Jones is admitted to your ward overnight from home. He has a past history of hypertension, stroke, gout, rheumatoid arthritis and diabetes. He has cellulitis of the foot and requires IV antibiotics. His medication chart is written up by the emergency medical officer overnight. Mr Jones does not have any of his own medications with him. As it is Saturday, you are required to dispense the medications from the impress cupboard. You dispense Mr Jones medication including diltiazem 60 mg tablets and administer the diltiazem according to the drug chart. Mr Jones complains of dizziness, appears pale and is generally feeling unwell. You check his BP, which is 80/40. As the nurse you contact the RMO (as the RMO you are asked to review Mr Jones).

At 1600 hours Mr Jones is due for a single tablet of 2 mg warfarin orally. You locate the warfarin from the impress. The warfarin on impress comes in doses of 1 mg, 3 mg and 5 mg, you choose to administer two 1 mg tablets of warfarin to Mr Jones.

Case study 4—Questions

To medically manage this patient, identify the cause of Mr Jones' hypotension.

In relation to diltiazem and warfarin:

- For each, identify the variables of drug composition.
- For each, identify the potential adverse effects to the patient.
- For each, identify the factors that led to this medication administration error.
- Discuss strategies you would employ to prevent this error, including and in addition to the 'five rights'.



Case study 4: Marevan bottles



Case study 4: Coumadin bottles



Case study 4: Diltiazem

Case study 5 Wrong dose

You are a Grade 2 Year 1 nurse working a busy postoperative evening shift on the orthopaedic ward. The ANUM is on the ward round, three staff are at tea, a graduate nurse is working in the allocated section.

You are caring for Mr Evans. Mr Evans has just undergone orthopaedic surgery for palliative pain management. He complains of pain, and is ordered morphine mixture 10 mg orally 4-hourly PRN. With the graduate nurse you double-check the morphine out of the S8 drug cupboard. The only morphine mixture available is morphine 10 mg in 1 mL. Using a syringe and the 'five rights' of drug administration, you draw up the morphine. When you arrive at the bedside you check that Mr Evans is the right patient and check for allergies. As you pass the morphine to Mr Evans to swallow, he expresses that it is an unusual amount. It becomes apparent that instead of dispensing 10 mg/1 mL, you have dispensed 10 mL = 100 mg morphine mixture—a potentially fatal error.

Case study 5—Questions

- What checks additional to the 'five rights' can you put in place to ensure that the correct amount of morphine is drawn up and administered to the patient?
- Discuss the importance of patient education in relation to drug administration and the reduction of drug error.
- Discuss additional system approaches to avoid drug error. Consider risk management: pharmacy, prescription and nursing administration of medication.

AS REQUIRED "PRN" MEDICATIONS

Attach ADR Sticker

See front page for details

UR No.: 222 444

Surname: EVANS

Given Name: ROBERT

D.O.B.: 2/5/51

Year 20 08

1st Prescriber to Print Patient Name and Check Label Correct:.....

| Date | Medication (Print Generic Name) | Date | Pharmacy | Continue on discharge? | Yes / No | Dispense? | Yes / No | Duration? | days/hrs |
|----------------------|---------------------------------|------------------|----------|------------------------|----------|-----------|----------|-----------|----------|
| 12/6 | Morphine mixture | | | | | | | | |
| Route | Dose | Hourly frequency | PRN | Max dose/24 hrs | Time | | | | |
| o | 10mg | 4/24 | | | | | | | |
| Indication | | Pharmacy | | Dose | Route | | | | |
| Severe pain | | | | | | | | | |
| Prescriber Signature | | Print Your Name | | Contact | Sign | | | | |
| | | ALLEN | | 582 | | | | | |
| Date | Medication (Print Generic Name) | Date | Pharmacy | Continue on discharge? | Yes / No | Dispense? | Yes / No | Duration? | days/hrs |
| Route | Dose | Hourly frequency | PRN | Max dose/24 hrs | Time | | | | |
| Indication | Pharmacy | | Dose | Route | | | | | |
| Prescriber Signature | Print Your Name | | Contact | Sign | | | | | |
| Date | Medication (Print Generic Name) | Date | Pharmacy | Continue on discharge? | Yes / No | Dispense? | Yes / No | Duration? | days/hrs |
| Route | Dose | Hourly frequency | PRN | Max dose/24 hrs | Time | | | | |
| Indication | Pharmacy | | Dose | Route | | | | | |
| Prescriber Signature | Print Your Name | | Contact | Sign | | | | | |
| Date | Medication (Print Generic Name) | Date | Pharmacy | Continue on discharge? | Yes / No | Dispense? | Yes / No | Duration? | days/hrs |
| Route | Dose | Hourly frequency | PRN | Max dose/24 hrs | Time | | | | |
| Indication | Pharmacy | | Dose | Route | | | | | |
| Prescriber Signature | Print Your Name | | Contact | Sign | | | | | |
| Date | Medication (Print Generic Name) | Date | Pharmacy | Continue on discharge? | Yes / No | Dispense? | Yes / No | Duration? | days/hrs |
| Route | Dose | Hourly frequency | PRN | Max dose/24 hrs | Time | | | | |
| Indication | Pharmacy | | Dose | Route | | | | | |
| Prescriber Signature | Print Your Name | | Contact | Sign | | | | | |
| Date | Medication (Print Generic Name) | Date | Pharmacy | Continue on discharge? | Yes / No | Dispense? | Yes / No | Duration? | days/hrs |
| Route | Dose | Hourly frequency | PRN | Max dose/24 hrs | Time | | | | |
| Indication | Pharmacy | | Dose | Route | | | | | |
| Prescriber Signature | Print Your Name | | Contact | Sign | | | | | |
| Date | Medication (Print Generic Name) | Date | Pharmacy | Continue on discharge? | Yes / No | Dispense? | Yes / No | Duration? | days/hrs |
| Route | Dose | Hourly frequency | PRN | Max dose/24 hrs | Time | | | | |
| Indication | Pharmacy | | Dose | Route | | | | | |
| Prescriber Signature | Print Your Name | | Contact | Sign | | | | | |

Case study 5: Medication chart

Summary

The summary session reinforces content covered in the learning activities, and is an opportunity for participants to reflect on what they have covered. No new material should be introduced.

Major points to recap in the summary include:

- interpreting the National Inpatient Medication Chart
- techniques for identifying prescription errors
- techniques for safe administration of prescribed medication.

Participants should be offered access to equipment and educators in the future to allow them to practise these skills if they need to improve their skill level or confidence. Participants may be encouraged to observe or assist experienced colleagues performing these skills in controlled settings to put these skills into a clinical context.

Resource list

The following resource list assumes three facilitators for every 12 participants, a ratio of 1:4. As a minimum, the following resources are needed to conduct this module.

| Resource | Quantity | Additional comments |
|--|----------|---------------------------------------|
| Facilitators | 3 | Allows 1:4 ratio with 12 participants |
| PowerPoint presentation | 1 | Provided with module |
| NIMCs—Appendices | | |
| MIMS | 3 | |
| Health service's policy and procedure manual | 3 | |
| Feedback sheets | 3 | As a prompt for each facilitator |
| Evaluation forms | 12 | One for each participant |

Evaluation

A formal evaluation has been specifically developed for this module. It incorporates the objectives of the module and the perceptions of the participants about whether they have increased their understanding by working through the module. It is highly recommended that this formal evaluation be copied and completed by all participants at the completion of the module.

A range of informal evaluation tools may also be used in conjunction with this evaluation throughout the module, including those available in the *Department of Human Services' Clinical Skills Facilitators Manual* from the basic course conducted in 2007.

References

1. Peyton J. 1998 *Teaching and Learning in Medical Practice*. Manticore Europe Ltd, Great Britain
2. SVHM Annual Nursing Medication Competency
3. Australian Council for Safety and Quality in Health Care. July 2002.
4. O'Shea E. *J Clin Nursing* 1999, 8: 496–504
5. Runciman W et al. 2003 Adverse drug events and medication errors in Australia. *International Journal for Quality in Health Care* 15 (Supplement 1): i49–i59
6. Tissot E et al. 2003 Observational study of potential risk factors of medication administration errors. *Pharmacy World and Science* 25(6), 264–268
7. www.fda.gov/medwatch/safety/2007/heparin_DHCP_02-06-2007.pdf
8. www.ismpcanada.org/hmssa/hmssadef.htm for further details.
9. www.ismp.org/newsletters/acutecare/articles/19990407.asp
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11. www.mihsr.monash.org/cce/pdf/ers/singleordoublecheckingmedicalprocedures.pdf

Module 3: Drug Administration—evaluation

Thank you for participating in this module. As part of our commitment to quality improvement the following questionnaire will be used to plan future implementation of this module. We appreciate your time completing this evaluation.

1. Overall

How would you rate this module?

poor fair good very good outstanding

2. Learning objectives

Please consider whether this module was successful in meeting the following learning objectives:

| <i>Safe medication administration</i> Learning objectives of Module 3: Drug administration | Strongly disagree | Disagree | Slightly agree | Agree | Strongly agree |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Identified common drug administration errors seen in the participants' clinical settings | <input type="checkbox"/> |
| Identified the 'five rights' of safe drug administration | <input type="checkbox"/> |
| Identified and discussed common drug administration interpretation errors | <input type="checkbox"/> |
| Considered prescription preparation for administration to reduce these errors | <input type="checkbox"/> |
| Identified and discussed the use of double-checking procedures in participants' clinical settings | <input type="checkbox"/> |
| Participated in case-based scenarios | <input type="checkbox"/> |

3. Important learning outcomes

What are the three most important things you have learned from this module?

