Medication safety – problems, solutions, challenges

Professor Bryony Dean Franklin FFRPharmS

CMSSQ
Centre for Medication Safety & Service Quality

Most common healthcare intervention

But...

Prescribing errors occur in median of 7% of medication orders and 52% of admissions (Lewis et al 2009)

Administration errors occur in 8% of doses, higher for IV doses (Keers et al 2013)

Dispensing error rates in community pharmacies vary from 0.04% to 24% of dispensed items (Reynolds et al 2014)

4.3% of admissions are preventable drug-related admissions (Winterstein et al 2002)

1-2% of inpatients suffer harm due to medication error

Medication safety

Avoiding adverse drug reactions

Avoiding medication errors

Optimising use by the patient

Medication safety

1. • Understanding the problems
2. • Potential solutions
3. • Challenges
4. • What next?

Part 1

UNDERSTANDING THE PROBLEMS

Understanding the problems – quantitative studies

REPORT

Validity and reliability of observational methods for studying medication administration errors

BRYONY DEAN AND NICK BARBER

An estimated 1–2% of patients admitted to U.S. hospitals are harmed as a result of medication errors,[1] and each error results in an additional $5000 in costs, excluding legal costs.[2] Less is known about the impact of medication errors in other parts of the world, but research sug-

Abstract: The validity and reliability of observational methods for studying medication administration errors (MAEs) were studied.

Between January and June 1998, two pharmacists observed consecutive drug administration rounds by nurses on two wards in a U.K. hospital and recorded all MAEs iden-

There was no difference between the observation and nonobservation periods in the percentage of omitted doses for which a reason was documented, and there was no change in the error rate with repeated observations. There was no difference in error rates before and after the first intervention for each nurse. There was also no differ-

Understanding the problems – quantitative studies

SYSTEMATIC REVIEW

Methodological variations and their effects on reported medication administration error rates

Monsey Chan McLeod, Nick Barber, Bryony Dean Franklin

▸ Additional material is published online only. To view please visit the journal online (http://dx.doi.org/10.1136/bmjqs-2012-001330).

Centre for Medication Safety and Service Quality, UCL School of Pharmacy and Imperial College Healthcare NHS Trust, London, UK

ABSTRACT

Background Medication administration errors (MAEs) are a problem, yet methodological variation between studies presents a potential barrier to understanding how best to increase safety. Using the UK as a case-study, we systematically summarised methodological variations in MAE studies, and their effects on reported MAE rates.

1–2% of hospital inpatients.[1 2] Of all types of medication errors, medication administration errors (MAEs) are least likely to be intercepted before they reach the patient.[3] Most hospital inpatients also receive more administrations than prescriptions, thus increasing the opportunities for error (OE). According to UK medication incident reports, errors at the

Understanding the problems - analysis of NRLS data

BMJ Quality & Safety Online First, published on 18 March 2014 as 10.1136/bmjqs-2013-002572

ORIGINAL RESEARCH

OPEN ACCESS

Identifying systems failures in the pathway to a catastrophic event: an analysis of national incident report data relating to vinca alkaloids

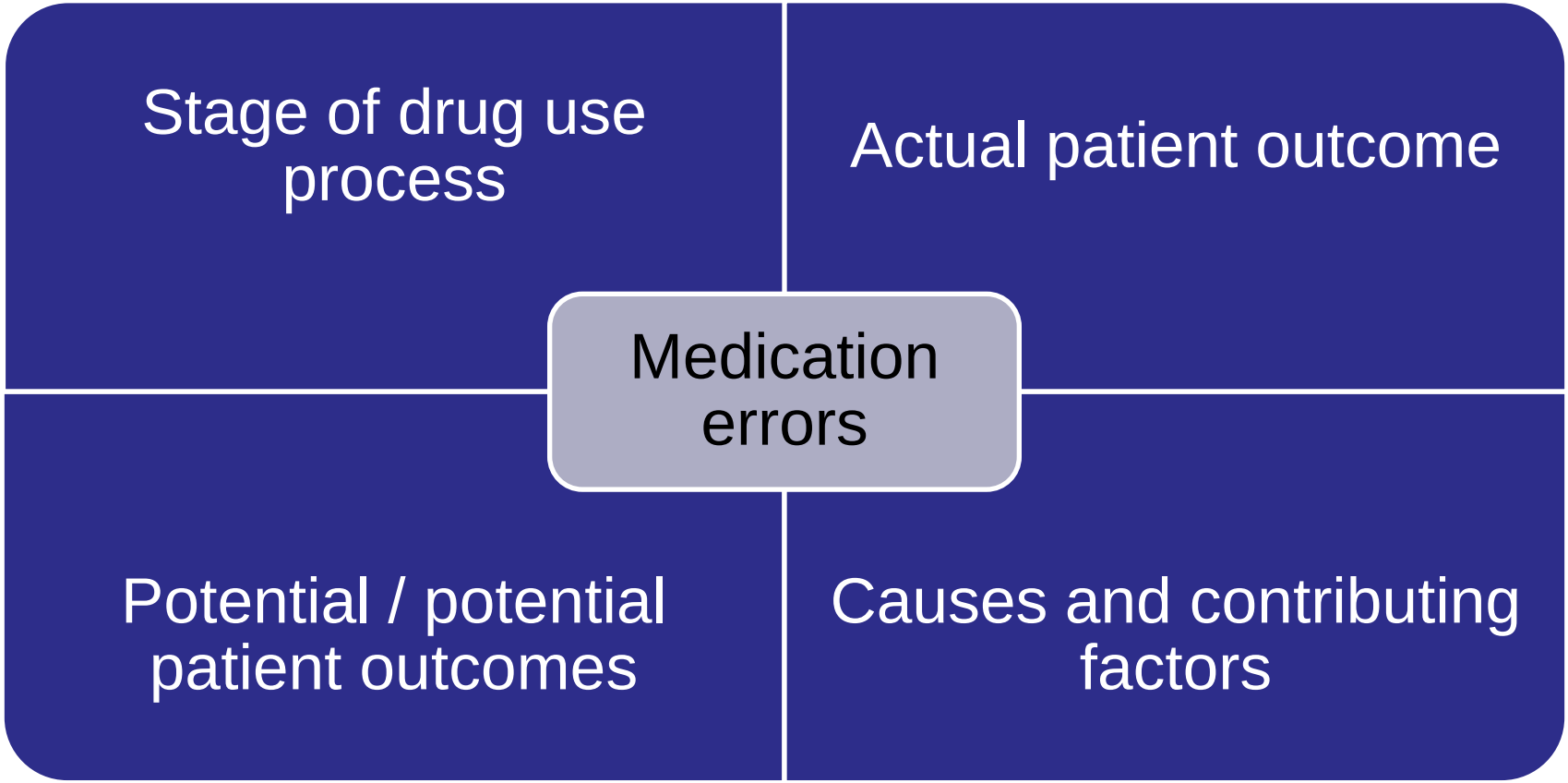
Bryony Dean Franklin,[1,2] Sukhmeet S Panesar,[3] Charles Vincent,[4] Liam J Donaldson[5]

