Medication Administration Errors in a Mental Health Hospital

Alan Cottney, East London NHS Foundation Trust

MUSN Event, 6th June 2013
The problem...
Four in ten drugs wrongly administered in hospitals

Nearly four in ten doses of drugs are wrongly administered to patients by hospital staff, a new survey claims.
Mother-of-four dies after blundering nurse administers TEN times drug overdose

By DAILY MAIL REPORTER
UPDATED: 09:58, 23 February 2011

A mother-of-four died after a nurse at a trouble-hit hospital trust gave her ten times the amount of drugs she was supposed to receive.

Arsula Samson, 80, had a heart attack at Good Hope Hospital, Birmingham, after she was given an overdose of deadly potassium chloride.
Hospital fined £100,000 after wrong drug killed new mother

Mayra Cabrera died after giving birth in Swindon when she was accidentally dosed with bupivacaine, a potent anaesthetic.
The problem...

NPSA, Safety in Doses 2009

[Bar chart showing the stages of the medication process with Administration as the highest category.]
The problem...

NPSA, Safety in Doses 2009

![Bar chart showing incidents at different stages of the medication process.](NPSA_Safety_in_Doses_2009_chart.jpg)
The problem...

- Locally:
  - Audit of last 4 years medication administration incident reports in ELFT
  - Average number incident reports of incorrect administration of medication:
    - 141 per year
The problem...

- Is this the tip of the iceberg? :
  - Suggested that for every 1 administration error detected by incident report, 300 could be detected if nurses were observed directly (Barker et al 2002)
  - If this was the case in ELFT, the true administration error rate would be around 42,000 per year
The problem...

• “Medication error rates are important for gauging the scope of the problem, setting priorities for prevention strategies, and measuring the impact of those strategies.”
  – Institute of Medicine, Preventing Medication Errors
The Project

• Aims:
  – To identify the incidence, nature, and severity of medication administration errors that are made at ELFT
  – To investigate factors that contribute to errors
  – To develop strategies for error reduction

• Sponsored by London Deanery and NHS London’s Simulation Technology-enhanced Learning Initiative (STeLI)
The Project

• How to investigate errors?

• “Observation is the most valid and effective method to detect and to quantify administration errors”
  – Council of Europe
The Project

• A pharmacist or pharmacy technician observed the morning, lunch, evening and night medication rounds on each of the 45 wards in ELFT.

• The next slides outline their findings...
<table>
<thead>
<tr>
<th>Speciality</th>
<th>Number of inpatient wards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult mental health services</td>
<td>18</td>
</tr>
<tr>
<td>Forensic mental health services</td>
<td>15</td>
</tr>
<tr>
<td>Mental health care of older people services</td>
<td>8</td>
</tr>
<tr>
<td>Community health services</td>
<td>2</td>
</tr>
<tr>
<td>Child and adolescent mental health services</td>
<td>2</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>45</strong></td>
</tr>
<tr>
<td>Details of medication rounds observed</td>
<td>Acute adult</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Number of medication rounds observed</td>
<td>60</td>
</tr>
<tr>
<td>Number of service users observed receiving medication</td>
<td>495</td>
</tr>
<tr>
<td>Number of doses of medication observed being given</td>
<td>1115</td>
</tr>
</tbody>
</table>
## Overall error details

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of administration errors observed</td>
<td>153</td>
</tr>
<tr>
<td>Medication rounds on which an error was made</td>
<td>69 (38%)</td>
</tr>
<tr>
<td>Average number of errors per medication round</td>
<td>0.9</td>
</tr>
<tr>
<td>Average number of errors per patient given medication</td>
<td>0.11</td>
</tr>
<tr>
<td>Average number of errors per dose given</td>
<td>0.04</td>
</tr>
<tr>
<td>Number of doses that need to be given for one error to occur</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Acute adult</strong></td>
<td><strong>PICU</strong></td>
</tr>
<tr>
<td>Average number of doses given before one administration error is made</td>
<td>21</td>
</tr>
</tbody>
</table>
Severity of errors

- A: Negligible
- B: Minor
- C: Serious
- D: Fatal

Number of errors:
- A: 48
- B: 95
- C: 10
- D: 0
Examples of errors

• **Negligible:**
  – A patient was prescribed metformin liquid, but was administered metformin tablets.