4. Module implementation

Please indicate to what extent you agree or disagree with each of the following statements in relation to the implementation of the module.

| | Strongly disagree | Disagree | Slightly agree | Agree | Strongly agree |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| The facilitator respected my experience | <input type="checkbox"/> |
| The facilitator encouraged my participation | <input type="checkbox"/> |
| I was able to ask the facilitator questions | <input type="checkbox"/> |
| The facilitator was able to answer my questions | <input type="checkbox"/> |
| The feedback I received was clear | <input type="checkbox"/> |
| The feedback I received will assist me in my future performance | <input type="checkbox"/> |
| There was adequate time for the skills stations | <input type="checkbox"/> |
| There was adequate time for the facilitated discussions | <input type="checkbox"/> |
| I have increased my confidence in drug administration | <input type="checkbox"/> |
| I have increased my confidence in interpreting the National Inpatient Medication Chart | <input type="checkbox"/> |
| I have identified future learning needs in this topic area | <input type="checkbox"/> |

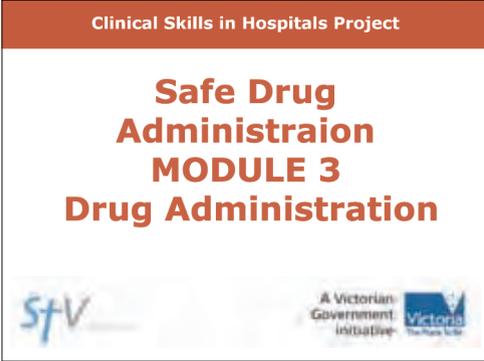
5. Future module implementation

Do you think the module should be altered in any way? yes no

If yes, what recommendations do you have?

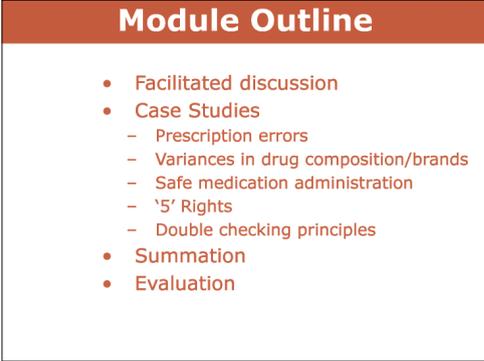
Thank you

PowerPoint presentation

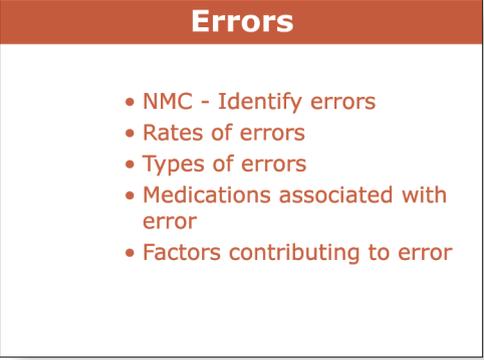
1. 

Clinical Skills in Hospitals Project

Safe Drug Administration
MODULE 3
Drug Administration

StV
A Victorian Government Initiative
2. 

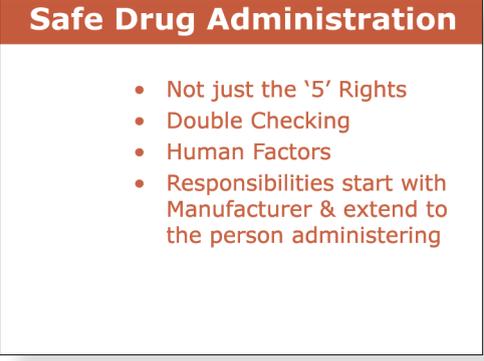
Module Outline

 - Facilitated discussion
 - Case Studies
 - Prescription errors
 - Variances in drug composition/brands
 - Safe medication administration
 - '5' Rights
 - Double checking principles
 - Summation
 - Evaluation
3. 

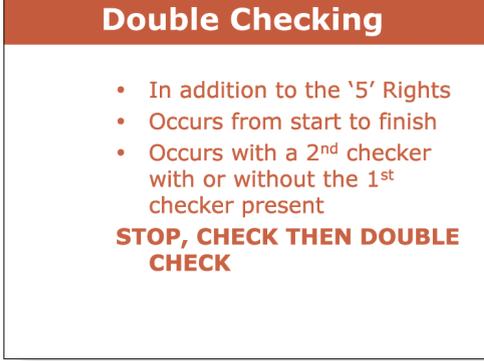
Errors

 - NMC - Identify errors
 - Rates of errors
 - Types of errors
 - Medications associated with error
 - Factors contributing to error
4. 

'5' Rights

 - **The 5 rights are:**
 - patient
 - drug
 - dose
 - route
 - time
5. 

Safe Drug Administration

 - Not just the '5' Rights
 - Double Checking
 - Human Factors
 - Responsibilities start with Manufacturer & extend to the person administering
6. 

Double Checking

 - In addition to the '5' Rights
 - Occurs from start to finish
 - Occurs with a 2nd checker with or without the 1st checker present

STOP, CHECK THEN DOUBLE CHECK



Module 4: Drug reactions and adverse events

Introduction

Safe medication administration was developed as a teaching and learning tool for Victorian clinical educators. The information contained in each module was developed using evidence-based resources and examples of best practice. Where expert opinion varies, a discussion section is included. However, it is not within the scope of *Safe medication administration* to address the full spectrum of local variations. Variations can occur in several areas, including practices relating to types of equipment used, infection control processes, practice guidelines and so on. Therefore, educators should, where appropriate, adapt content to reflect their local policies, procedures and protocols. This will ensure the relevancy of the package content to your learners.

The modules are designed to be discrete courses in their own right. They are timetabled so they can be completed in a 1–2 hour timeframe. This timeframe was chosen after we received feedback from clinical educators requesting shorter courses, because health professionals often have limited time to educate away from patients. However, the packages may also be combined into a one- or two-day course.

Safe medication administration should be used as an educational tool to assist in the teaching of clinical skills. It is structured as a guide to assist clinical educators, and uses many concepts taught in the *Clinical Skills in Hospitals Project* (Train-the-Trainer courses). Educators are encouraged to build on this resource by adding their own scenarios which incorporate hospital/health service protocols, policies and other resources. Each module is designed as a lesson plan to incorporate the simulations into the teaching of clinical skills.

Aims

Safe medication administration aims to increase participants' safety awareness through developing skills associated with prescribing, documentation and medication administration. This package is intended for use with medical, nursing and pharmacy participants.

Package structure

Safe medication administration contains five modules which provide learning opportunities for health professionals at all levels of experience and from medical, nursing and pharmacy disciplines. Modules 1 and 2 are regarded as fundamental. Modules 3 and 4 are more difficult and are regarded as intermediate. Module 5 is more advanced and is regarded as complex.

| Level of complexity | Package structure |
|---|-------------------|
| <p>Complex For participants with more than 4 years experience or who have completed Modules 1–4</p> | |
| <p>Intermediate For participants in postgraduate years 3–4 or who have completed Modules 1 and 2</p> | |
| <p>Fundamental For participants in postgraduate years 1–2</p> | |

Skills in *Safe medication administration* include completing and interpreting the National Inpatient Medication Chart, taking patient history, using therapeutic delivery devices, appropriate therapeutic administration, and recognising adverse events and medication errors.

This package was designed to develop participants' knowledge, skills and behaviours in the safe administration of medication, and to expose them to increasingly complex skills and knowledge aimed at testing their ability to combine these individual skills, work as a team and problem solve in more difficult situations.

Educators delivering these modules should be aware of participants' level of experience and choose appropriate modules. Modules presume an increasing level of knowledge as they progress, ranging from a fundamental knowledge of anatomy and physiology for the fundamental modules, up to detailed knowledge of errors associated with drug administration for the complex modules. Novice participants (such as first-year graduates) are expected to start with the fundamental modules, and only move onto intermediate and more complex modules as they demonstrate proficiency. More experienced participants may start at the intermediate level if the educator is satisfied that they have the prior knowledge and skills. Individual educators are responsible for assessing each participant's baseline knowledge and determining which modules they should complete. More specific descriptions of presumed knowledge are outlined in each module.

The design of these packages presumes that the clinical educators using them have knowledge and expertise in current best practice regarding the teaching of clinical skills and conducting facilitated discussions. Knowledge and expertise are presumed commensurate with the Department of Human Services' basic and advanced Train-the-Trainer programs. Clinical educators are encouraged to refer to the Department of Human Services' *Clinical Skills Facilitators Manual* for theory on:

1. Peyton's model for teaching clinical skills
2. leading small group discussions
3. giving feedback
4. crisis resource management skills.



Module 4: Drug reactions and adverse events

Authors: Dr Stuart Dilley, Dr James Gomes, Julian Van Dijk

Aims

Safe medication administration—Module 1: National Inpatient Medication Chart, Module 2: Therapy delivery pumps and Module 3: Drug administration are specifically aimed at identifying and minimising unsafe procedures and practices in drug administration. Despite best efforts, adverse events or reactions can still occur. *Module 4: Drug reactions and adverse events* allows participants to reflect on drug reactions and adverse events that might occur in their clinical practice and to develop competence in managing such events, should they occur.

Presumed knowledge

This module is targeted to health professionals responsible for prescribing and administering common medications. They are expected to have a reasonable knowledge of indications, side-effects and common adverse effects associated with the following drugs:

1. antibiotics
2. anticonvulsants—phenytoin, sodium valproate, carbamazepine
3. warfarin
4. opiate analgesia—morphine, pethidine, fentanyl
5. benzodiazepines—diazepam, midazolam
6. anti-arrhythmic drugs—digoxin, beta-blockers
7. anti-hypertensive drugs
8. neuroleptic agents.

Participants are also expected to have appropriate basic life support (BLS) skills to manage serious adverse drug events in the short term.

Objectives

By the end of this module, participants should have:

1. discussed common adverse drug events that might occur in their clinical setting
2. identified common themes and therapeutic drug classes responsible for adverse events
3. reflected on how they might manage common adverse drug events in the hospital setting
4. practised managing an adverse drug event in a simulated patient (manikin).