Table 1 Incidents presented according to the main defence (as in figure 1) breached

Defence	Number of reports
Administration only in designated centres	**0**
Only those on local register can prescribe, dispense, issue, check or administer intrathecal (IT) chemotherapy	**0**
IT chemotherapy on separate prescription with accompanying checklist and audit trail	**1**
Intravenous (IV) and IT chemotherapy separated in time	**15**
1. *Administered at separate times—IV then IT*	*6*
2. *Signature to confirm all IV chemotherapy for that day given, before IT released to the doctor who will administer it*	*9*
IV and IT chemotherapy separated in location	**7**
1. *Separate storage in pharmacy and ward areas, with IT doses in a dedicated locked fridge*	*5*
2. *Separate storage in pharmacy and ward areas, with IT doses in a dedicated locked fridge*	*5*
3. *Separate transport of IT in distinctive container*	*1*
4. *Administration in separate clinical areas*	*1*
IV and IT chemotherapy differentiated in appearance	**6**
1. *IV vinca alkaloids for adults and adolescents prepared in minibags, not syringes*	*1*
2. *Labelling of medication with route of administration printed in bold 'for intrathecal use only' and 'for intravenous use only'*	*5*
Under normal circumstances, administered during working hours only	**0**
Administration checks	**0**
Other	**6**
TOTAL	**35**

Bold numbers represent main categories; italic numbers represent sub-categories of these.

Understanding the problems



Understanding the problems – ethnographic observation

PLOS ONE

RESEARCH ARTICLE

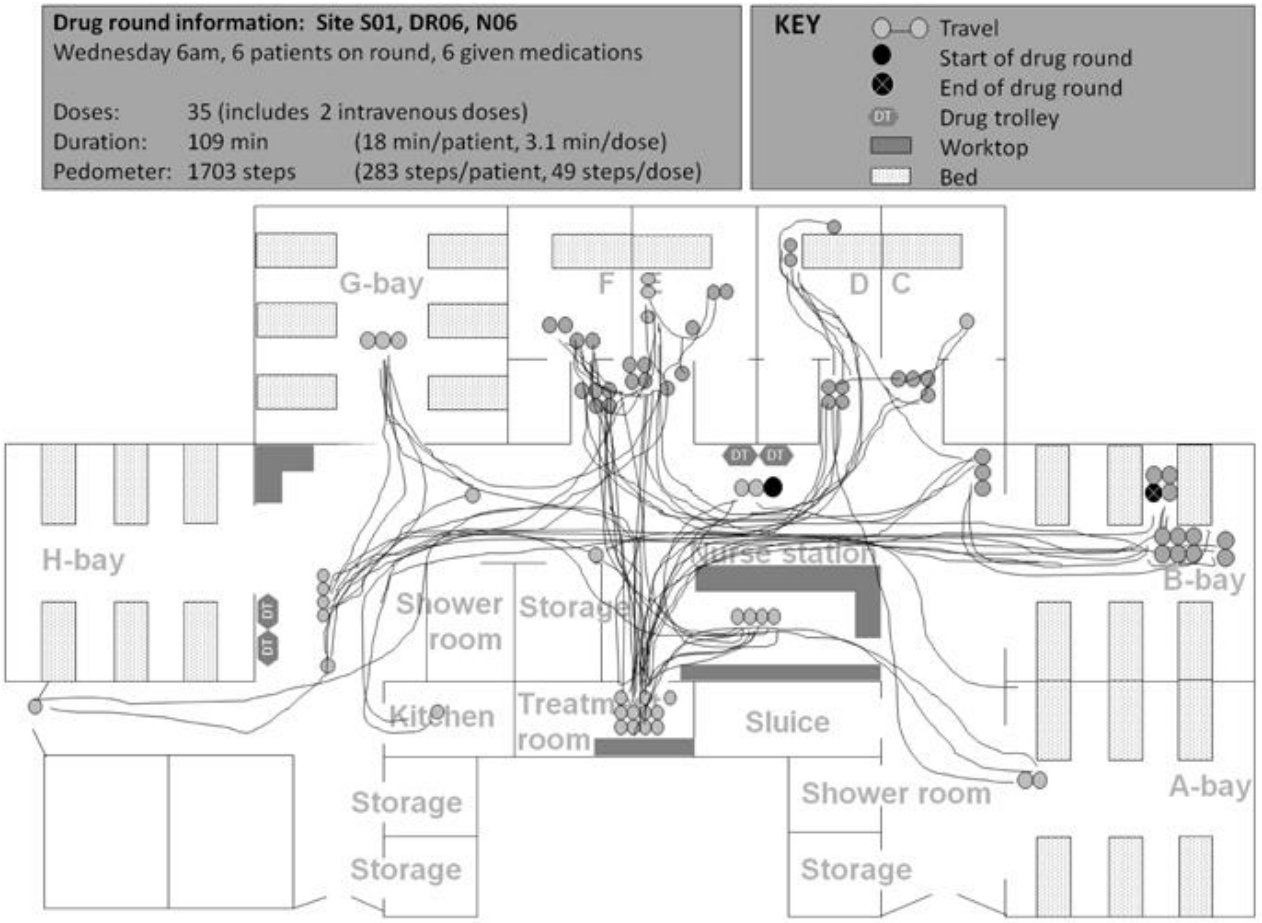
Facilitators and Barriers to Safe Medication Administration to Hospital Inpatients: A Mixed Methods Study of Nurses' Medication Administration Processes and Systems (the MAPS Study)

Monsey McLeod[1], Nicholas Barber[2], Bryony Dean Franklin[1]*

1 The Centre for Medication Safety and Service Quality, Pharmacy Department, Imperial College Healthcare NHS Trust, London, United Kingdom, and the Research Department of Practice and Policy, UCL School of Pharmacy, London, United Kingdom, **2** The Health Foundation, London, United Kingdom

* bryony.deanfranklin@imperial.nhs.uk

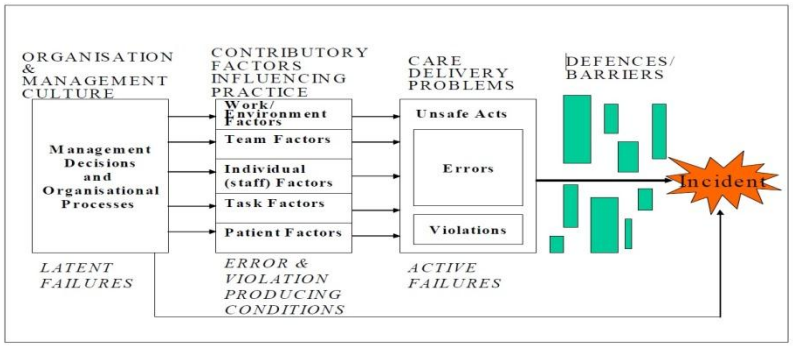
Understanding the problems – ethnographic observation