• **Minor**
  – A patient was prescribed clozapine, but this was unintentionally omitted.
Examples of errors

• Serious
  – A patient had recently suffered a deep vein thrombosis, and was on the full treatment dose of a low-molecular weight heparin (LMWH). The LMWH dose was unintentionally omitted due to an oversight on the part of the administering nurse.
Number of errors

- Dose omission: 60
- Wrong dose: 19
- Wrong strength/concentration: 8
- Wrong drug: 19
- Wrong form: 18
- Wrong technique: 2
- Wrong route: 2
- Wrong time: 15
- Wrong patient: 1
- Monitoring error: 1
- Expired drug: 0
- Other: 8
Type of medication involved in error

- **Physical health**: 64%
- **Mental health**: 36%
Type of medication

Number of Errors

- Antidepressant
- Anti-infective
- Antimanic
- Antipsychotic
- Benzo
- CV
- Diabetic
- Hyoscine
- Inhaler
- Laxative
- Promethazine
- Simple analgesia
- Topical
Statistically significant factors

- The following variables were found to independently predict the number of errors:
  - Total number of regular doses due
  - Total number of PRN doses given
  - Total number of other ward activities
  - Trolley medication stored according in alphabetical or no order, rather than by drug class
Statistics

• A Poisson regression with robust standard errors was used to determine the best combination of predictors and the relative risks of these predictors to predict error.

• Variables which had a p-value of <= 0.2 were included in the modelling analysis.

• Predictors were included in the final model if they were significant at the 0.05 level (WALD test). All potential correlations were checked and variables were removed if they were highly correlated with other predictors included in the model.
Number of doses

• For every increment of one regular dose of medication due an error is 3% more likely to occur on that medication round

(RR: 1.03: 1.02-1.03 95% CI, p= <0.0001).
<table>
<thead>
<tr>
<th></th>
<th>No PRN doses given</th>
<th>One or more PRN doses given</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of medication rounds</td>
<td>93</td>
<td>87</td>
</tr>
<tr>
<td>Number of patients</td>
<td>668</td>
<td>749</td>
</tr>
<tr>
<td>Number of doses given</td>
<td>1833</td>
<td>1871</td>
</tr>
<tr>
<td>Number of errors made</td>
<td>51</td>
<td>102</td>
</tr>
</tbody>
</table>
PRN Doses

- An increase of one PRN dose given predicts a 17% increase in error per round
  (RR: 1.17; 1.05-1.30 95% CI, p=0.041).
Ward activities

• For every ward activity happening at the same time as the medication round, the likelihood of an error on that round increases by 33%

(RR: 1.33; 1.10-1.62 95% CI, p=0.0038).
## Error rate per ward activity

<table>
<thead>
<tr>
<th>Activity</th>
<th>Number of medication rounds during which activity was also taking place</th>
<th>Subsequent average number of errors per dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>No activity</td>
<td>97</td>
<td>0.030</td>
</tr>
<tr>
<td>Meal</td>
<td>53</td>
<td>0.051</td>
</tr>
<tr>
<td>OT group</td>
<td>10</td>
<td>0.054</td>
</tr>
<tr>
<td>Smoking break</td>
<td>31</td>
<td>0.050</td>
</tr>
<tr>
<td>Ward meeting</td>
<td>15</td>
<td>0.053</td>
</tr>
<tr>
<td>Ward round</td>
<td>23</td>
<td>0.060</td>
</tr>
</tbody>
</table>
Non-stock trolley medication stored in "shelf/class"
Other factors that may have influenced error rate...
Patients given medication

- Night: 30%
- Morning: 31%
- Evening: 25%
- Lunch: 14%
Administration errors made

- Morning: 48%
- Night: 23%
- Evening: 18%
- Lunch: 11%
## Morning and night medication administration round compared