Background information for educators

Safe medication administration should be a proactive activity of hospitals and individuals. Earlier modules in this package address these principles and aim to create a safe environment and safe practice for medication administration. Despite having policies and procedures in place, adverse events, reactions and errors can and do occur. This module discusses the recognition and management of some of these events as common themes, and then uses the simulation scenarios to illustrate these principles on specific cases. It is not possible to cover all adverse drug events or situations. This package provides some examples to illustrate common problems and prompts participants to reflect on their own practice.

Educators should be familiar with the professional background of participants and tailor the module accordingly. Medical staff and senior nursing staff are expected to have a greater knowledge of medical interventions than junior nursing staff and allied health. Non-medical staff are not expected to initiate treatment of some of these conditions, but ought to be familiar with the concepts, recognise when things are 'not normal' and understand the general principles behind management.

What constitutes appropriate management depends on the background of the participants involved. Medical staff are expected to recognise and manage these conditions. Nursing and allied health staff may be expected to recognise these conditions, seek assistance from more experienced staff and then help provide ongoing care to the patient.

The discussion should not go beyond the 30 minutes allocated, in order to keep the module to time. Facilitators are reminded that debriefing time is also a valuable opportunity to clarify or further discuss the management of these clinical conditions.

Allergic reactions

Antibiotics are the commonest cause of drug related allergic reactions, with the beta-lactam or penicillin-like antibiotics most frequently implicated. However, true penicillin allergy is much less prevalent than that reported by patients or parents.^{1, 2, 3}

Some adverse drug events cannot be avoided. Appropriately prescribing penicillin to a patient with no known drug allergies who breaks out in a rash on the third day of treatment constitutes a non-preventable adverse event.

It is commonly taught that at least 10% of patients with an allergy to penicillin will have an allergic reaction to cephalosporins. Most evidence suggests that a cross-reaction between penicillin and cephalosporins is rare, perhaps no greater than that between penicillin and structurally unrelated antibiotics.^{1, 4}

Allergic drug reactions comprise a spectrum of clinical presentations from mild rash through to anaphylaxis with cardiac arrest. The clinical features present are determined by the severity of the reaction, but include the following:

- rhinitis, conjunctival erythema, tearfulness
- flushing, itch, urticaria
- angioedema, swelling
- nausea, vomiting, abdominal pain
- dysphagia, stridor, throat or chest tightness
- shortness of breath, cough
- wheeze, cyanosis, hypoxia
- tachycardia, hypotension
- shock, cardiac arrest.

The emergency management of anaphylaxis should include these actions:^{5, 6}

- Stop administration of causative agent.
- Call for assistance.
- Adrenaline 0.01 mg per kg body weight (up to 0.5 mg) IM.
- High-flow oxygen and airway/ventilatory support if needed.
- IV access and 20 mL per kg body weight bolus of 0.9% saline if hypotensive.
- Consider IV adrenaline infusion (as per hospital protocols) or further IM adrenaline every 3–5 minutes if needed.
- Continual nebulised salbutamol or nebulised adrenaline.
- IV hydrocortisone 5 mg per kg body weight.

Mild allergic reactions may only require removing the causative agent, oral prednisolone and antihistamines. Antihistamines may be useful for mild allergic reactions confined to the skin, but are not shown to be useful in anaphylaxis. Promethazine, in theory, has the potential to worsen hypotension, because it also causes vasodilatation.

Drug toxicity

Many of the toxic effects of commonly used pharmaceuticals are merely extensions of their therapeutic effects (for example, sedation with benzodiazepines, bradycardia with beta-blockers, hypoglycaemia with insulin). Toxicity can arise if inappropriate doses are used, or if appropriate doses are used in combination with similar drugs with similar toxic profiles. This is particularly important when considering the use of agents that affect the central nervous and cardiovascular systems.

Central nervous system toxicity⁷

The CNS effects of proprietary drugs include altered mental state (agitation, delirium and reduced consciousness), seizures and movement disorders.

Alterations in mental state range from agitation to coma, but also include delirium. Delirium is an organic brain syndrome characterised by fluctuating confusion, altered level of consciousness and altered psychomotor activity. It is usually treatable and reversible. Delirium is more common in elderly patients. An altered consciousness state puts these patients at risk of falls and injury, as well as from the direct CNS effects of the drugs.

Drugs commonly implicated in inducing agitation and/or delirium include:

- antihistamines
- antidepressants, particularly tricyclic antidepressants
- antipsychotic medications
- opiate analgesics, such as codeine and morphine
- corticosteroids.

Agitated or delirious patients should be kept safe. Simple non-pharmacological methods can be very useful in dealing with these patients:⁸

- peaceful, familiar environment
- presence of staff/persons well known to the patient
- avoidance of darkness or bright lights
- simple explanation and regular orientation.

Pharmacologic intervention may be required. For patients where delusions or hallucinations are distressing, consider:

- haloperidol 1.5–10 mg orally titrated to effect
- haloperidol 5 mg IM as a single dose.

If anxiety is a major symptom, or agitation is not controlled with haloperidol, consider the use of benzodiazepines (diazepam or midazolam) either orally or parenterally, titrated according to response. Chlorpromazine has strong anticholinergic effects and may worsen the delirium, so should be avoided.

The offending drugs should be removed or reconsidered. Other organic causes of delirium also should be excluded, for example, stroke, infection, myocardial infarction and so on.

Drugs commonly implicated in over-sedation include:

- opiate analgesics
- benzodiazepines
- antipsychotic agents
- antidepressant agents
- antihistamines.

Initial management of the over-sedated patient should include attention to airway, breathing and circulation (ABCs).

Opiate-induced over-sedation can be reversed with naloxone. Intramuscular administration is just as effective as intravenous. The dose should be titrated against response, but a starting dose of 400–800 µg is appropriate. While resuscitation of the non-breathing individual is paramount, excessive use of naloxone may precipitate an acute opiate withdrawal syndrome in a dependent individual and should be avoided.

Benzodiazepine induced over-sedation can be reversed with flumazenil. This is rarely done in the setting of out-of-hospital benzodiazepine overdose, due to the risk of seizures in a benzodiazepine-dependent individual, or unmasking the effects of co-ingestants such as tricyclic antidepressants (seizures). However, flumazenil 0.5 mg IV in the setting of iatrogenic over-sedation with benzodiazepines is quite reasonable.

Toxicity from anticonvulsants most commonly manifests as CNS toxicity, and are usually dose related. Common symptoms and signs include:

- nystagmus
- ataxia
- slurred speech
- decreased coordination
- drowsiness, sedation
- confusion.

Cardiovascular toxicity

Anti-hypertensive and anti-arrhythmic agents are among the most commonly prescribed drugs in our society. Frequently, patients are prescribed more than one agent from each group, and commonly are taking agents from both groups. The effects of these combinations may be additive and result in adverse cardiovascular effects.

Hypotension and bradycardia beyond the desired effect may occur with the following drugs, and may be exacerbated by using combinations of these drugs:

- beta-blocker drugs—propranolol, atenolol, metoprolol, sotalol, carvedilol
- calcium channel blocking drugs—verapamil, nifedipine, amlodipine, diltiazem
- other anti-arrhythmic drugs—digoxin, amiodarone, flecainide
- diuretic agents—frusemide, hydrochlorothiazide, indapamide, spironolactone
- angiotensin converting enzyme inhibitors—captopril, enalapril, ramipril, quinapril, perindopril, lisinopril, fosinopril and so on
- angiotensin receptor blocking agents—irbesartan, candesartan, losartan
- other vasodilators—GTN, prazosin.

Care should be taken when prescribing and administering these drugs alone or in combination, with particular regard to the patient's heart rate and blood pressure.

Other non-cardiovascular drugs may also contribute to cardiovascular toxicity through reductions in blood pressure or via cardiac conduction disturbances (for example, QRS and QT prolongation). Some of these agents include:

- opiate analgesics
- benzodiazepines
- phenothiazine derivatives—chlorpromazine, promethazine
- other CNS drugs—tricyclic antidepressants, olanzapine, droperidol.

Drug monitoring

All drugs need ongoing vigilance to ensure their clinical efficacy without toxicity developing. More specifically, drugs with a narrow therapeutic index require regular monitoring of plasma levels for toxicity. These include:

- anticonvulsants—phenytoin, carbamazepine, valproate
- anticoagulants—warfarin, heparin
- digoxin
- lithium
- antibiotics—vancomycin, gentamicin.

Monitoring includes clinical assessment (for example, neurological sequelae of anticonvulsant toxicity) and biochemical assessment (for example, drug levels, INR monitoring). Biochemical assessment requires an understanding of the pharmacodynamics of each of the agents. Plasma levels of drug are usually assessed when the drug concentration is in steady state, that is, five half-lives. Trough levels of anticonvulsant medications are usually assessed.

Variability in drug levels may occur for several reasons,⁹ including:

- dosing
- compliance
- age—children, elderly
- physiology—gender, pregnancy
- disease—renal, hepatic, cardiovascular, respiratory
- drug interactions
- genetics.

Drug interactions and the subsequent effects on therapeutic levels are important factors for health professionals to consider when prescribing and administering drugs.¹⁰

In particular, warfarin interacts with many drugs and these interactions may lead to either increases or decreases in the INR with associated risk of bleeding or thrombosis respectively. Drugs groups that interact with warfarin to cause an increase in INR include:

- analgesics—aspirin, paracetamol
- antibiotics—macrolides and cephalosporins in particular, but many others
- anticoagulants—heparin
- anticonvulsants
- anti-arrhythmics—amiodarone
- antidepressants
- beta-blockers
- oral hypoglycaemic agents
- diuretics agents
- H2 and proton pump inhibitors
- non-steroidal anti-inflammatory agents
- statins and fibrate medications
- thyroxine.

Drugs that interact with warfarin to cause a decrease in INR include:

- anti-anxiety agents
- anti-arrhythmics
- antibiotics, antifungals, antivirals
- corticosteroids
- anticonvulsants.