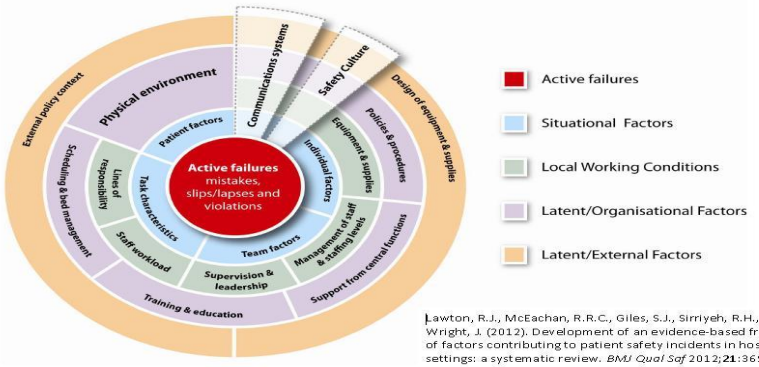


Understanding the problems

Various theoretical frameworks for causes of problems in healthcare:

- Accident causation model (Reason)
- London Protocol (Vincent et al)
- Yorkshire contributory factors framework (Lawton et al)





Lawton, R.J., McEachan, R.R.C., Giles, S.J., Sirriyeh, R.H., Watt, I.S., Wright, J. (2012). Development of an evidence-based framework of factors contributing to patient safety incidents in hospital settings: a systematic review. *BMJ Qual Saf* 2012;**21**:369-380 doi:10.1136/bmjqs-2011-000443

Understanding the problems

Causes of prescribing errors in hospital inpatients: a prospective study

Bryony Dean, Mike Schachter, Charles Vincent, Nick Barber

Summary

Background To prevent errors made during the prescription of drugs, we need to know why they arise. Theories of human error used to understand the causes of mistakes made in high-risk industries are being used in health-care. They have not, however, been applied to prescribing errors, which are a

Introduction

Prescribers are human, and therefore make mistakes. In the past, the response to such mistakes has been to focus on personal accountability, whatever the circumstances. However, the systems in which people work also contribute to errors. Findings of studies of industrial errors, and from the discipline of human psychology,

Understanding the problems

ARTICLES

Causes of prescribing errors in hospital inpatients: a prospective study

REVIEW ARTICLE

Drug Saf 2009; 32 (10): 819-836
0114-5916/09/0010-0819/$49.95/0

The Causes of and Factors Associated with Prescribing Errors in Hospital Inpatients

A Systematic Review

Mary P. Tully,[1] *Darren M. Ashcroft,*[1] *Tim Dornan,*[2] *Penny J. Lewis,*[1] *David Taylor*[3] and *Val Wass*[2]

Understanding the problems

Causes of prescribing errors in hospital inpatients: a prospective study

REVIEW ARTICLE

Drug Saf 2009; 32 (10): 819-836
0114-5916/09/0010-0819/$49.95/0

Original article

Prescribing errors in hospital inpatients: a three-centre study of their prevalence, types and causes

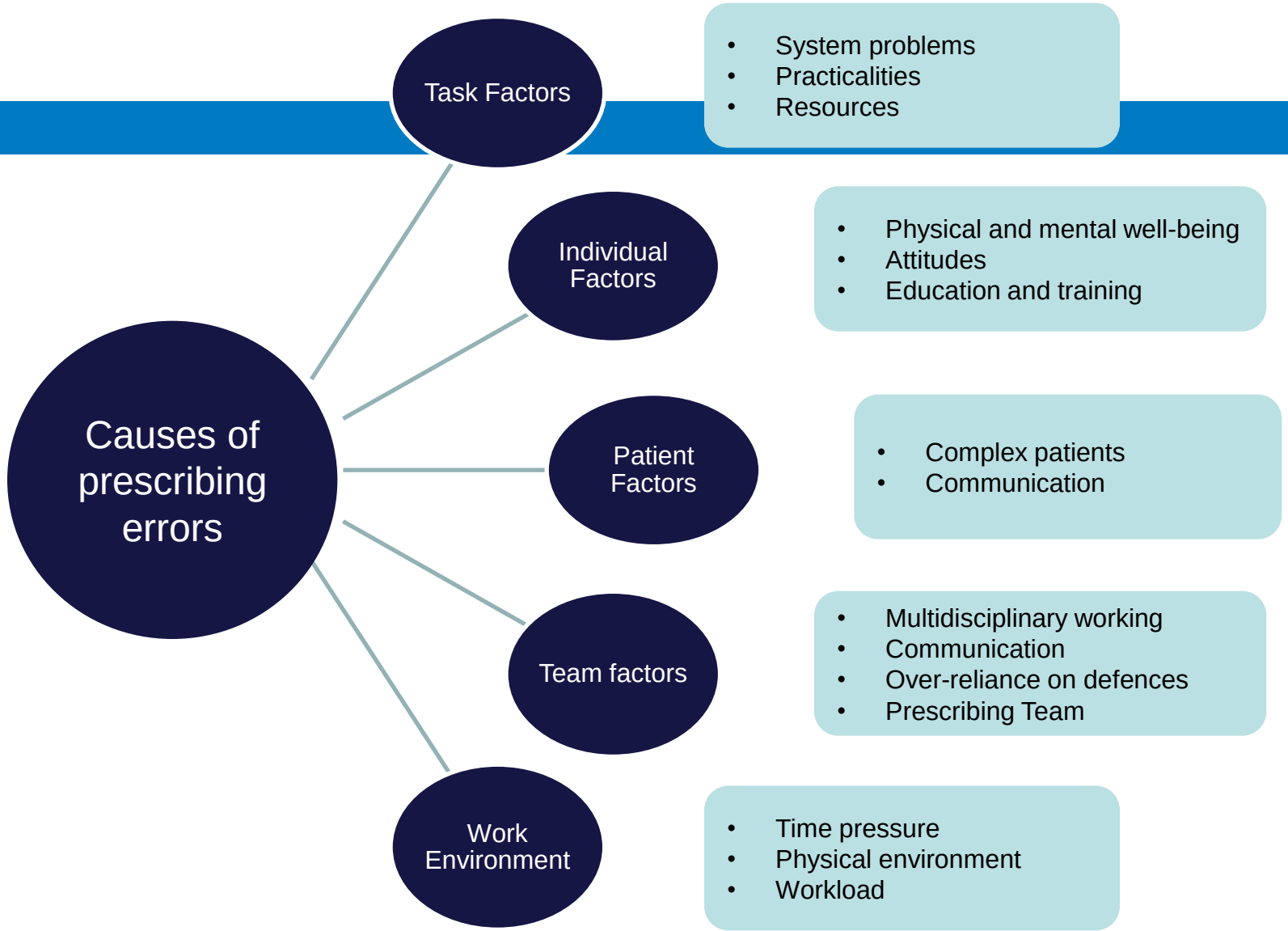
Bryony Dean Franklin,[1,2] Matthew Reynolds,[1,2] Nada Atef Shebl,[3] Susan Burnett,[4,5] Ann Jacklin[1,2]

► An additional appendix is published online only. To view this file please visit the journal