<table>
<thead>
<tr>
<th></th>
<th>Morning round</th>
<th>Night round</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average number of doses given per patient</td>
<td>3.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Average number of interruptions per round</td>
<td>4.5</td>
<td>2.2</td>
</tr>
<tr>
<td>Average number of other activities at same time as medication round</td>
<td>1.3</td>
<td>0.2</td>
</tr>
<tr>
<td>Average number of staff members down</td>
<td>0.4</td>
<td>0.1</td>
</tr>
<tr>
<td>Nurse AfC Band</td>
<td>Number of rounds</td>
<td>Errors per dose</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Band 5</td>
<td>120</td>
<td>0.03</td>
</tr>
<tr>
<td>Band 6</td>
<td>44</td>
<td>0.06</td>
</tr>
<tr>
<td>Band 7</td>
<td>7</td>
<td>0.05</td>
</tr>
<tr>
<td>Not stated</td>
<td>9</td>
<td>0.08</td>
</tr>
<tr>
<td>Nurse status</td>
<td>Number of rounds</td>
<td>Errors per dose</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Permanent</td>
<td>164</td>
<td>0.04</td>
</tr>
<tr>
<td>Bank</td>
<td>11</td>
<td>0.06</td>
</tr>
<tr>
<td>Not stated</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Ward staffing</td>
<td>Number of rounds</td>
<td>Errors per dose</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Nurses down on usual allocation</td>
<td>141</td>
<td>0.04</td>
</tr>
<tr>
<td>No staff down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One or more staff members down</td>
<td>39</td>
<td>0.05</td>
</tr>
</tbody>
</table>
Any-type interruption

\[ R^2 = 0.8942 \]

Number of interruptions:
- No interruptions
- 1 interruption
- 2 interruptions
- 3 interruptions
- 4 interruptions
- 5 or more interruptions

Number of errors/medication round
## Source of interruptions

<table>
<thead>
<tr>
<th></th>
<th>Total number of interruptions</th>
<th>Average number of interruptions per medication round</th>
</tr>
</thead>
<tbody>
<tr>
<td>From patients</td>
<td>257</td>
<td>1.43</td>
</tr>
<tr>
<td>From staff members</td>
<td>242</td>
<td>1.34</td>
</tr>
<tr>
<td>Carrying out other ward activities</td>
<td>38</td>
<td>0.21</td>
</tr>
</tbody>
</table>
Interruptions from staff members

Total number of interruptions

Morning: 110
Lunch: 40
Evening: 40
Night: 40
# Association between expiry date checking and administration errors

<table>
<thead>
<tr>
<th></th>
<th>All medication expiry dates checked</th>
<th>Not all medication expiry dates checked</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of patients</td>
<td>31%</td>
<td>69%</td>
</tr>
<tr>
<td>Errors/patient</td>
<td>0.074</td>
<td>0.110</td>
</tr>
</tbody>
</table>

**East London NHS Foundation Trust**
In 52% (80/153) of the administration errors the pharmacist believed a lack of thoroughness when reading the prescription was a contributing factor. Some examples of these types of errors are:

- A nurse misread the chart and administered medication due at 18:00hrs at 22:00hrs.
- Six doses of medication were unintentionally omitted because the nurse failed to notice that the patient had a second prescription chart.
- A clozapine dose was unintentionally omitted because the nurse did not look at the titration sheet on the front of the chart.
Nurse knowledge

The pharmacy observers identified a lack of knowledge on the part of the administering nurse as a contributing factor in 35% (53/153) of the errors that were made. Examples of these errors include:

- Cutting tablets that should not be cut e.g. modified release tablets.
- Not realising importance of timeliness of certain medication e.g. insulin, antibiotics.
- The patient used their inhaler incorrectly, but this was not corrected by the nurse because they were unaware of how it was suppose to be used.
- Nurse thought that by pulling syringe plunger to the end of a 5ml syringe this would give a volume of 5ml; not realising that the graduations stopped before the end.
- Unaware of the difference between vitamin B and multivitamin tablets.
Similar drugs