Digoxin similarly has a narrow therapeutic index. Apart from the synergistic effects of beta-blockers and calcium channel blockers on cardiac conduction causing toxicity, other drugs interact with digoxin to increase or decrease plasma digoxin levels. Drugs that are known to increase digoxin levels include:

- amiodarone
- antibiotics—erythromycin, tetracycline, clarithromycin, trimethoprim
- ACE inhibitors
- diltiazem, verapamil
- non-steroidal anti-inflammatory drugs.

Management of toxic or sub-therapeutic levels includes recognition of factors that may have affected steady state levels, including dosing, compliance, drug interaction and disease. Dosing should be altered temporarily or permanently, guided by ongoing assessment. In most instances, dose variation is based on 'clinical experience'. However, in the case of warfarin, consensus guidelines are available to guide warfarin prescribing in response to INR.¹¹ Many hospitals have similar protocols for guiding heparin dosing based on APTT measurements.

In the case of warfarin toxicity and elevated INR, the following is suggested:¹²

- INR < 5.0, no bleeding: Lower dose or omit next dose. Restart when INR in therapeutic range.
- INR 5.0–9.0, no bleeding: Cease warfarin, consider reasons for INR elevation. If bleeding risk high, give vitamin K (1.2 mg orally or 0.5–1 mg IV), resume warfarin when INR in therapeutic range.
- INR > 9.0, no bleeding: Cease warfarin. Vitamin K (2.5–5 mg orally or 1 mg IV) if low risk of bleeding. Vitamin K 1 mg IV if high risk of bleeding and consider prothrombinex (25–50 units per kg body weight) and FFP (150–200 mL).
- Any significant bleeding: Cease warfarin, give 5–10 mg vitamin K IV as well as prothrombinex 25–50 units per kg body weight and FFP 150–300 mL.

Learning activities

Suggested learning activities and timetables are outlined below. Timetable 1 is designed for 12 participants working in two groups of six. Timetable 2 is designed for 6 participants working together.

| Timetable 1 | | | |
|-------------|--------------|--------------|-----------|
| Timing | Activity | | Objective |
| 30 minutes | Discussion | | 1, 2 |
| 10 minutes | Simulation 1 | Simulation 2 | 3 |
| 20 minutes | Debrief | Debrief | 3 |
| 10 minutes | Simulation 2 | Simulation 1 | 3 |
| 20 minutes | Debrief | Debrief | 3 |
| 10 minutes | Summary | | 1, 2 |
| 10 minutes | Evaluation | | |

Total time = 1 hour 50 minutes

| Timetable 2 | | |
|-------------|--------------|-----------|
| Timing | Activity | Objective |
| 30 minutes | Discussion | 1, 2 |
| 10 minutes | Simulation 1 | 3 |
| 20 minutes | Debrief | 3 |
| 10 minutes | Simulation 2 | 3 |
| 20 minutes | Debrief | 3 |
| 10 minutes | Summary | 1, 2 |
| 10 minutes | Evaluation | |

Total time = 1 hour 50 minutes

Facilitated discussion

The facilitator should lead a discussion amongst participants about common adverse drug events that might occur in the hospital setting. The discussion should focus on the potential for adverse events or drug interactions and strategies to prevent or manage such events. It should not be a comprehensive lecture of adverse drug reactions. The discussion should then introduce the simulation training to follow.

Facilitators should be aware of the different professional groups that may be present during this discussion, particularly if they include junior nursing staff or allied health professionals, and to allow these groups to discuss their roles in managing a patient's adverse drug reactions. Where the group is made up of a mixture of participants, facilitators may split participants into smaller groups to discuss a clinical scenario and report back to the group. A selection of scenarios is provided with this module for this purpose, but educators may also wish to develop their own. Thus, participants can concentrate on issues that are relevant to their craft group and skill level while informing other craft groups of their capabilities and limitations.

The discussion should not go beyond 30 minutes, in order to keep the module to time. Facilitators are reminded that debriefing time is also a valuable opportunity to clarify or further discuss management.

PowerPoint slides are available for the facilitator to use to summarise these main points at the end of the discussion, or as triggers if participants have not identified the major issues.

The facilitator should ensure these major issues are covered:

- recognition and initial management of allergic and anaphylactic reactions
- risk of synergistic drug interactions from drugs with similar therapeutic actions
- factors that might lead to drug toxicity and altered drug levels
- management of common drug toxicities.

Scenario 1

You are reviewing a patient on the surgical ward who had been admitted overnight with cellulitis. You note that he was prescribed IV cephazolin, which has not been administered yet. The patient thinks he might be allergic to penicillin, but is not sure. What is your role at this point (medical, nursing, allied health)?

Participants should consider the likelihood of allergic drug reaction. They should be asked to discuss their role in management with respect to their health professional group, and then be led in a discussion regarding prevention and management of allergic drug reactions.

Scenario 2

You are asked to assess the mobility of an elderly woman with a view to discharging her home. She appears to be unsteady on her feet, complaining of dizziness, and clearly unsafe for discharge. You note that her medications include digoxin, atenolol, GTN patch, frusemide, irbesartan, imipramine and temazepam. What is your role in her management at this point (medical, nursing, allied health)?

Participants should consider the likelihood of synergistic drug effects. They should be asked to discuss their role in management with respect to their health professional group and be led in a discussion regarding synergistic drug interactions.

Scenario 3

You are waiting at the bedside of an elderly man on the medical ward who is taking warfarin. He was recently started on erythromycin for a chest infection. He returns from the toilet with a urinary specimen that looks like frank blood. What is your role in his initial management (medical, nursing, allied health)?

Participants should consider the likelihood of drug interaction between warfarin and erythromycin. They should be asked to discuss their role in management with respect to their health professional group and then be led in a discussion regarding the problem of drug interactions and therapeutic levels.

Scenario 4

You are approached by the wife of an epileptic patient concerned about her husband's symptoms. He had been admitted three days earlier after several seizures at home. He had received a loading dose of phenytoin in the emergency department on presentation and continues on regular phenytoin now. He complains of dizziness and tiredness. He has trouble walking without holding onto things and has almost fallen on several occasions. What is your role in his management at this point (medical, nursing, allied health)?

Participants should consider the likelihood of phenytoin toxicity. They should be asked to discuss their role in management with respect to their health professional group, and be led in a discussion regarding the management of patients taking medications that need close therapeutic monitoring, for example, anticonvulsants, digoxin, warfarin and so on.

Simulation session

This exercise allows participants to practise managing adverse drug events in a simulated environment.

The program assumes two facilitators for 12 participants. Participants should be divided into two groups of six (Timetable 1). Three participants each participate in one scenario and observe a second. Those not participating in the scenario observe and participate in the debriefing session. The debriefing period should include all six participants—that is, the active participants and their observers. These scenarios can be run with smaller groups. If only six participants are present, the scenarios can be run consecutively (Timetable 2).

If there are no medical participants, facilitators should fill these roles and allow nursing or allied health participants to contribute to the scenarios as they would in real life.

These scenarios can be run on low-fidelity simulators (for example, Resus Anne), but are also quite suitable for more sophisticated simulators (for example, Sim Man, HPS METI).

Simulation 1: Anaphylaxis

Scenario design

In this scenario, a 40-year-old male suffers an anaphylactic reaction to IV antibiotics on the medical ward. Participants are required to recognise this and manage the patient accordingly.

| Case history | |
|----------------------------|---|
| Patient details | |
| Sex | Male |
| Age | 40 |
| Past history | Previously well |
| Social history | Lives at home with wife and young son |
| History of present illness | Admitted with appendicitis and taken from ED to theatre Antibiotics prescribed postoperatively for ruptured appendix—these had not been given in theatre |
| Presenting symptoms | Short of breath, tightness in throat, wheezy, palpitations, sweaty, dizzy |

| Resources | |
|-----------------------------------|--|
| General | |
| Setting/environment | Hospital surgical ward |
| Patient attire | Hospital gown |
| Monitoring | None initially |
| Supporting documentation required | Hospital medication chart, with Ampicillin 1 gm tds, Gentamicin 240 mg daily and Metronidazole 500 mg tds charted Hospital observation chart, stable observations preceding event |

| Equipment | | |
|--|---------|--------------|
| Equipment | Number | Sourced from |
| Manikin capable of simulating anaphylaxis, that is, tachycardia, hypotension, tachypnoea | 1 | |
| Hospital bed | 1 | |
| Hospital gown | 1 | |
| Pillow/blanket | 1 | |
| Treatment chart | 1 | |
| Observation chart | 1 | |
| IV cannulae | 1 | |
| Medication props—adrenaline, hydrocortisone, promethazine, salbutamol and antibiotics | 1 set | |
| Resuscitation trolley—ECG monitoring, pulse oximetry, airway equipment | 1 | |
| Oxygen mask and supply | 1 | |
| IV fluid and giving set | 1 | |
| Needles and syringes | Various | |
| Nebuliser mask | 1 | |

Roles

Participant 1

You are a health professional working on the surgical ward of your hospital. A 40-year-old male has not long returned from theatre, where he was diagnosed with a ruptured appendix. He has no significant past history and is not on any long-term medication. The nurse looking after this man will call for your assistance shortly. There is no monitoring in the surgical ward, but a resuscitation trolley is available containing some monitoring and resuscitation equipment and drugs.

Participants 2 and 3

You are health professionals working on the surgical ward. Your colleague, Participant 1, was called to manage a 40-year-old man who has just returned from theatre following surgery for a ruptured appendix. He has no significant past history and is not on any long-term medication. Your colleague may call on you for assistance. There is no monitoring in the surgical ward, but a resuscitation trolley is available containing some monitoring and resuscitation equipment and drugs.

Faculty role play: ward nurse

You are the ward nurse looking after this 40-year-old man who has just returned from theatre where he underwent an appendectomy. You have started infusing his gentamicin and metronidazole and have just given a bolus dose of ampicillin. The patient starts to complain of some tightness in the throat and difficulty breathing. You see a rash starting to develop and call on Participant 1 to assist and manage the patient.

Faculty role play: senior clinician (optional)

You are a senior clinician working in the hospital. At the end of the scenario, you arrive to take handover. If the participants experience difficulty with the scenario, you may enter earlier to offer assistance.