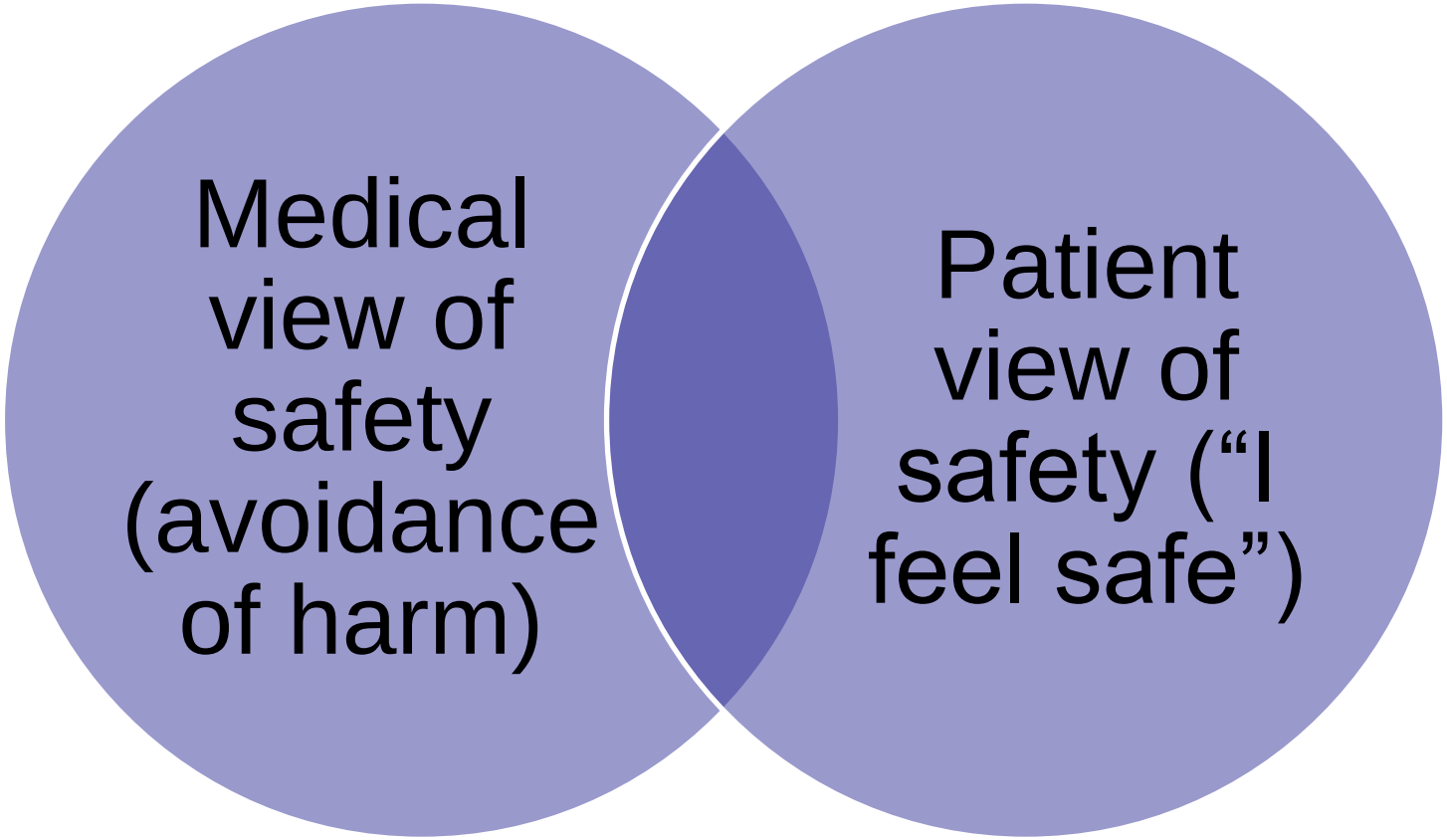
ABSTRACT

Aim To compare the prevalence and causes of prescribing errors in newly written medication orders and how

about similarities or differences in prescribing error rates between wards, specialties or organisations. The only UK study to present comparative data for


Causes of prescribing errors
Task Factors
System problems
Practicalities
Resources
Individual Factors
Physical and mental well-being
Attitudes
Education and training
Patient Factors
Complex patients
Communication
Team factors
Multidisciplinary working
Communication
Over-reliance on defences
Prescribing Team
Work Environment
Time pressure
Physical environment
Workload

Two views of safety



Part 2

POTENTIAL SOLUTIONS

Potential solutions

Technology?

Human factors?

Systems design?

Communication?

Education?

Education

QUALITY IMPROVEMENT REPORT

Using the internet to deliver education on drug safety

B D Franklin, K O'Grady, J Parr, I Walton

Qual Saf Health Care 2006;**15**:329–333. doi: 10.1136/qshc.2005.017608

See end of article for authors' affiliations

Correspondence to: B D Franklin, Pharmacy Department, Hammersmith Hospitals NHS Trust, London W12 0HS, UK; bdean@hhnt.nhs.uk

Accepted for publication 18 June 2006

Background: Medication administration errors (MAEs) occur in 3–8% of all non-intravenous drug doses given in UK hospitals; higher rates have been reported for intravenous drugs. Educational interventions are often advocated as one way of reducing these rates. However, group education sessions are often not practical. We developed internet-based educational modules on drug safety, and evaluated their effect on MAEs.
Methods: 11 modules were developed on different aspects of drug safety and delivered via commercially available software. All nursing staff on one ward were encouraged to participate. MAEs were identified using observation; the denominator used to calculate MAE rates was the number of opportunities for error. We aimed to observe 56 drug rounds before and after asking staff to complete the package.
Results: The 19 nurses who administered drugs on the study ward all agreed to participate. Of these, 12 (63%) nurses completed all 11 modules. Pre-education, 82 (6.9%) errors were identified in 1188 opportunities for error. Afterwards, 66 (5.0%) errors were identified in 1397 opportunities for error (95% confidence interval (CI) for the difference −3.8% to 0%). The MAE rate for non-intravenous drugs was 6.1% pre-education and 4.1% afterwards (95% CI for the difference −3.8% to −0.2%). Most errors with regard to intravenous doses were due to fast administration of bolus injections.
Conclusions: An interactive educational package focusing on patient safety was developed, with a high rate of uptake among nursing staff on the study ward. A reduction in non-intravenous MAEs was observed after the use of the package, but no significant change was seen in the overall error rate.

