ANTIBIOTIC ADMINISTRATION & MEDICATION ERROR AND REPORTING
12th APRIL 2010

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Preceptor:
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OBJECTIVES OF PRESENTATION

- As a requirement for Drug Information Unit (DIU) attachment.
- To update the knowledge of pharmacist on antibiotic administration.
- To recognize the medication error.
- To share the procedure of medication error reporting.
ADMINISTRATION OF ANTIBIOTICS

Factors to be considered:

○ Drug selection
○ Administration - bolus vs infusion
○ Product stability

Antibiotic Stability, Sue Ruxton, Pharmacy GMP Manager Baxter Healthcare
BOLUS OR INFUSION?

- **Bolus injections**
  - allow much higher but transient serum levels
  - might increase the penetration of the drugs in tissues

- **Constant infusions**
  - induce more stable antibiotic concentrations in serum
  - progressive but possibly advantageous accumulation of antibiotics in the infected sites
INTERMITTENT INFUSION

- Produces high peak and low trough concentrations in serum
- Usually between 1 to 6 doses per day
- Ideal for:
  - Unstable drugs
  - Long half-life
  - Concentration dependent killing
- Possibility of resistance developing

Ref: Antibiotic Stability, Sue Ruxton, Pharmacy GMP Manager Baxter Healthcare
CONTINUOUS INFUSION

- Produces a relatively consistent concentration of antibiotic that can be maintained above the MIC
- Continuous administration over 24 hours
- Ideal for:
  - Stable drugs
  - Short half life
  - Time dependent killing

Ref: Antibiotic Stability, Sue Ruxton, Pharmacy GMP Manager Baxter Healthcare
AMY S. BENKO et al, Continuous Infusion versus Intermittent Administration of Ceftazidime, 1996

- Ceftazidime (b-lactams) demonstrate concentration-independent killing, achieving maximal killing at concentrations of four or five times the MIC for the organism (depend on t>MIC)

- Conclusion: continuous infusion of ceftazidime consistently results in concentrations in serum above MICs and may produce a more reliable serum drug concentration in critically ill patients with suspected gram-negative infections than intermittent administration.
DRUG STABILITY

Need to consider:

- Dose
- Compatibility with diluents
- Compatibility with container
- Storage

Ref: Antibiotic Stability, Sue Ruxton, Pharmacy GMP Manager Baxter Healthcare
DOSE - CONCENTRATION

- Dose will affect the final concentration
- Concentration will determine the volume of the infusion / injection.
- Drug stability is dependent on concentration

Example:
**IMIPENEM + CILASTIN**

Stability is concentration dependent, 2.5mg/ml has longer shelf-life than 5mg/ml solution.
Outcome: limited concentration range

Ref: Antibiotic Stability, Sue Ruxton, Pharmacy GMP Manager Baxter Healthcare
DILUENTS' COMPATIBILITY

- Reconstituted with water for injection
- Usually further diluted with normal saline
- 5% glucose is used very occasionally
- Check manufacturer’s recommendations for diluents that can be used

Example:

**DAPTOMYCIN**

  - Reduced stability using 5% glucose as the diluent
  - Outcome: Normal saline is the preferred diluent

Ref: Antibiotic Stability, Sue Ruxton, Pharmacy GMP Manager Baxter Healthcare
CONTAINER SYSTEM

- Stability can vary in different container types due to different characteristics of the container material.
- Solution components can interact with the container – causing solution instability
- Container can affect solution properties due to water vapour transfer through the container

Ref: Antibiotic Stability, Sue Ruxton, Pharmacy GMP Manager Baxter Healthcare
STORAGE AND TEMPERATURE

Antibiotic solutions are sensitive to temperature

Reducing temperature will increase stability of the solution

Freezing of antibiotic solutions – check container system being used

Example:
IMIPENEM + CILASTIN

Only stable for 4 hours at room temperature
Outcome: Not suitable for 24 hours continuous infusion

Ref: Antibiotic Stability, Sue Ruxton, Pharmacy GMP Manager Baxter Healthcare
TEMURAMAH SOAL SELIDIK
PERKHIDMATAN IV RECONSTITUSI
ANTIBIOTIK
MEDICATION ERROR
MEDICATION ERROR

- Medication safety is one of the major components in patient safety.
- Medication errors do occur and often go undetected.
- Some medication errors may result in serious patient morbidity and mortality.
- We need to further strengthen a mechanism to monitor and make recommendations for remedial actions when errors occur and are reported.

Survey of Nursing Perceptions of Medication Administration Practices, Perceived Sources of Errors and Reporting Behaviours, Merkirit Armutlu, Mary-Lou Foley.
DEFINITION OF MEDICATION ERROR

“A medication error is any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the healthcare professional, patient or consumer”.