Simulator programming considerations

| System | Baseline state | Resolution |
|--------------------------------------|---|--|
| CVS | HR 120 ST BP 80/60 mmHg Flushed, sweaty | HR 100 SR BP 110/70 mmHg |
| Respiratory | Swollen lips RR 30 O ₂ sat 85% RA Wheeze | RR 20 O ₂ sat 99% on O ₂ Clear chest |
| Neurologic | GCS 15 | GCS 15 |
| Response to participant intervention | Remains in baseline state until all the following are done or discussed: <ul style="list-style-type: none"> ■ call for assistance ■ IV access ■ stop drug infusions ■ IM/IV adrenaline ■ 1000 mL IV fluid bolus ■ hydrocortisone 100 mg IV ■ oxygen administered ■ ECG monitoring ■ nebulised salbutamol ■ disposition plan | |

Debriefing points:

- importance of adrenaline
- removal of offending agents
- supportive management (oxygen, fluids and so on)
- documentation/explanation to patient regarding anaphylaxis.

Simulation 2: Opiate overdose

Scenario design

In this scenario, a 70-year-old woman is being managed on the medical ward for exacerbation of her airways disease. She has fallen out of bed and appears to have sustained a fractured neck of femur. She is over-sedated with opiates analgesics while awaiting X-ray confirmation of her fracture. Participants are required to recognise this and manage the patient accordingly.

| Case history | |
|----------------------------|---|
| Patient details | |
| Sex | Female |
| Age | 70 |
| Past history | COAD, prescribed salbutamol puffer QID, ipratropium puffer bd, regular courses of prednisolone |
| Social history | Lives in unit behind daughter's house |
| History of present illness | Admitted to hospital three days earlier with a fractured rib following a simple fall Her pain is managed with a morphine infusion running at 2 mg per hour Other current hospital medications include: <ul style="list-style-type: none"> ■ salbutamol nebs 5 mg every 4 hours ■ ipratropium nebs bd ■ prednisolone 50 mg daily ■ temazepam 20 mg nocte ■ imipramine 25 mg nocte |
| Presenting symptoms | Went to toilet unaided after evening medications and fell—appears to have sustained a fractured neck of femur; returned to bed Phone order given for 10 mg IM morphine by covering doctor while X-rays are arranged |

| Resources | |
|-----------------------------------|---|
| General | |
| Setting/environment | Hospital medical ward |
| Patient attire | Hospital gown |
| Monitoring | None initially |
| Supporting documentation required | Hospital treatment sheet, medication chart with above medications charted and phone order for morphine Admission blood gases showing PCO ₂ 58, PO ₂ 80 |

| Equipment | | |
|---|---------|--------------|
| Equipment | Number | Sourced from |
| Manikin capable of simulating opiate intoxication, that is, unconsciousness, bradypnoea | 1 | |
| Hospital bed | 1 | |
| Hospital gown | 1 | |
| Pillow/blanket | 1 | |
| Treatment chart | 1 | |
| Observation chart | 1 | |
| IV cannulae | 1 | |
| Medication props—naloxone, flumazenil | 1 set | |
| Resuscitation trolley—ECG monitoring, pulse oximetry, airway equipment | 1 | |
| Oxygen mask and supply | 1 | |
| IV fluid and giving set | 1 | |
| Needles and syringes | Various | |

Roles**Participant 1**

You are a health professional working on the medical ward of your hospital. A 70-year-old female with COAD had been admitted three days earlier with a fractured rib and is on a morphine infusion for this. She had been given her usual nighttime medication a short while ago, but then went off to the toilet unaided. She fell, and appears to have sustained a fractured neck of femur. The nursing staff on the ward gave her some analgesia as per telephone instructions from a covering doctor. The nurse looking after this lady will call for your assistance shortly. There is no monitoring on the medical ward, but a resuscitation trolley is available containing some monitoring and resuscitation equipment and drugs.

Participants 2 and 3

You are health professionals working on the medical ward. Your colleague, Participant 1, was called to manage a 70-year-old woman with COAD who was admitted to hospital with a fractured rib. She fell this evening and appears to have sustained a fractured neck of femur. X-rays are pending. Your colleague may call on you for assistance. There is no monitoring in the medical ward, but a resuscitation trolley is available containing some monitoring and resuscitation equipment and drugs.

Faculty role play: ward nurse

You are the ward nurse looking after this 70-year-old woman with COAD who was admitted three days earlier with a fractured rib. She is on a morphine infusion, 2 mg per hour for pain relief. She has had her evening dose of temazepam and imipramine, but then fell when she took herself off to the toilet. You received a phone order from a covering HMO for morphine, which you have administered, while awaiting an X-ray to confirm the presence of a fractured neck of femur. She appears NOT to have sustained any head injury. You note that this lady's conscious state has deteriorated and she is not responding to you as she was 15 minutes earlier.

Faculty role play: senior clinician (optional)

You are a senior clinician working in the hospital. At the end of the scenario, you arrive to take handover. If the participants experience difficulty with the scenario, you may enter earlier to offer assistance.

| Simulator programming considerations | | |
|--------------------------------------|--|--|
| System | Baseline state | Resolution |
| CVS | BP 110/80 Pulse 80 regular | BP 130/90 Pulse 80 regular |
| Respiratory | RR 6 Shallow respirations Oxygen saturation 80% room air Clear chest | RR 15 Good tidal volumes Oxygen saturation 92% on intranasal oxygen Clear chest |
| Neurologic | GCS 7: (E1, V2, M4) Pinpoint pupils No evidence of head injury | GCS 14: (E3, V5, M6) Normal pupils |
| Response to participant intervention | Remains in baseline state until all the following are done or discussed: <ul style="list-style-type: none"> ■ call for assistance ■ stop morphine infusion ■ oxygen administered ■ provide respiratory assistance ■ naloxone 400 µg boluses IV ■ consider flumazenil 0.5 mg IV ■ disposition plan | |

Debriefing points:

- dose-dependent opiate toxicity
- synergistic effects of other medications (temazepam, imipramine)
- patient factors in drug toxicity (age, COAD)
- supportive management and specific therapy for opiate toxicity
- analgesic option post-resuscitation.

Summary

The summary session reinforces content covered in the learning activities, and is an opportunity for participants to reflect on what they have covered. No new material should be introduced.

Major points to recap in the summary include:

- the importance of proactive prevention, rather than reactive management of adverse drug events
- the need for continual monitoring and vigilance in drug prescribing and administration
- drug classes commonly implicated in adverse events through toxic profiles or interactions with other agents
- pathways and guidelines for the management of adverse events, such as anaphylaxis and acute drug toxicity.

Participants should be encouraged to review the literature on adverse drug events in their own time to reinforce the material covered in this module. They should be offered access to educators in the future if they need to practise or improve their skill level or confidence.

Resource list

The following resource list assumes two facilitators for every 12 participants, a ratio of 1:6. As a minimum, the following resources are needed to conduct this module.

| Resource | Quantity | Additional comments |
|--|----------|----------------------------------|
| Facilitators | 2 | Based on 12 participants |
| PowerPoint presentation | 1 | For use in discussion |
| Equipment as listed for each individual scenario | | |
| Feedback forms | 2 | As a prompt for each facilitator |
| Evaluation forms | 12 | One for each participant |

Evaluation

A formal evaluation has been specifically developed for this module. It incorporates the objectives of the module and the perceptions of the participants about whether they have increased their understanding by working through the module. It is highly recommended that this formal evaluation be copied and completed by all participants at the completion of the module.

A range of informal evaluation tools may also be used in conjunction with this evaluation throughout the module, including those available in the Department of Human Services' *Clinical Skills Facilitators Manual* from the basic course conducted in 2007.

References

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10. Lucas H 2000 Drug interactions that matter (6): Antiarrhythmics. *The Pharmaceutical Journal* 262: 28–31: www.pjonline.com/editorial/19990703/education/antiarrhythmics.html
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Resources

Facilitator feedback form

The following form could be used to assist you giving feedback and/or directing your debrief post simulation.

Feedback using the Pendleton model

Pendleton’s model of feedback assists learners to maximize their potential at different stages of training, raise their awareness of strengths and areas for improvement, and identify actions to be taken to improve performance. Pendleton’s rules are structured in such a way that the learner identifies the positives first, in order to create a safe environment. This is followed by the facilitator or group reinforcing these positives and discussing skills to achieve them. Different techniques are then suggested. The advantage of this method is that the learner’s strengths are discussed first. Avoiding a discussion of weaknesses right at the beginning prevents defensiveness and allows reflective behaviour in the learner.

Below is a series of questions to assist you in this technique:

1. Ask the learner how they feel.
2. Ask the learner what went well and why (this can be combined with question 1 and 3).
3. Tell the learner what went well and why.
4. Ask the learner what could have been done better and why.
5. Tell the learner what could have been done better and why.
6. Summarise the learner’s strengths and identify up to three things to concentrate on.

Note: This form does not need to be given to the participant — it is a guide for you, the group facilitator.

Module 4: Drug reactions and adverse events—evaluation

Thank you for participating in this module. As part of our commitment to quality improvement the following questionnaire will be used to plan future implementation of this module. We appreciate your time completing this evaluation.

1. Overall

How would you rate this module?

poor fair good very good outstanding

2. Learning objectives

Please consider whether this module was successful in meeting the following learning objectives:

| <i>Safe medication administration</i> Learning objectives of Module 4: Drug reactions and adverse events | Strongly disagree | Disagree | Slightly agree | Agree | Strongly agree |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Discussed common adverse drug events that might occur in your clinical setting | <input type="checkbox"/> |
| Identified common themes and drug classes responsible for adverse events | <input type="checkbox"/> |
| Reflected on how you might manage adverse drug events in the hospital setting | <input type="checkbox"/> |
| Practised managing an adverse drug event on a simulated patient | <input type="checkbox"/> |

3. Important learning outcomes

What are the three most important things you have learned from this module?

