High-risk situations in Medication Safety

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Second Global Ministerial Summit on Patient Safety, Bonn 29/30th March 2017

The situation must be taken seriously

"Fortunately for the patient, the surgeon cuts his own fingers when he uses the wrong side of the scalpel;

If the same thing had happened in the case of drugs they would have been examined most carefully a long time ago....."

Muscholl E. Second W.D.M. Paton Memorial Lecture. The evolution of experimental pharmacology as a biological science: the pioneering work of Buchheim and Schmiedeberg. Br J Pharmacol. 1995 Oct;116(4):2155-9.



A. hunffatur?

Rudolf Buchheim (1820 – 1879)

https://en.wikipedia.org/wiki/Rudolf_Buchheim#/ media/File:Rudolf_Buchheim.JPG

High-risk situations in Medication Safety







Health Professionals

• The external environment



Hospital

Community





The medication



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Adapted from Routledge PA. Safe prescribing: a titanic challenge. Br J Clin Pharmacol. 2012; 74: 676-84

The Patient





• Age

• Major predictor of medication error (i)

• Number of medications (polypharmacy)

Major predictor of medication error (i)_

Multimorbidity

- More than one condition
- o physical-mental multimorbidity (ii)

Renal disease

increased hospital days, costs, and graft loss (iii)

○ Liver disease

• Discrepancies high with complementary and alternative medicines (iv)

(i) Nguyen TL et al. Improving medication safety: Development and impact of a multivariate model-based strategy to target high-risk patients. PLoS One. 2017 Feb 13;12 (2):e0171995. doi: 10. 1371/ journal.pone. 0171995

(ii) Panagioti M et al. Multimorbidity and Patient Safety Incidents in Primary Care: A Systematic Review and Meta-Analysis. PLoS One. 2015 Aug 28; 10 (8): e0135947. doi: 10.1371/journal.pone.0135947. eCollection 2015.

(iii) Taber DJ et al. Clinical and economic outcomes associated with medication errors in kidney transplantation. Clin J Am Soc Nephrol. 2014 May;9(5):960-6. doi: 10.2215/ CJN. 09300913. Epub 2014 Apr 24.

(iv) Hayward KL et al. Prevalence of medication discrepancies in patients with cirrhosis: a pilot study. BMC Gastroenterol. 2016 Sep 13;16:114. doi: 10.1186/s12876-016-0530-4. **The Health Professional**

Stage of training

- Error rate year 1 = 8.4% (i)
 Error rate year 1 = 6.3% (ii)
- Error rate consultants = 5.9% (i)
 Error rate consultants = 6.3% (ii)

Profession (()

- (i) Dornan T et al. An in-depth investigation into causes of prescribing errors by foundation trainees in relation to their medical education: EQUIP study
- http://www.gmc-
- uk.org/FINAL_Report_prevalence_and_causes_of_prescribing_errors. pdf_28935150.pdf

(ii) Ryan C et al. Prevalence and causes of prescribing errors: the PRescribing Outcomes for Trainee Doctors Engaged in Clinical Training (PROTECT) study. PLoS One. 2014 Jan 3;9(1):e79802. doi: 10.1371/ journal.pone.0079802. eCollection 2014.

(iii) De Winter S et al. Pharmacist-versus physician-acquired medication history: a prospective study at the emergency department. Qual Saf Health Care.2010 Oct;19(5):371-5. doi: 10.1136/qshc.2009.035014. Epub 2010 Jul 1.

Specialty

- Different strengths and weaknesses (iv & v)
- But similarities greater than differences (iv & v)

(iv) Pardo-Cabello AJ et al. Potentially inappropriate prescribing in hospitalized patients with comparative study between prescription by internist and geriatricians]. Farm Hosp. 2014 Jan 1;38(1):65-8. doi: 10.7399/FH.2014.38.1.871

(v) Egger SS et al. Prevalence of potentially inappropriate medication use in elderly patients: comparison between general medical and geriatric wards. Drugs Aging. 2006; 23(10):823-37.

Aspects of safety 1. Communication failures 2. Critical circumstances

- 3. Complacency
- 4. Corner-cutting

6. Courage of convictions

5. Callowness Inexperience

7. Commitment to excellence

Routledge PA. Safe prescribing: a titanic challenge. Br J Clin Pharmacol. 2012; 74: 676-84

F.G.O. Stuart (1843-1923) https://commons.wikimedia.org/wiki/File:RMS_Titanic_3.jpg

The Swiss Cheese Model



Reason, J. (1990) Human Error. Cambridge: University Press, Cambridge.