Survey of Nursing Perceptions of Medication Administration Practices, Perceived Sources of Errors and Reporting Behaviours, Merkirit Armutlu, Mary-Lou Foley.
PREVENTABLE EVENT

SUCH AN EVENT MAY BE RELATED TO:

- professional practices
- healthcare products
- procedures and systems including prescribing
- order communication
- product labelling
- packaging and nomenclature
- Compounding
- dispensing
- distribution
- administration
- education
- monitoring and use.

Survey of Nursing Perceptions of Medication Administration Practices, Perceived Sources of Errors and Reporting Behaviours, Merkirit Armutlu, Mary-Lou Foley.
ADMINISTRATION ERROR

- Studies identified errors in preparing and administration intravenous medications of 13% to 84% in hospital within one country.

Why is this happen?
TO ADMINISTRATION ERROR

- Healthcare system requirement and professional standard.
- Delivery of education and training for healthcare staff including:
  - Doctors
  - Nurses
  - Pharmacist
STUDIES AND AUDIT DONE IN UK

Audit Form
- Qualification of the Staff
- Whether right drug was chosen
- Right diluent
- Preparation mixed properly
- Right dose, right time and right route
- Right infusion rate
- Details of aseptic technique follows
- Correct labelling

RESULT OF THE STUDY
OBSERVED 273 ADMINISTRATION AND 122 NURSES

- Labeling error: 43%
- Wrong drug: 0%
- Wrong diluent: 1%
- Wrong dose or infusion volume: 1%
- Wrong Rate: 1%
- Wrong administration rate: 48%
- Wrong time: 18%

HOW TO REDUCE THE ERROR?

1) Wrong drug and dose error
   • Mostly due to labeling error
     • Not label properly
     • Error in identification
   • Solution:
     • Pharmaceutical industries provide design solution to assist practitioners:
       • Ready to use prefilled syringes and infusion
       • Vial and ampoules with flags label
HOW TO REDUCE THE ERROR?

2) Wrong diluent

- **Factors:**
  - Practitioners can not find relevent info of suitable diluent from product literature

- **Solution:**
  - Provide clinical staff or readily available information concerning diluent
    - Outside packaging
    - Reference table
  - Pharmaceutical industries provide diluent attach to product or readily diluted products

*Journal of Medication Errors in Intravenous Drug Preparation and Administration: a multicentre audit in the UK, Germany and France, D H Cousins, B Sabatier, D Begue, et al*
3) Wrong Rate Error

- Factors:
  - Workload of staff and can not find the correct information

- Solution:
  - Pharmacist provide information such as table of references in the ward.
INITIATIVE FROM
DEPARTMENT OF
PHARMACY HUSM
MEDICATION ERROR REPORTING
CLASSIFICATION OF MEDICATION ERROR SEVERITY

NO ERROR

Category A - Potential error, Circumstances/events have potential to cause incident

ERROR, NO HARM

Category B - Actual Error – did not reach patient
Category C - Actual Error – caused no harm
Category D - Additional monitoring required – caused no harm
CLASSIFICATION OF MEDICATION ERROR SEVERITY

ERROR HARM
Category E - Treatment/Intervention required
  – caused temporary harm
Category F - Initial/prolonged hospitalization – caused temporary harm
Category G - Caused permanent harm
Category H - Near death event
CLASSIFICATION OF MEDICATION ERROR SEVERITY

ERROR, DEATH
Category I - Death
All medication errors involving any medicine used both in public and private sectors should be reported.
OBJECTIVES OF MEDS ERROR REPORTING

- The primary objective of medication error reporting:
  - To obtain information on the occurrence of medication errors
  - Maintain a database of medication errors, analyse reports, propose remedial actions and monitor the situations in an effort to minimise the reoccurrence of such errors
  - To improve patient safety
MEDICATION ERROR (ME) REPORT FORM

Reporters do not necessarily have to provide any individual identifiable health information, including names of practitioners, names of patients, names of healthcare facilities, or dates of birth (age is acceptable)

<table>
<thead>
<tr>
<th>1 Date of event:</th>
<th>Type of Facility: * Government/ Private</th>
</tr>
</thead>
<tbody>
<tr>
<td>dd/mm/yy</td>
<td>Hospital [ ] Clinic [ ] Pharmacy [ ]</td>
</tr>
<tr>
<td>Time of event:</td>
<td>Others: _______________________________</td>
</tr>
<tr>
<td>hh/mm (24 hr)</td>
<td></td>
</tr>
</tbody>
</table>

2 Please describe the error. Include description/sequence of events and work environment (e.g. change of shift, short staffing, during peak hours). If more space is needed, please attach a separate page.