Technology

ORIGINAL RESEARCH

OPEN ACCESS

The effect of the electronic transmission of prescriptions on dispensing errors and prescription enhancements made in English community pharmacies: a naturalistic stepped wedge study

Open Access
Scan to access more free content

Savage *et al. BMC Health Services Research* 2010, **10**:135
http://www.biomedcentral.com/1472-6963/10/135

BMC Health Services Research

RESEARCH ARTICLE Open Access

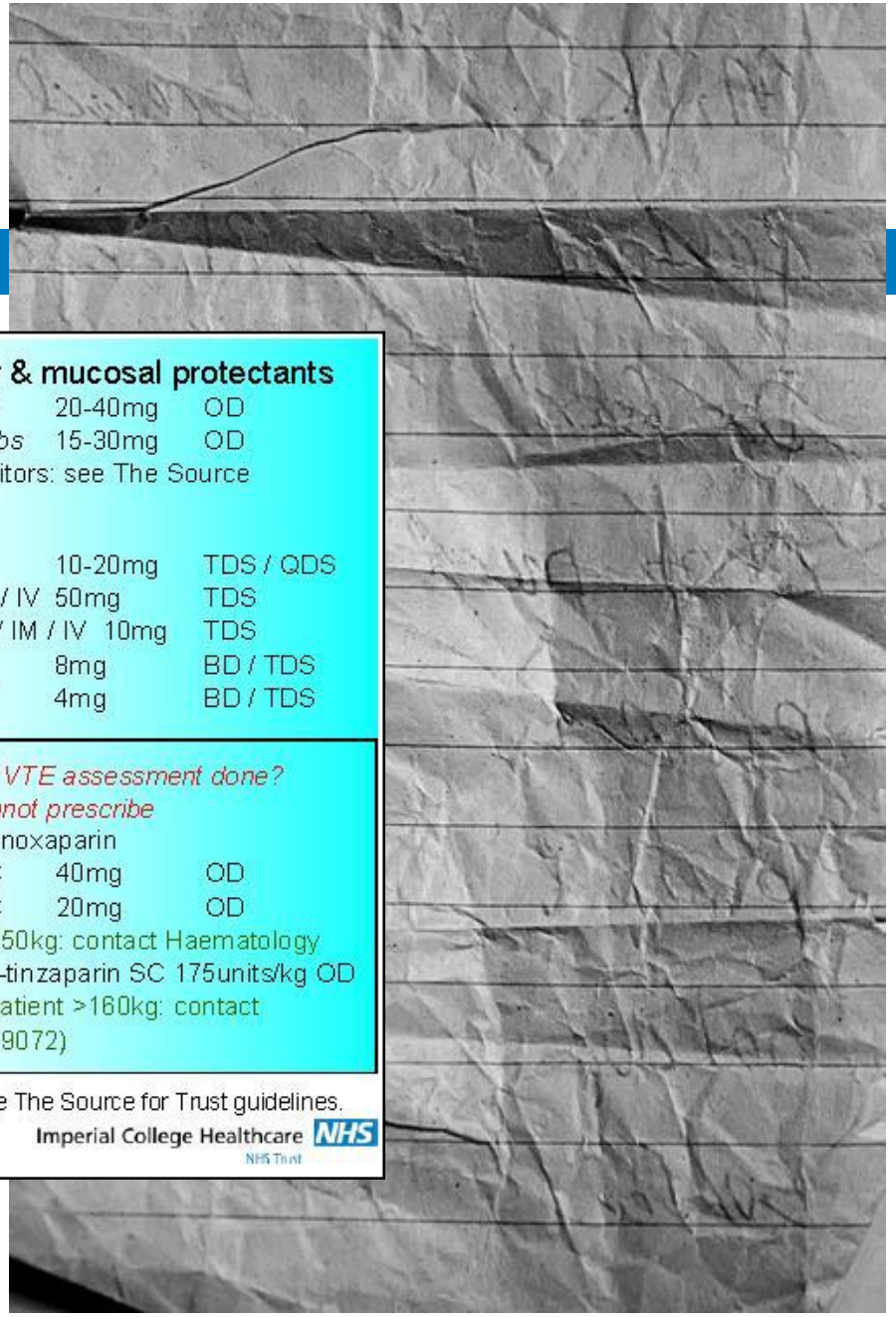
Medication errors with electronic prescribing (eP): Two views of the same picture

Imogen Savage*[1], Tony Cornford[2], Ela Klecun[2], Nick Barber[1], Sarah Clifford[1] and Bryony Dean Franklin[1,3]

Abstract

Background: Quantitative prospective methods are widely used to evaluate the impact of new technologies such as

Dr-CARD



Analgesia—acute pain

Paracetamol	PO / PR	500mg-1g	QDS
Paracetamol	IV *>50kg*	1g	QDS
	≤50kg	15mg/kg	QDS
Ibuprofen	PO	400mg	TDS / QDS
Naproxen	PO	250mg	TDS / QDS
Codeine	PO	30-60mg	QDS
Dihydrocodeine	PO	30-60mg	QDS
Tramadol	PO / IM / IV	50-100mg	QDS
Morphine	PO	5-10mg	4 hourly
Morphine	IM / SC	2.5-5mg	4 hourly

Antihistamines

Chlorphenamine PO	4mg	TDS
Chlorphenamine IM / IV	10mg	QDS

Laxatives

Senna	PO	1-2 tablets	ON / BD
Lactulose	PO	15ml	OD / BD
Macrogol (e.g. Movicol)	PO	1-2 sachets	OD / BD
Glycerol 4g	PR	1-2 supps	PRN
Phosphate	PR	1 enema	PRN

Antisecretory & mucosal protectants

Omeprazole PO	20-40mg	OD
Lansoprazole *fast-tabs*	15-30mg	OD

IV proton pump inhibitors: see The Source

Antiemetics

Domperidone	PO	10-20mg	TDS / QDS
Cyclizine	PO / IM / IV	50mg	TDS
Metoclopramide	PO / IM / IV	10mg	TDS
Ondansetron	PO	8mg	BD / TDS
Ondansetron	IM / IV	4mg	BD / TDS