- Similar drugs being mixed up was identified as the cause of 11% of the errors. Examples include:
  - Venlafaxine modified release and immediate release tablets.
  - Olanzapine orodispersible and normal release tablets.
  - Haloperidol tablets and liquid.
  - Valproate modified release and enteric coated tablets.
  - Lansoprazole orodispersible tablets and normal-release capsules.
  - Aripiprazole liquid and tablets.
  - Soluble Adcal and chewable tablets.
  - Hyoscine hydrobromide and hyoscine butylbromide tablets.
  - Carmellose and hypromellose eye drops.
  - Humalog and humulin insulin.
Other contributing factors

- Unclear prescription:
  - 5% of errors
- Agitated/demanding patient:
  - 10% of errors
- Ward round:
  - 3% of errors
- Liquid medication:
  - 9% of errors
Intentionally omitted doses

- Of the 443 intentionally omitted doses, only 7 of the doses should not have been omitted.
  - So, only 1.6% of doses that were omitted were omitted inappropriately.
- This demonstrates that the observed nurses generally make sound clinical decisions.
Reasons for intentionally omitted doses

- Patient refused: 58%
- Clinical reasons: 18%
- Patient off ward: 7%
- Drug unavailable: 7%
- Topicals omitted until wash: 10%
Documentation

• Doses not signed for: 1.5%
• Given against unsigned prescription: 0.4%
• Missing consent: 2.2%
• Allergy status not completed: 0.6%
• So, on the whole, documentation was of a good standard.
DATIX v Direct observation

• Number of incident reports during observation period = 17

• Rate of error detection:
  – DATIX: 0.0017 per round
  – Observation: 0.8500 per round

• So 500 times more errors are detected by direct observation than by incident reporting via DATIX.
Next steps...

- Nurses were invited to give their responses to the findings.
- Themes in their Responses:
  - Need for better education
  - Changing/abolishing the times on the drug chart
  - More support when giving medication: increased staff in clinical areas, interceptor for queries.
  - More pharmacist input: make informal observation more common.
Next steps...

• Improved medication administration training.
  – Role-play medication administration training
    • Incorporates training round the most commonly observed errors
  – Educational film
• Based around harnessing the cognitive power of error.
Next steps...

- Thinking about a ward safety checklist for medication administration...
This checklist is not intended to be comprehensive. Additions and modifications to fit local practice are encouraged.
**Ward Safety Checklist**

Carry out a pre-round briefing to discuss issues and expectations of the round. Similarly, carry out a post-round debrief to explore issues arising and potential improvements to the effectiveness of future rounds.

<table>
<thead>
<tr>
<th>Introduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation</td>
</tr>
<tr>
<td>Coats removed, ties tucked, arms bare below elbows, hands washed</td>
</tr>
<tr>
<td>Introduction</td>
</tr>
<tr>
<td>An introduction of team to patient, including names and roles as appropriate</td>
</tr>
<tr>
<td>Confirm patient identity</td>
</tr>
<tr>
<td>Name, DOB, Hospital number</td>
</tr>
<tr>
<td>Continue your ward round as appropriate to your specialty</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time Out</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pause</td>
</tr>
<tr>
<td>Check for agreed team understanding of patient status</td>
</tr>
<tr>
<td>Observation chart, concerns/triggers</td>
</tr>
<tr>
<td>Fluid balance, urine output, fluid in take, speech/swallow assessment, nutritional intake</td>
</tr>
<tr>
<td>MRSA status and treatment plan</td>
</tr>
<tr>
<td>Infection control (temp, markers, source) MRSA, Antibiotics (duration and compliance with policy)</td>
</tr>
<tr>
<td>Results/scans checked</td>
</tr>
<tr>
<td>Allergies</td>
</tr>
<tr>
<td>Drugs, review of chart for accuracy, clarity and necessity</td>
</tr>
<tr>
<td>VTE risk and treatment plan</td>
</tr>
<tr>
<td>Drips/Catheters, IV sites review: is there still a need?</td>
</tr>
<tr>
<td>Falls, skin care, pain, mobility</td>
</tr>
<tr>
<td>Area specific issues (e.g. oncology, AAU, etc)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Document and Action</td>
</tr>
<tr>
<td>Check documentation completed, signed and dated accurately</td>
</tr>
<tr>
<td>Confirm ownership of tasks, with timescales</td>
</tr>
<tr>
<td>Confirm Discharge Objectives</td>
</tr>
<tr>
<td>Measures and timescale</td>
</tr>
<tr>
<td>TTA completed</td>
</tr>
<tr>
<td>Communicate</td>
</tr>
<tr>
<td>Communicate actions and timescales to absent members of the team. Share information with other teams and services as appropriate.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Affix patient label here or enter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name:</td>
</tr>
<tr>
<td>DOB:</td>
</tr>
<tr>
<td>Hosp No:</td>
</tr>
</tbody>
</table>
Complete pre-administration round checks overleaf, then follow the procedure below for each patient due medication.