3 In which process did the error occur?
   - Prescribing [ ]
   - Dispensing (includes filling) [ ]
   - Administration [ ]
   - Others (Please specify):

4 Did the error reach the patient?
   - Yes [ ]
   - No [ ]

4.1 Describe the direct result on the patient (e.g. death, type of harm, additional patient monitoring).

4.2 Please tick the appropriate ** Error Outcome Category (Select one)

   ** NO ERROR
   - A Potential error, circumstances/events have potential to cause incident

   ** ERROR, NO HARM
   - B Actual Error - did not reach patient
   - C Actual Error - caused no harm
   - D Additional monitoring required - caused no harm

   ** ERROR, HARM
   - E Treatment/intervention required - caused temporary harm
   - F Initial/prolonged hospitalization - caused temporary harm
   - G Caused permanent harm
   - H Near death event

4.3 In which process did the error occur?
   - Prescribing [ ]
   - Dispensing (includes filling) [ ]
   - Administration [ ]
   - Others (Please specify):

5 Indicate the possible error cause(s) and contributing factor(s)

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5. Indicate the possible error cause(s) and contributing factor(s):
   - Inexperienced Personnel
   - Failure to adhere to work procedure
   - Look alike medication/packaging
   - Others (Please specify): ____________________________
   - Peak hour
   - Illegible prescription
   - Patient information/record unavailable/inaccurate
   - Stock arrangement/storage problem
   - Sound alike medication
   - Wrong labelling/instruction on dispensing envelope or bottle/container

6. Which category made the initial error?
   - Doctor
   - Nurse
   - Asst. Medical Officer
   - Pharmacist
   - Pharmacist Asst.
   - Others: ____________________________

7. Other category also involved in the error?
   - Doctor
   - Nurse
   - Asst. Medical Officer
   - Pharmacist
   - Pharmacist Asst.
   - Others: ____________________________

8. Which category detected the error or recognised the potential error?
   - Doctor
   - Nurse
   - Asst. Medical Officer
   - Pharmacist
   - Pharmacist Asst.
   - Others: ____________________________

9. If available, please provide patient’s particulars (Do not provide any patient identifiers).
   - Age: _____ years/ months  Gender: [ ] Male  [ ] Female  Diagnosis: ____________________________

10. Please complete the following for the product(s) involved. If more space is needed for additional products, kindly attach a separate page.
    For similar packaging, please fill 10.4 to 10.7.

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Product # 1 (intended)</th>
<th>Product #1 (error)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.1 Brand/Product Name</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.2 Generic Name (Active Ingredient)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.3 Dose, frequency, duration, route</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.4 Manufacturer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.5 Dosage Form</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.6 Strength/Concentration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.7 Type and Size of Container</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Please delete where not applicable
11 Reports are most useful when relevant materials such as product label, copy of prescription/order, etc., can be reviewed. Can these materials be provided?

☐ No
☐ Yes, Please specify:


12 Suggest any recommendations, or describe policies or procedures you instituted or plan to institute to prevent future similar errors. If available, kindly attach investigational report e.g. Root Cause Analysis (RCA).

Reporter’s Details

Name and Profession:

Facility/Address:

Postcode:

E-mail:

Telephone number:

Fax Number:

For official use:

Date report received: dd/mm/yy

Ref. No.:

ME Type:

ME Category:

Medication Safety

It’s Everyone’s Responsibility
1. Medication Error encountered
2. Fill ME form
3. Send ME report to Medication Safety Centre (MedSC)
   - Incomplete: Contact reporter for details
   - Complete: Check ME form
     - Reject: MedSC
     - Accept: Register ME report
       - Grading of ME report
         - NMEC
         - MedSC, Reporter
       - Record and compile for further action
         - MedSC

PROCEDURE FOR REPORTING

All Medication Error Reports should be sent to:

Medication Safety Centre
Pharmaceutical Services Division
Ministry of Health Malaysia
P.O. Box 924, Jalan Sultan
46790 Petaling Jaya Selangor

or

Fax to 03-79682268
REFERENCES

1) Journal of Influence of Constant Infusion versus Bolus Injections of Antibiotics on in Vivo Synergy, M. G. Bergeron, B. M. Nguyen, L. Gauvreau


3) Survey of Nursing Perceptions of Medication Administration Practices, Perceived Sources of Errors and Reporting Behaviours, Merkirit Armutlu, Mary-Lou Foley.

4) The Impact of Dedicated Medication Nurses on the Medication Administration Error Rate, A Randomized Controlled Trial, Nancy L. Greenhold, Rita Shane.

5) Understanding Why Medication Administration Errors May Not Be Reported, Douglas S. Wakefield, Bonnie J. Wakefield, American Journal of Medical Quality

6) Antibiotic Stability, Sue Ruxton, Pharmacy GMP Manager Baxter Healthcare