LMW Heparin *Is VTE assessment done?*

Red listed—GPs cannot prescribe

•*DVT prophylaxis*—enoxaparin

CrCl ≥ 30ml/min	SC	40mg	OD
CrCl < 30ml/min	SC	20mg	OD

Patients >100kg or <50kg: contact Haematology

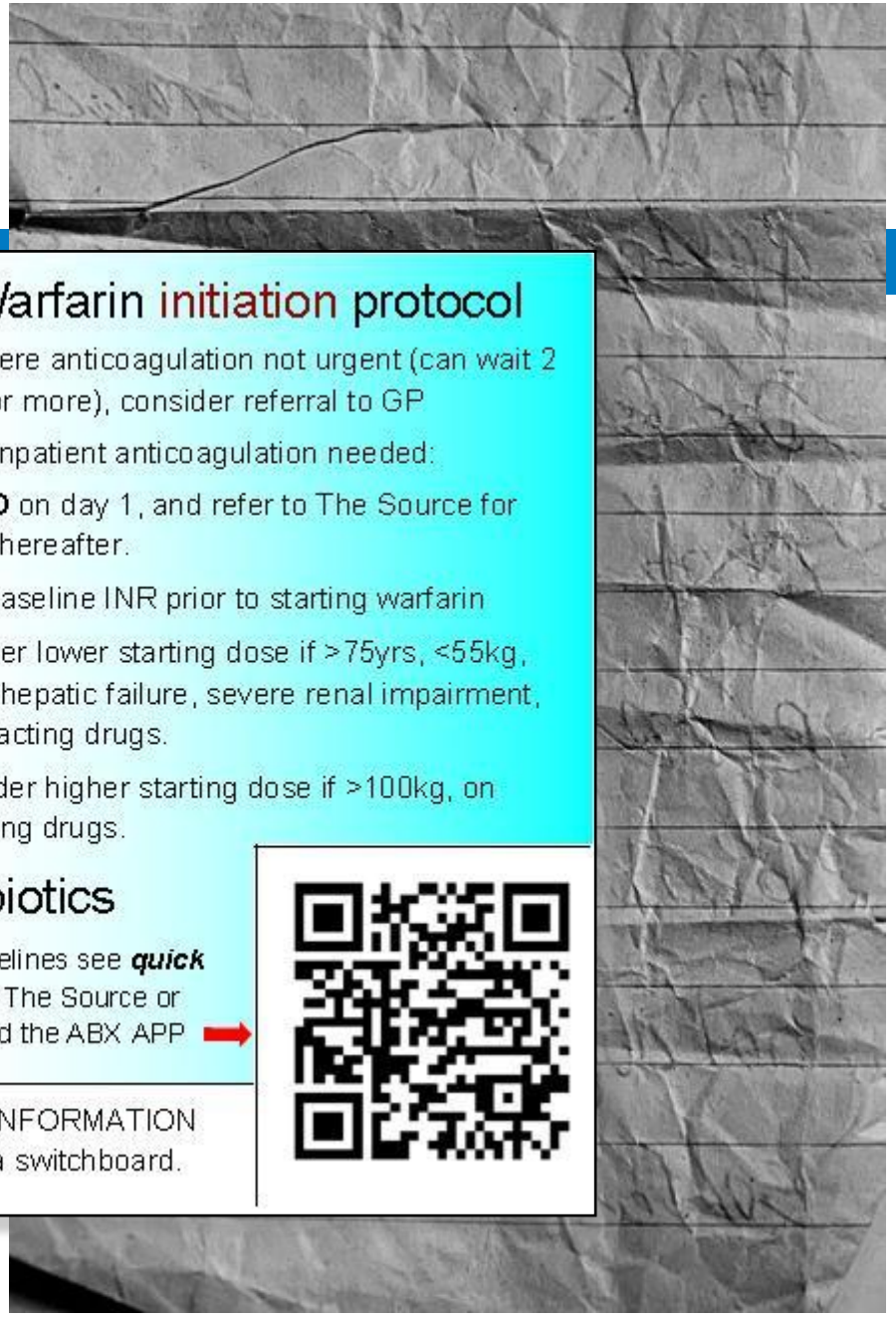
•*DVT/PE treatment*—tinzaparin SC 175units/kg OD

CrCl < 20ml/min or patient >160kg: contact Haematology (bleep 9072)

FY1 DOSE REMINDER CARD: typical adult doses. See BNF for full dose ranges. See The Source for Trust guidelines. In severe renal or hepatic impairment, seek pharmacy advice. Review July 2014; v8 ext: 30503

Imperial College Healthcare NHS NHS Trust

Dr-CARD



Insulin sliding scale

prescribed as 50 units of soluble insulin (e.g. Human Actrapid) in 50ml sodium chloride 0.9%

BM range (mmol/L)	Insulin administration rate
0.0-3.9	0.5 units/hour (recheck every 15mins)
4.0-7.9	1 units/hour
8.0-11.9	2 units/hour
12.0-15.9	3 units/hour
16.0-19.9	4 units/hour
≥20.0	6 to 8 units/hour

(If >20mmol/L for 2 hours contact medical staff)

Not for use in patients with HONK, in level 2 or 3 patients, or in theatre or recovery—see The Source

Warfarin initiation protocol

Where anticoagulation not urgent (can wait 2 weeks or more), consider referral to GP

Where inpatient anticoagulation needed:

5mg OD on day 1, and refer to The Source for dosing thereafter.

- Take baseline INR prior to starting warfarin
- Consider lower starting dose if >75yrs, <55kg, cardiac/hepatic failure, severe renal impairment, on interacting drugs.
- Consider higher starting dose if >100kg, on interacting drugs.

Antibiotics

For guidelines see ***quick links*** on The Source or download the ABX APP

For enquiries contact the WARD PHARMACIST or MEDICINES INFORMATION Ext: 11703/11713. Out of hours contact the on-call pharmacist via switchboard.

Dr-CARD

Analgesia—acu
Paracetamol PO /
Paracetamol IV >5
≤5
Ibuprofen PO
Naproxen PO
Codeine PO
Dihydrocodeine PO
Tramadol PO / I
Morphine PO
Morphine IM / S

Antihistamines
Chlorphenamine P
Chlorphenamine I

Laxatives
Senna PO
Lactulose PO
Macrogol (e.g.Movic
Glycerol 4g PR
Phosphate PR

FY1 DOSE REMIND
In severe renal or he

rin initiation protocol
coagulation not urgent (can wait 2
, consider referral to GP
t anticoagulation needed:
y 1, and refer to The Source for
er.
INR prior to starting warfarin
r starting dose if >75yrs, <55kg,
failure, severe renal impairment,
rugs.
er starting dose if >100kg, on
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ee ***quick***
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Evidence-based interventions

- Electronic prescribing /computerised decision support?
- Barcode verification?
- IV pumps incorporating dose error reduction software?
- Clinical pharmacists?
- Medication reconciliation?
- Educational interventions?
- Audit and feedback?
- Reducing interruptions?