**Read and understand prescription**

- **Front of chart**
  - Medication chart corresponds to the patient
    - Ask patient to state their name and DOB
    - Consult patient wrist band or photograph (if present)
  - T2/T3 form present and correct (if needed)
  - Allergy section complete
  - Assess if any medication prescribed on front of chart is due:
    - Once only medication
    - Depot injections
    - Clozapine titration

- **Inside chart**
  - Fully open medication chart
  - Read all prescriptions from left to right, beginning at the top of the chart and working down
  - Confirm medication that is due at current time

- **For each prescription**
  - The following are present and clear:
    - Drug name
    - Route
    - Time of dose
    - Doctor’s signature
    - Drug form (if needed) e.g. modified-release (MR) tablet, dispersible tablet, liquid
    - Other endorsements e.g. “take with food”, “for seven days only”
  - Prescription is still valid
    - Has not been crossed out
    - Any stated time limit has not been exceeded
    - Still space on chart to sign for administration
  - Prescription is clinically appropriate
    - Medication is appropriate
    - Dose is appropriate
    - Route is appropriate
    - Time is appropriate

**Dispense**

- **Dispensing**
  - Select drug
  - Drug name on packaging corresponds to drug name on prescription
  - If present, patient name on packaging corresponds to the patient
  - Dose can be safely given using the strength of product available
  - Expiry date not exceeded
  - Dispense drug using correct technique
    - E.g. oral syringes for liquids, insulin syringes only used for insulin

**Administer**

- **Physical health**
  - Patient physically well enough to receive medication
  - Any required pre-dose monitoring is completed
    - E.g. blood glucose, BP, blood test

- **Administer**
  - Medication given to patient
  - Compliance checked

- **Document**
  - Chart signed in correct place
  - If dose intentionally omitted, reason is stated
  - Any required post-dose monitoring is completed

**PAUSE**

Ensure that the medication you have dispensed adheres to the 5 rights:
- Right Patient
- Right Time
- Right Medicine
- Right Dose
- Right Route

- Ensure that you have fully read and fully understood all of the prescription.
- If in doubt, ask!

**PAUSE**

Now complete post-medication round checks outlined overleaf.
<table>
<thead>
<tr>
<th>STEP</th>
<th>AREA TO CHECK</th>
<th>WHAT TO CONFIRM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Front of chart</td>
<td>☐ Patient name&lt;br&gt;☐ Allergy status&lt;br&gt;☐ Once-off dose due?&lt;br&gt;☐ Depot dose due?&lt;br&gt;☐ Any additional charts?</td>
</tr>
<tr>
<td>2</td>
<td>Inside chart – opened fully</td>
<td><strong>For each prescription:</strong>&lt;br&gt;☐ Drug name&lt;br&gt;☐ Time due&lt;br&gt;☐ Dose&lt;br&gt;☐ Route&lt;br&gt;☐ Form (e.g. liquid/tablet)&lt;br&gt;☐ Additional instructions?&lt;br&gt;☐ No medication overlooked</td>
</tr>
<tr>
<td>3</td>
<td>PRN side (if used)</td>
<td><strong>In addition to Step 3 confirmations:</strong>&lt;br&gt;☐ Reason for use&lt;br&gt;☐ Last given?</td>
</tr>
</tbody>
</table>
Next steps...

- Introduction of electronic medicines cabinets
Questions

• Any requests for further information can be directed to:
  – Alan Cottney, Project Lead Pharmacist, East London NHS Foundation Trust.
  – alan.cottney@eastlondon.nhs.uk
References