Communication and medication errors



UK Prescribing Safety Assessment

 Developed by the British Pharmacological Society (BPS) and the UK Medical Schools Council

Aedical

Schools

Council

BRITISH PHARMACOLOGICAL

- Between February and June 2014, over 7000 final year medical students undertook the PSA, with an overall pass rate of 94%
- Section 1 Prescribing Section 8 Section 2 Prescription Data interpretation review 8 sections-60 items Section 7 Section 3 Total = 120 mins Planning Druq monitoring (200 marks) management Section 6 Section 4 Adverse drug Providing reactions information Section 5 Calculation skills
- Pilot in 2016 with pharmacist prescribers

Maxwell SR et al. Prescribing safety: ensuring that new graduates are prepared. Lancet. 2015 Feb 14;385(9968):579-81. doi: 10.1016/S0140-6736(14)62339-4.

Reid F et al. Piloting the United Kingdom 'Prescribing Safety Assessment' with pharmacist prescribers in Scotland. Res Social Adm Pharm. 2017 Jan 6. pii: S1551-7411(16)30209-1. doi: 10.1016/j.sapharm.2016.12.009. [Epub ahead of print]

High-risk situations in Medication Safety

• The people





Health Professionals

The external environment



Hospital

Community

• The medication



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The External environment

Hospital or community setting

- Hospital inpatient medication error rate = 8.9% (i)
- o Community error rate = 5% (ii)

(i) Dornan T et al. An in-depth investigation into causes of prescribing errors by foundation trainees in relation to their medical education: EQUIP study

<u>http://www.gmc-</u> <u>uk.org/FINAL Report prevalence and causes of prescribing errors.pdf 28935150.pdf</u>

(ii) Avery A et al. Investigating the prevalence and causes of prescribing errors in general practice: The PRACtICe Study <u>http://www.gmc-</u>

- Preventability high in anticoagulant treatment (42.5%) (iii)
- Anticoagulant-related AEs often related to dosage factors (46.9%) (iii)

(iii) Damen NL et al. Medication-related adverse events during hospitalization: a retrospective patient record review study in The Netherlands. Pharmacoepidemiol Drug Saf. 2017 Jan;26 (1): 32-39. doi: 10.1002/pds.4037.



Perioperative

- Frequency of drug administration error = 0.73% (iv)
- Omissions (27%), incorrect doses
 (23%) & substitutions (20%) (iv)

(iv) Zhang Y et al. The frequency and nature of drug administration error during anaesthesia in a Chinese hospital.. Acta Anaesthesiol Scand. 2013; 57: 158–64



Royal College of Physicians. National standard paper-based in-patient prescription chart https://www.rcplondon.ac.uk/projects/outputs/national-standard-paper-based-patientprescription-chart

High-risk situations in Medication Safety

• The people



• The external environment









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HIGH-RISK (ALERT) MEDICINES

| Therapeutic Group | Some examples from the therapeutic group |
|--------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Anti-infectives | Aminoglycosides (e.g. gentamicin, vancomycin) & amphotericin Allergy to antibiotics |
| Potassium & other salts/ electrolytes for injection | Potassium, magnesium & calcium salts & hypertonic sodium chloride |
| nsulins | Soluble insulins |
| Narcotics (e.g. opioids & sedatives | Opioids (e.g. morphine, diamorphine), benzodiazepines & propofol |
| Chemotherapeutic agents & immunosuppressives | Etoposide, vincristine & methotrexate |
| Heparins & oral anticoagulants "A PINCH" | Heparins (unfractionated [UFH] & low molecular weight [LMWH]) Vitamin K antagonists (e.g. warfarin) & Newer Oral Anticoagulants (e.g. apixaban, dabigatran edoxoban & rivaroxaban) |

Prescribing errors and high risk medicines

Type of errors

- 1 Dosage problems or wrong dosage
- 2 Prescription errors
- 3 Missing or incorrect weight
- 4 Prescribing policies not followed
- 5 Medications omissions
- 6 No or wrong prescription date

7 Drug/drug interaction; medication given to known allergic patient; medication duplication

Alanazi MA, Tully MP, Lewis PJ. A systematic review of the prevalence and incidence of prescribing errors with high-risk medicines in hospitals. J Clin Pharm Ther. 2016; 41: 239-45

Addressing high-risk situations



- Strategies should be chosen which influence as many steps of the medication management system as possible
- "High-leverage" risk reduction strategies, such as forcing functions and standardisation should be bundled together with "low-leverage" strategies such as staff education and passive information dissemination
- Strategies should be used if they have been proven effective
- The strategies which are chosen should be sustainable