Patient safety strategies

Annals of Internal Medicine | SUPPLEMENT

The Top Patient Safety Strategies That Can Be Encouraged for Adoption Now

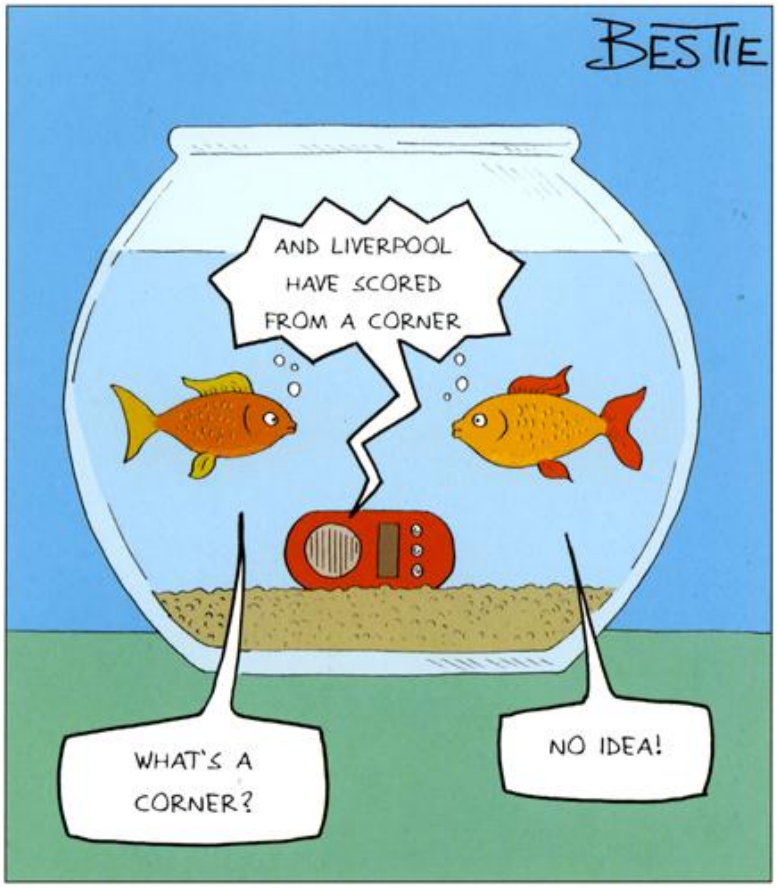
Paul G. Shekelle, MD, PhD; Peter J. Pronovost, MD, PhD; Robert M. Wachter, MD; Kathryn M. McDonald, MM; Karen Schoelles, MD, SM; Sydney M. Dy, MD, MSc; Kaveh Shojania, MD; James T. Reston, PhD, MPH; Alyce S. Adams, PhD; Peter B. Angood, MD; David W. Bates, MD, MSc; Leonard Bickman, PhD; Pascale Carayon, PhD; Sir Liam Donaldson, MBChB, MSc, MD; Naihua Duan, PhD; Donna O. Farley, PhD, MPH; Trisha Greenhalgh, BM BCH; John L. Haughom, MD; Eileen Lake, PhD, RN; Richard Lilford, PhD; Kathleen N. Lohr, PhD, MA, MPhil; Gregg S. Meyer, MD, MSc; Marlene R. Miller, MD, MSc; Duncan V. Neuhauser, PhD, MBA, MHA; Gery Ryan, PhD; Sanjay Saint, MD, MPH; Stephen M. Shortell, PhD, MPH, MBA; David P. Stevens, MD; and Kieran Walshe, PhD

- Strongly encouraged:
  - "Do not use" list for hazardous abbreviations
- Encouraged:
  - Clinical pharmacists
  - Medication reconciliation
  - Complementary methods to detect adverse events
  - Computerised prescriber order entry (CPOE)

Part 3

CHALLENGES

Context



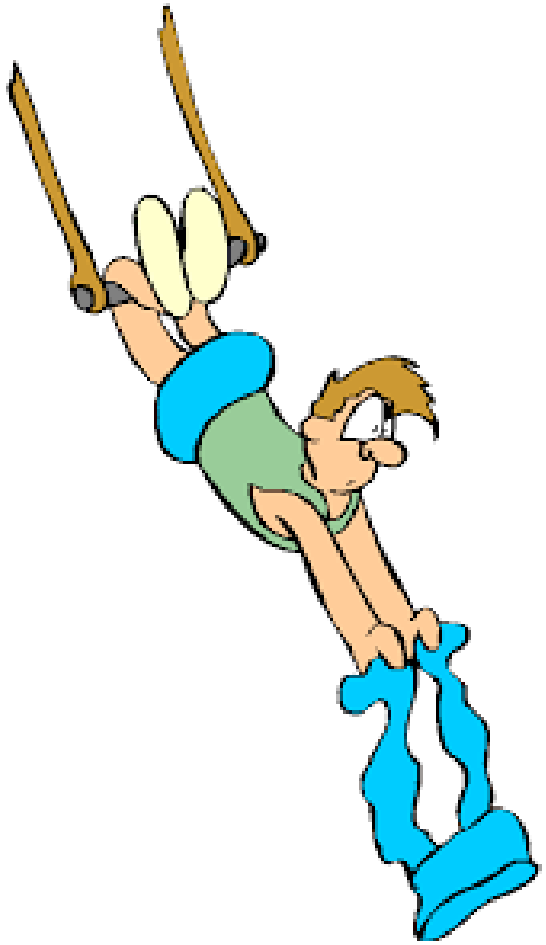
- What is relevant in one context may not be relevant in another
- IV antibiotics are likely to be equally effective from one hospital to another – but the effectiveness of smart pumps used to administer them is likely to vary considerably

Context

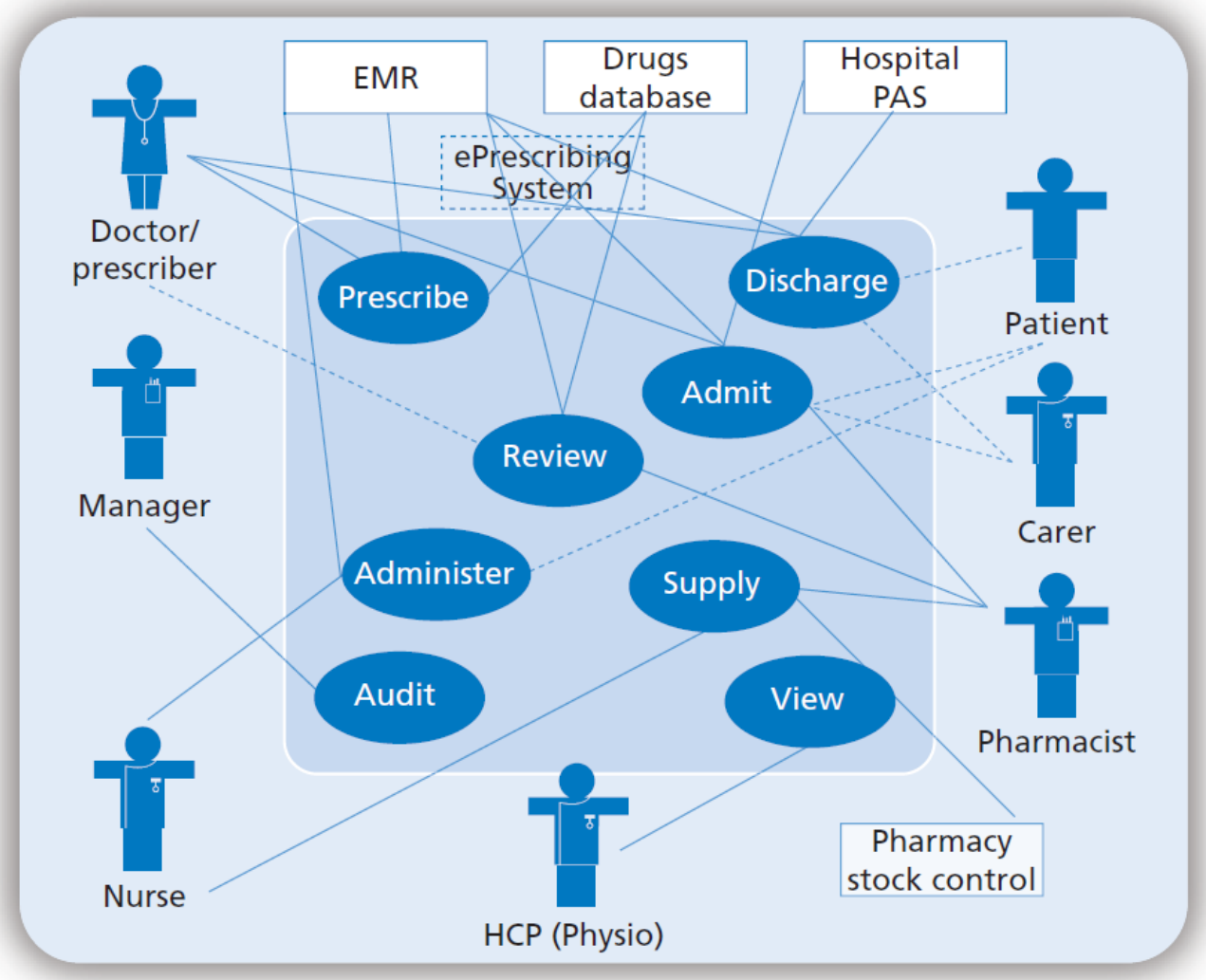
- Strongly encouraged:
  - “Do not use” list for hazardous abbreviations
- Encouraged:
  - Clinical pharmacists
  - Medication reconciliation
  - Complementary methods to detect adverse events
  - Computerised prescriber order entry