4. Module implementation

Please indicate to what extent you agree or disagree with each of the following statements in relation to the implementation of the module.

| | Strongly disagree | Disagree | Slightly agree | Agree | Strongly agree |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| The facilitator respected my experience | <input type="checkbox"/> |
| The facilitator encouraged my participation | <input type="checkbox"/> |
| I was able to ask the facilitator questions | <input type="checkbox"/> |
| The facilitator was able to answer my questions | <input type="checkbox"/> |
| The feedback I received was clear | <input type="checkbox"/> |
| The feedback I received will assist me in my future performance | <input type="checkbox"/> |
| There was adequate time for the facilitated discussions | <input type="checkbox"/> |
| There was adequate time for the simulations | <input type="checkbox"/> |
| I have increased my confidence in managing adverse drug reactions | <input type="checkbox"/> |
| I have identified future learning needs in this topic area | <input type="checkbox"/> |

5. Future module implementation

Do you think the module should be altered in any way? yes no

If yes, what recommendations do you have?

Thank you

PowerPoint presentation

1. **Clinical Skills in Hospitals Project**

Safe Medication Therapy
MODULE 4
'Drug Reactions and Adverse Events'


2. **Module Outline**

 - Facilitated discussion
 - Simulation 1
 - Debrief
 - Simulation 2
 - Debrief
 - Summation
 - Evaluation
3. **Discussion**

 - Allergic reactions
 - CNS toxicity
 - CVS toxicity
 - Drug monitoring

Module 5: Error awareness

Introduction

Safe medication administration was developed as a teaching and learning tool for Victorian clinical educators. The information contained in each module was developed using evidence-based resources and examples of best practice. Where expert opinion varies, a discussion section is included. However, it is not within the scope of *Safe medication administration* to address the full spectrum of local variations. Variations can occur in several areas, including practices relating to types of equipment used, infection control processes, practice guidelines and so on. Therefore, educators should, where appropriate, adapt content to reflect their local policies, procedures and protocols. This will ensure the relevancy of the package content to your learners.

The modules are designed to be discrete courses in their own right. They are timetabled so they can be completed in a 1–2 hour timeframe. This timeframe was chosen after we received feedback from clinical educators requesting shorter courses, because health professionals often have limited time to educate away from patients. However, the packages may also be combined into a one- or two-day course.

Safe medication administration should be used as an educational tool to assist in the teaching of clinical skills. It is structured as a guide to assist clinical educators, and uses many concepts taught in the Clinical Skills in Hospitals Project (Train-the-Trainer courses). Educators are encouraged to build on this resource by adding their own scenarios which incorporate hospital/health service protocols, policies and other resources. Each module is designed as a lesson plan to incorporate the simulations into the teaching of clinical skills.

Aims

Safe medication administration aims to increase participants' safety awareness through developing skills associated with prescribing, documentation and medication administration. This package is intended for use with medical, nursing and pharmacy participants.

Package structure

Safe medication administration contains five modules which provide learning opportunities for health professionals at all levels of experience and from medical, nursing and pharmacy disciplines. Modules 1 and 2 are regarded as fundamental. Modules 3 and 4 are more difficult and are regarded as intermediate. Module 5 is more advanced and is regarded as complex.

| Level of complexity | Package structure |
|---|---|
| <p>Complex For participants with more than 4 years experience or who have completed Modules 1–4</p> | <pre> graph TD ErrorAwareness([Error awareness]) DrugAdmin[Drug administration] <--> DrugReactions[Drug reactions and adverse events] NIMC[National Inpatient Medication Chart] --> DrugAdmin TherapyPumps[Therapy delivery pumps] --> DrugReactions DrugReactions --> ErrorAwareness </pre> |
| <p>Intermediate For participants in postgraduate years 3–4 or who have completed Modules 1 and 2</p> | |
| <p>Fundamental For participants in postgraduate years 1–2</p> | |

Skills in *Safe medication administration* include completing and interpreting the National Inpatient Medication Chart, taking patient history, using therapeutic delivery devices, appropriate therapeutic administration, and recognising adverse events and medication errors.

This package was designed to develop participants' knowledge, skills and behaviours in the safe administration of medication, and to expose them to increasingly complex skills and knowledge aimed at testing their ability to combine these individual skills, work as a team and problem solve in more difficult situations.

Educators delivering these modules should be aware of participants' level of experience and choose appropriate modules. Modules presume an increasing level of knowledge as they progress, ranging from a fundamental knowledge of anatomy and physiology for the fundamental modules, up to detailed knowledge of errors associated with drug administration for the complex modules. Novice participants (such as first-year graduates) are expected to start with the fundamental modules, and only move onto intermediate and more complex modules as they demonstrate proficiency. More experienced participants may start at the intermediate level if the educator is satisfied that they have the prior knowledge and skills. Individual educators are responsible for assessing each participant's baseline knowledge and determining which modules they should complete. More specific descriptions of presumed knowledge are outlined in each module.

The design of these packages presumes that the clinical educators using them have knowledge and expertise in current best practice regarding the teaching of clinical skills and conducting facilitated discussions. Knowledge and expertise are presumed commensurate with the Department of Human Services' basic and advanced Train-the-Trainer programs. Clinical educators are encouraged to refer to the Department of Human Services' *Clinical Skills Facilitators Manual* for theory on:

1. Peyton's model for teaching clinical skills
2. leading small group discussions
3. giving feedback
4. crisis resource management skills.



Module 5: Error awareness

Authors: Julian Van Dijk, Stuart Dilley

Aims

The purpose of this module is to increase participants' awareness of factors that contribute to performance error and identify potential countermeasures, which can be used to minimise both risk and impact of error.

Presumed knowledge

This module is targeted to health professionals who have either completed the previous four modules in the *Safe medication administration* package, or have at least four years experience in clinical practice.

Objectives

By the end of this module, participants should have:

1. discussed the factors that affect individual, team and systems performance
2. defined types of error
3. identified issues that increase the likelihood of medication error in a participant's workplace
4. identified strategies to minimise medication error
5. discussed and reviewed their clinical setting, identifying potential weakness that may lead to error
6. participated in scenarios that require error management strategies.

Background information for educators

Introduction

Error and error reduction has become an important focus for the provision of safer health care. Reports into medical error such as *To Err is Human—Building a Safer Healthcare System* paints an uncomfortable picture of an error-riddled health care system that fails to recognise its vulnerability and susceptibility, leading to ineffective error recognition and reduction strategies.^{1, 2}

So, why is health care so fraught with error? Are we not well qualified individuals aiming to institute best practice standards to benefit patient care? And if there is so much error in what we do, what can be done to reduce its impact on patients?

Unfortunately, the answers to these questions are both simple and complex. Simple, because humans are very prone to making errors, and complex, because there is no singular method to reduce error.

This module reviews the concepts behind human error and presents the idea of 'error wisdom' as a tool for participants to review their own clinical settings and how they work within them.

Human error

A considerable volume of literature exists concerning human error and management strategies. Much of this work concerns high-risk organisations, such as aviation, nuclear power and the military. The interest in these organisations is partly due to the very public nature of accidents and high potential for injury and loss of life.

In contrast, the medical industry, which is no less a high-risk venture, has only recently attracted the type of attention in determining error causality.¹ The culture of health care is seen as significantly behind other industries in developing a proactive safety culture.^{3,4}

Literature on the subject of human error causality categorises error into broad categories, active errors or latent conditions.

Active errors

Active errors are made by humans in action while we go about our activities. They are often described in terms of the following:

Slips and lapses

These are routine activities (that can be subconscious) that we become distracted from, leading to inattention, which results in error. Distractions while on medication or drug rounds is commonplace in many organisations. It is easy to reflect on how easy a distraction can interfere with this task.

Rule-based errors

Clinical practice is full of unexpected situations. During such events we attempt to use a known rule or plan to resolve the situation. Rule-based errors occur when we either apply the right rule to the wrong situation or the wrong rule to the right situation.

Knowledge-based errors

These occur when unexpected or new situations arise, for which we have no rules, or for which we have run out of rules to tackle the event. In such cases, we have no prior compiled responses,¹ and this requires us to 'think up' a response. In such situations, which normally produce anxiety, we are not good at rapidly developing responses and solutions without time to think about it. As these errors occur, we do not have the knowledge base to support the required solutions. The other implications for rapidly developed solutions is that they can blind us to other events that may be more important to deal with. This type of event can be termed 'unintentional blindness', where we cannot see the whole picture due to a full working memory.

Violations

Violations occur when a rule or procedural policy is known, but is ignored or disregarded, leading to error. A violation is a complex area, because there may be good reasons why a policy is ignored—perhaps to avert a greater error.

‘Malicious violation’ is an act committed with the direct intent not to follow a rule. Malicious errors are considered rare events in health care, and most practitioners are well-intentioned people trying to do a good job.

As we can see active error are about us, the fact that we are prone to error in a range of circumstance. However, error causality has other factors as well

Latent conditions

Latent conditions are a system-level problem, *that being the pace or organisations that we work in*. Latent conditions are weaknesses and vulnerabilities that lie in a system, unrecognised until a set of events occur highlighting the weakness and a disaster occurs. J. Reason⁴ describes latent conditions as a ‘resident pathogen’, with an organisation waiting for the right time to strike! Latent conditions are caused by, for instance, policy and procedural gaps, absences in planning or a hole that exists because issues have not been recognised as problems or predicted to be problems. Every organisation has problems or latent conditions, and although we may see one and do something about it, other latent issues will remain.

These conditions are often present for a long period before an adverse event, and there is a chance of detection and for a defensive barrier to be raised to minimise the risk of people becoming trapped.

The definitions of error causality discussed here are important to understand when we consider how error is managed by different organisations.

Error management

Error management strategies can be reviewed under the headings ‘personal approach’ or ‘system approach’.^{4,6}

Personal approach

The personal approach should be familiar to most health professionals—it is the old ‘shame, blame and retrain’ model.⁷ The personal approach model of error management views error as occurring from ‘aberrant mental processes’.⁴ The result is that strategies or countermeasures minimise ‘unwanted variability of human behaviour’.⁴ The risk of this approach in managing error is that it distances the system that the individual works in and as part causality. The advantage is that someone can be blamed!