Institute for Safe Medication Practices: Medication safety Alert (Acute Care). Your high-alert medication list— Relatively useless without associated risk-reduction strategies <u>http://www.ismp.org/Newsletters/acutecare/showarticle.aspx?id=45</u>

| Description | ISMP) |
|----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Proactively identify risks and how they can be minimised | |
| Build in safeguards to prevent or respond to failure | |
| Use constraints (e.g. restriction of access or requirement for special conditions or authorisation | |
| Use active means to provide necessary information when critical tasks are being performed | |
| Use special equipment or environmental corprevent hazard from reaching target | nditions to |
| Create clinically sound, uniform models of ca products to reduce variation and complexity | are or |
| Reduce number of steps, handoffs (handove eliminating crucial redundancies | rs) without |
| Transfer to external site to reduce distraction with expertise, with appropriate quality cont | n of staff trol checks |
| | Description Proactively identify risks and how they can be minimised Build in safeguards to prevent or respond to Use constraints (e.g. restriction of access or requirement for special conditions or author Use active means to provide necessary infor when critical tasks are being performed Use special equipment or environmental cor prevent hazard from reaching target Create clinically sound, uniform models of ca products to reduce variation and complexity Reduce number of steps, handoffs (handove eliminating crucial redundancies Transfer to external site to reduce distraction with expertise, with appropriate quality contents |

http://www.ismp.org/Newsletters/acutecare/showarticle.aspx?id=45

Standardisation and safety



- Create clinically sound, uniform models of care or products to reduce variation and complexity
- Employ evidence-based standard order sets
- Standardise concentrations, container sizes and drugs used to treat specific conditions
- Use scales that only weigh patients in Kilograms

Institute for Safe Medication Practices: Medication safety Alert (Acute Care). Your high-alert medication list— Relatively useless without associated risk-reduction strategies <u>http://www.ismp.org/Newsletters/acutecare/showarticle.aspx?id=45</u>

Flexible protocol for starting treatment with warfarin and predicting its maintenance dose

| Warfarin Day | International Normalised Ratio Preferable (Measured 9 to 10 am) | Warfarin Dose Preferable given at 5 - 6 pm (milligrams) |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | < 1.4 | 10.0 |
| 2 | < 1.8 1.8 > 1.8 | 10.0 1.0 0.5 |
| 3 | < 2.0 2 - 2.1 2.2 - 2.3 2.4 - 2.5 2.6 - 2.7 2.8 - 2.9 3.0 - 3.1 3.2 - 3.3 3.4 3.5 3.6 - 4.0 > 4.0 | $ \begin{array}{c} 10.0 \\ 5.0 \\ 4.5 \\ 4.0 \\ 3.5 \\ 3.0 \\ 2.5 \\ 2.0 \\ 1.5 \\ 1.0 \\ 0.5 \\ 0 \\ \end{array} $ |
| | | Predicted Maintenance Dose (Milligrams |
| 4 | $ < 1.4 \\ 1.4 \\ 1.5 \\ 1.6 - 1.7 \\ 1.8 \\ 1.9 \\ 2 - 2.1 \\ 2.2 - 2.3 \\ 2.4 - 2.6 \\ 2.7 - 3.0 \\ 3.1 - 3.5 \\ 3.6 - 4.0 \\ 4.1 - 4.5 \\ > 4.5 $ | > 8.0 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 Miss out next day's dose then give 2 milligrams Miss out 2 day's doses then give 1 milligram |

Fennerty A et al. Flexible induction dose regimen for warfarin and prediction of maintenance dose. Br Med J 1984; 288: 1268-1270

- After 4 days, 67/100 patients had achieved a therapeutic level of Prothrombin time (PT) ratio
- 9 exceeded the therapeutic range & 24 remained subtherapeutic
- None had bled due to excessive anticoagulation
- After ten days, observed dose within 1 mg of that predicted in 65/86 patients (76%)

Cosh DG et al. Prospective evaluation of a flexible protocol for starting treatment with warfarin and predicting its maintenance dose. Aust N Z J Med. 1989 Jun;19(3):191-7.

Summary and conclusions

 Situations may be high risk due to a combination of factors associated with the people involved, the external environment and the medications involved

 Potentially high risk situations must be pro-actively addressed, ideally using a range of sustainable strategies of proven efficacy

 Several such strategies have been developed and applying them more often in clinical practice can reduce the risk of medication errors and associated harms



Diolch yn fawr (Thank you very much)

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| ::: | PAMS | |
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| | Patient | Acces |



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World Health

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