Generally, the literature considers this type of approach as flawed, because system issues are ignored, leading to reduced compliance of error reporting. True countermeasures cannot be deployed, because only part of the problem is identified.

It is also important to identify that humans are also ‘heroes’—not just ‘hazards’. We know this because humans often avert error or retrieve situations from error.

Characteristics that facilitate ‘hero’ behaviour include the ability to:

- adjust
- compensate
- recover a situation
- improvise.

System approach

The system approach considers error in terms of building defensive barriers around the known fact that humans are fallible and mistakes will happen.⁴ In this approach, human error potential is accepted, and the organisation continually looks for the latent ‘risk’ within it that may cause error traps. In organisations that adopt this type of system, error reporting is encouraged. Such organisations continually seek to improve their defence barrier response to identified problems. When adverse events occur, the response is to determine what part of the barrier failed and why, rather than seeking someone to blame.

How does error occur in the system model?

The ‘Swiss cheese model’ is often used to describe how error can occur at a system level.

This theory explains that multiple layers of cheese exist, and being Swiss, there are holes in each layer. However, they are not all aligned. These layers represent an organisation’s attempts to build levels or barriers, defences and countermeasures. However, latent conditions mean that there are always some holes in the barriers, in this case, the holes in the Swiss cheese.

The holes present in the cheese are caused by both active and latent conditions. The holes, while present, are not static. Each layer’s defensive holes are continually moving in response to counter-measures and risk management employed. But while one hole is fixed, another are of latency or active error will occur.

If we consider an ‘error risk’ as an arrow that will fly through the defensive gaps, while it may penetrate one or two layers, it should be stopped by the fact that there are many layers to get through.

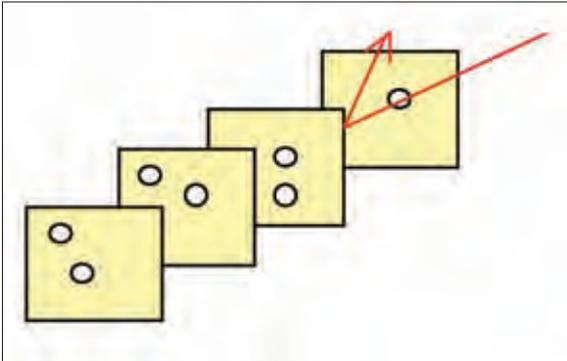


Figure 1: Defensive barriers repelling error trajectory

However, on occasion, all the holes in the multiple layers align, and if error risk is present, this can penetrate all the levels of defence to cause an unsafe act or error, leading to adverse outcomes. J. Reason labels this 'accident trajectory'.^{4, 6}

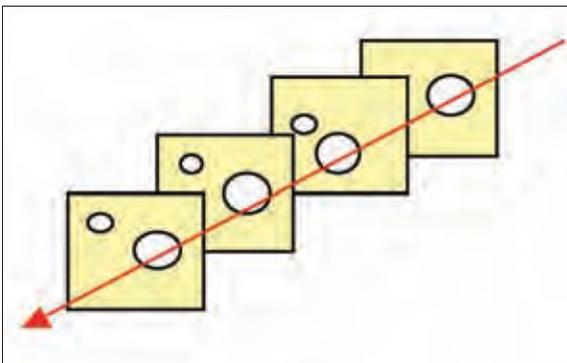


Figure 2: Defensive barriers align failing repelling error trajectory

What can we do about this?

Error is unavoidable. The literature identifies that it is extremely difficult for individuals to change or influence systems. However, certain personal strategies may make us more aware of the potential risks leading to error.

J. Reason proposes a mental preparedness as an important tool for individual in health care to carry with them. The model is called the 'three-bucket model', and it considers probability of error, rather than certainty. The aim of this model is to promote error wisdom.

The model's three buckets represent:

Self: What is my situation?

- negative life events
- sick
- tired
- lack of knowledge
- inexperience.

Example: You are halfway through a busy nightshift, and need to prepare an infusion that requires you to calculate the drug concentration to volume that you are not familiar with. You are tired and working in a poorly lit area.

Issues: fatigued, required to perform calculation, lack of familiarity with the drug and handling drug in a poorly lit area.

Context: Where am I about to conduct this action and what is going on around me?

- distraction
- time pressure
- interruptions
- lack of equipment.

Example: You are attempting to writing up a drug chart in a busy emergency department while being continually interrupted.

Issues: Interruption and potential distraction removing your attention from the job at hand.

Task: The steps of the task I am undertaking or about to undertake:

- omission errors; task is not completed
- task step variation
- lack of cueing between steps
- out of sight, out of mind.

Example: you are undertaking a drug round on a busy shift. As you move between patients you employ the 'five rights' checklist for each drug administered. You are about to complete the drug round for your last patient, who you have looked after often. You believe that you are familiar enough with this patient's drug requirement, so do not fully review the drug chart. The drug chart presents the same list of drugs that you are used to, so you administer them without full employment of the 'five rights' checklist.

Issues: Repetitive task, which can create a false sense of security. *Takes if varied and steps omitted such as with the use of checklist, can increase the probability of error.*

Each bucket can be filled with 'bad stuff' that represents negative issues that may increase the probability of error if not identified and dealt with. If all three buckets are loaded to the top with bad stuff, then the error probability is very high. If all three buckets are empty, then there is a low probability of error.

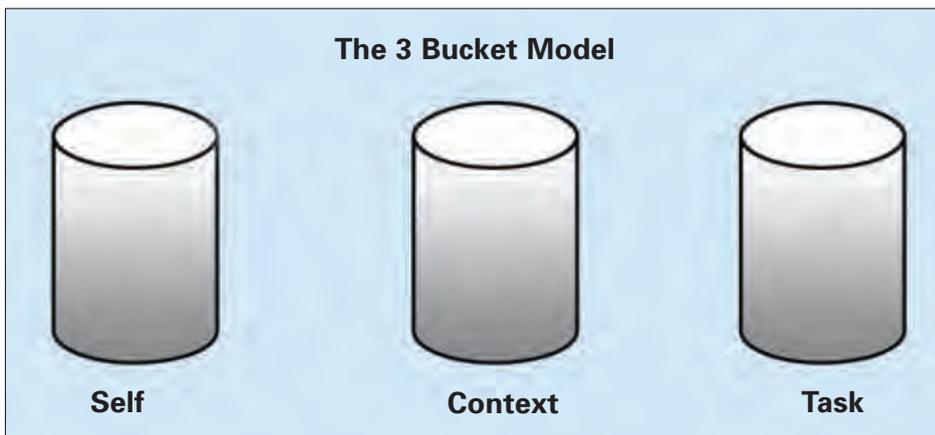


Figure 3: The three-bucket model with bad stuff represented as grey within each bucket (The more 'bad stuff' the higher the probability of error.)

An individual may read the levels of probability based on the three-bucket model as:



Nearing full—high probability, serious risk, if possible, situation should be avoided.

Half-full or filling—increased probability, moderate risk, be wary when proceeding.

Near empty—routine situation, probability risk low, proceed with caution.

Figure 4: The three-bucket model with bad stuff represented as grey within each bucket

This model is intended as a mental assessment of the state of each bucket to determine the probability of error, should an individual proceed with a given task. If the individual identifies a high probability situation, then a more proactive response to planning countermeasures to minimise that probability should be employed.

Learning activities

Suggested learning activities and timetable are outlined below.

| Timing | Activity | Objective |
|------------|-------------------------|-----------|
| 20 minutes | Facilitated discussions | 1–6 |
| 10 minutes | DVD Scenario 1 | 2–7 |
| 10 minutes | DVD Scenario 2 | 2–7 |
| 10 minutes | DVD Scenario 3 | 2–7 |
| 5 minutes | Summary | |
| 5 minutes | Evaluations | |

Total time = 1 hour

Facilitated discussion

The topics raised are designed to be discussed in relation to your health care environment. Participants may share reflections on practice situations as a form of review. The session is not designed to ‘blame and shame’; rather, the facilitator may need to identify the session as confidential for those present.

The aim of this session is create an open discussion about error risk and consider the clinical environments in which we work.

DVD case scenarios

The three DVD scenarios show health professionals in their clinical environments dealing with medication. Each scenario shows groups and individuals making common errors in managing medications.

Each scenario allows the participants to consider the three-bucket model in reviewing what occurred and why.

The facilitator should develop a discussion about each aspect of the three-bucket model, and through this discussion, encourage participants to review their own clinical environment where they work.

Questions to consider include:

- What are the barriers set up to minimise error and how/when are they compromised (identify the Swiss cheese model in their clinical setting)?
- What countermeasures can be employed at both a personal and system level to improve their clinical environment?

Summary

The summary session reinforces content covered in the learning activities, and is an opportunity for participants to reflect on what they have covered. No new material should be introduced.

Important points to include in the summary are:

- Error is common and part of being human.
- Error causation is often a combination of active error and latent condition—these represent both the individual and the environment where they work.
- Error management can be viewed as either focusing on the individual and their fallibility or on the system that they work in and how better to protect or minimise the risk and impact of error that might occur.

Models of error, such as the Swiss cheese model, help to identify the layers of protective mechanisms that exist within a system. They also alert us to the fact that there are holes in any system all of the time. Risk management is a continual process of review for potential, latent and active issues, which may align to create an error trap.

J. Reason promotes the concept of 'error wisdom' as a tool for individuals to consider themselves more broadly, the environment (context) and the tasks they perform. This mental model requires frequent use by individuals to better understand the potential for error that exists in the clinical setting.

Evaluation

A formal evaluation has been specifically developed for this module. It incorporates the objectives of the module and the perceptions of the participants about whether they have increased their understanding by working through the module. It is highly recommended that this formal evaluation be copied and completed by all participants at the completion of the module.

A range of informal evaluation tools may also be used in conjunction with this evaluation throughout the module, including those available in the Department of Human Services' *Clinical Skills Facilitators Manual* from the basic course conducted in 2007.

References

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2. Sunders E, Sunders S, Pawlowski J, Blum R, Feinstein D and Pratt S 2007 Crew Resource Management and Team Training. *Anesthesiology Clinics* 25: 283–300
3. Rall M and Diekermann P 2005 Safety culture and crisis resources management in airway management: general principles to enhance safety in critical airway situations. *Best Practice and Research Clinical Anaesthesiology* 19(4): 539–557
4. Reason J 2000 Human Error: models and management. *BMJ* 320: 768–770
5. Glavin R 2006 What every clinical teacher should know about patient safety. *The Clinical Teacher* 13: 103–106
6. Reason J 2004 Beyond the organisational accident: the need for 'error wisdom' on the front line. *Qual Safe Health Care* 13 (Suppl II): ii28–ii33
7. Howard P 2003 Medication errors in the emergency department. A system approach to minimising risk. *Emergency Medicine Clinics of North America* 21: 141–158

Module 5: Error awareness—evaluation

Thank you for participating in this module. As part of our commitment to quality improvement the following questionnaire will be used to plan future implementation of this module. We appreciate your time completing this evaluation.

1. Overall

How would you rate this module?

poor fair good very good outstanding

2. Learning objectives

Please consider whether this module was successful in meeting the following learning objectives:

| <i>Safe medication administration</i> | Strongly disagree | Disagree | Slightly agree | Agree | Strongly agree |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Learning objectives of Module 5: Error awareness | | | | | |
| Discussed the factors that impact on individual, team and systems performance | <input type="checkbox"/> |
| Define types of error | <input type="checkbox"/> |
| Identified issues that increase the likelihood of medication error in a participant's workplace | <input type="checkbox"/> |
| Identified strategies to minimise medication error | <input type="checkbox"/> |
| Discussed and review your clinical setting, identifying potential weakness that may cause error traps | <input type="checkbox"/> |
| Participated in scenarios that require error management strategies | <input type="checkbox"/> |

3. Important learning outcomes

What are the three most important things you have learned from this module?

4. Module implementation

Please indicate to what extent you agree or disagree with each of the following statements in relation to the implementation of the module.

| | Strongly disagree | Disagree | Slightly agree | Agree | Strongly agree |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| The facilitator respected my experience | <input type="checkbox"/> |
| The facilitator encouraged my participation | <input type="checkbox"/> |
| I was able to ask the facilitator questions | <input type="checkbox"/> |
| The facilitator was able to answer my questions | <input type="checkbox"/> |
| The feedback I received was clear | <input type="checkbox"/> |
| The feedback I received will assist me in my future performance | <input type="checkbox"/> |
| There was adequate time for the skills stations | <input type="checkbox"/> |
| There was adequate time for the facilitated discussions | <input type="checkbox"/> |
| There was adequate time for the simulations | <input type="checkbox"/> |
| I have increased my confidence in identifying error risks in my clinical environment | <input type="checkbox"/> |
| I have identified future learning needs in this topic area | <input type="checkbox"/> |

5. Future module implementation

Do you think the module should be altered in any way? yes no

If yes, what recommendations do you have?

Thank you

PowerPoint presentation

- Clinical Skills in Hospitals Project**

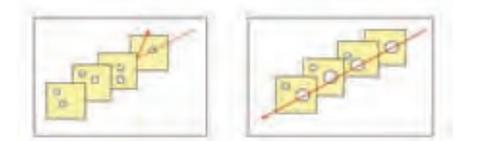
Safe Medication Administration
MODULE 5
'Human error'

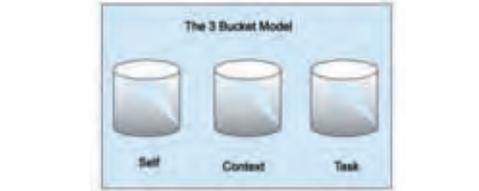

- Module Outline**

 - Facilitated discussion
 - DVD case scenarios
 - Summation
 - Evaluation
- Error Categories**

 - Active Errors
 - Latent conditions
- Error Management**

 - Personal Approach
 - Systems Approach
- Swiss Cheese Error Model**


- 3 Bucket Model**

 - Error Wisdom
- Skill Stations**

 - 3 DVD Scenarios

Acronyms, abbreviations and measurements

Acronyms

| | |
|----------|--|
| A/C | assist control |
| AAFB | acid and alcohol fast bacilli |
| ABG | arterial blood gas |
| ACS | acute coronary syndromes |
| AEDs | automated external defibrillator(s) |
| AF | atrial fibrillation |
| AHA | American Heart Association |
| ALS | advanced life support |
| AMI | acute myocardial infarction |
| APO | acute pulmonary oedema |
| APTT | activated partial thromboplastin time |
| ARC | Australian Resuscitation Council |
| ASB | assisted spontaneous breathing |
| AV node | atrioventricular node |
| BBB | bundle branch block |
| BiPAP | bilevel positive airway pressure |
| BLS | basic life support |
| BUN | blood urea nitrogen |
| CABG | coronary artery bypass graft |
| cath lab | catheterisation laboratory |
| CE | cardiac enzymes |
| CHB | complete heart block |
| CK | creatine kinase |
| CKMB | creatine kinase Mb |
| CMV | controlled mandatory ventilation |
| CNS | central nervous system |
| COAD | chronic obstructive airways disease |
| COPD | chronic obstructive pulmonary disease |
| CPAP | continuous positive airway pressure |
| CPR | cardiopulmonary resuscitation |
| CRM | crisis resource management |
| CVA | cerebrovascular accident |
| CVC | central venous catheter |
| CVS | cardiovascular system |
| CXR | chest X-ray |
| DIC | disseminated intravascular coagulation |
| DKA | diabetic ketoacidosis |
| DKS | Damus-Kaye-Stansel [procedure] |

| | |
|-----------|---|
| DRABC | D: danger R: response A: airway B: breathing C: circulation |
| DVT | deep vein thrombosis |
| ECF | extracellular fluid |
| ECG | electrocardiogram |
| ED | emergency department |
| EMD | electromechanical dissociation |
| ENT | ear, nose and throat |
| EPAP | expiratory positive airways pressure |
| ET | endotracheal |
| FBE | full blood examination |
| FFP | fresh frozen plasma |
| FRC | functional residual capacity |
| g | gram |
| GCS | Glasgow Coma Scale |
| GI | gastro-intestinal |
| GIT | gastro-intestinal tract |
| GTN | glyceryl trinitrate |
| Hb | haemoglobin |
| HIV | human immunodeficiency virus |
| HME | heat moisture exchanger |
| HPS METI | a brand (Human Patient Simulator) of fully automatic, high-fidelity patient simulator |
| HR | heart rate |
| I:E ratio | inspiration-to-expiration ratio |
| ICF | intracellular fluid |
| ICP | intracranial pressure |
| INR | international normalised ratio |
| IO | intraosseous |
| IPAP | inspiratory positive airways pressure |
| IPPV | intermittent positive pressure ventilation |
| IV | intravenous |
| LBBB | left bundle branch block |
| LDH | lactate dehydrogenase |
| LMA | laryngeal mask airway |
| mA | milliampere |
| MET | medical emergency team |
| NBM | nil by mouth |

| | |
|--------------|--|
| NGT | nasogastric tube |
| NIMC | national inpatient medication chart |
| NIPPV | non-invasive positive pressure ventilation |
| NIV | non-invasive ventilation |
| NP airways | nasal prong airways |
| NSEACS | non-ST elevation acute coronary syndrome |
| NSR | normal sinus rhythm |
| OP | oropharyngeal airway |
| OTC | over-the-counter medications |
| PCA | patient-controlled analgesia |
| PCI | percutaneous coronary intervention |
| PEA | pulseless electrical activity |
| PEEP | positive end expiratory pressure |
| pH | the measure of the acidity or alkalinity of a solution |
| PICC | peripherally inserted central catheter |
| PIP | peak inspiratory pressure |
| PRVC | pressure regulated volume control |
| PS | pressure support |
| PTX | pneumothorax |
| QRS | wave form seen on electrocardiogram |
| RA | room air |
| RBBB | right bundle branch block |
| RIC line | rapid infusion catheter exchange set |
| RMO | registered medical officer |
| rPA | retaplastase |
| RR | respiration rate |
| RSI | rapid sequence induction |
| rt-PA | alteplase |
| RV | right ventricular |
| SIMV | synchronised intermittent mandatory ventilation |
| SK | streptokinase |
| SR | Sinus rhythm |
| STEMI | ST elevation myocardial infarction |
| SVC | superior vena cava |
| TPN | total parenteral nutrition |
| UWSD | underwater seal drainage |
| V/Q mismatch | ventilation/perfusion mismatch |
| VF | ventricular fibrillation |
| VT | ventricular tachycardia |
| WCC | white cell count |
| WOB | work of breathing |
| WPW | Wolf-Parkinson-White syndrome |

Chemical formulae

| | |
|--------------------------------|--|
| CaCl ₂ | calcium chloride |
| CO ₂ | carbon dioxide |
| ETCO ₂ | end-tidal carbon dioxide |
| FiO ₂ | fraction of inspired oxygen |
| H ₂ CO ₃ | bicarbonate |
| MgCl ₂ | magnesium chloride |
| MgSO ₄ | magnesium sulphate |
| PaCO ₂ | partial pressure of carbon dioxide in arterial blood |
| PaO ₂ | partial pressure of oxygen in arterial blood |
| SpO ₂ | percentage of oxygen saturation in blood |
| SaO ₂ | saturation of oxygen in arterial blood flow |

Units of Measurement

| abbreviation | unit |
|--------------|---|
| mmHg | millimetres of mercury |
| L | litre |
| mL | millilitre |
| µg | microgram — one-millionth (10 ⁻⁶) of a gram |
| mmol | millimole |
| J | joule |
| mg | milligram |
| cm | centimetre |
| m | metre |