Unintended consequences

- May be positive or negative
- Eg name stamps (positive)
- Eg for CPOE (negative)
  - New error types
  - Extra workload
  - Workflow issues
  - “Illusion of communication”
  - Paper persistence
  - “Never ending hardware demands”



Wide range of stakeholders



Complexity

How do I receive my medication when I'm in hospital?

Admission to hospital

1. Doctor writes a hospital prescription on a paper or electronic chart

The doctor prescribes medication which is needed to manage the patient's immediate problem.

The doctor talks to the patient, relative and/ or GP to determine the patient's usual medication.

The doctor prescribes the appropriate usual medication.

2. Pharmacist checks the medication

The pharmacist talks to the patient and/ or GP to confirm the details of the patient's usual medication.

The pharmacist checks the hospital prescription is accurate and appropriate.

The pharmacist supplies the medication if needed.

During hospital stay

Doctors regularly review and amend the prescription chart.

Pharmacists regularly check the prescription chart and supply medication if needed.

Nurses administer medication to patients according to the prescription chart.

Discharge from hospital

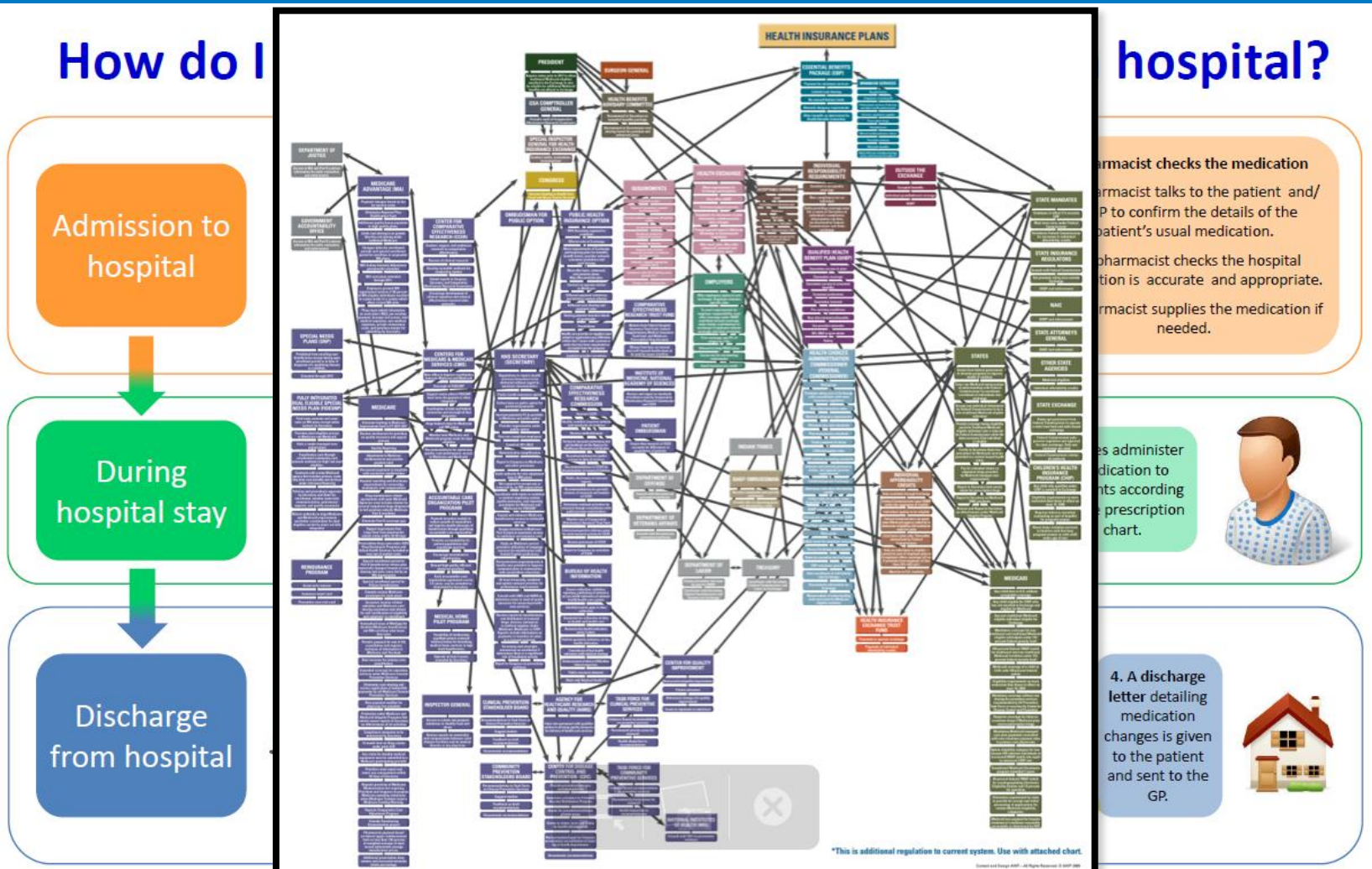
1. Doctor writes the discharge prescription.

2. Pharmacist checks the discharge prescription and supplies the medication.

3. Nurse gives the patient the medication to take from hospital.

4. A discharge letter detailing medication changes is given to the patient and sent to the GP.

Complexity


How do I
hospital?
Admission to hospital
During hospital stay
Discharge from hospital
rmacist checks the medication
rmacist talks to the patient and/
P to confirm the details of the
atient's usual medication.
pharmacist checks the hospital
tion is accurate and appropriate.
rmacist supplies the medication if needed.
s administer
dication to
nts according
prescription
chart.
4. A discharge letter detailing medication changes is given to the patient and sent to the GP.
HEALTH INSURANCE PLANS
*This is additional regulation to current system. Use with attached chart.

Measurement

PHARMACOEPIDEMIOLOGY AND DRUG SAFETY 2009; **18**: 992–999
Published online 24 July 2009 in Wiley InterScience (www.interscience.wiley.com) **DOI**: 10.1002/pds.1811

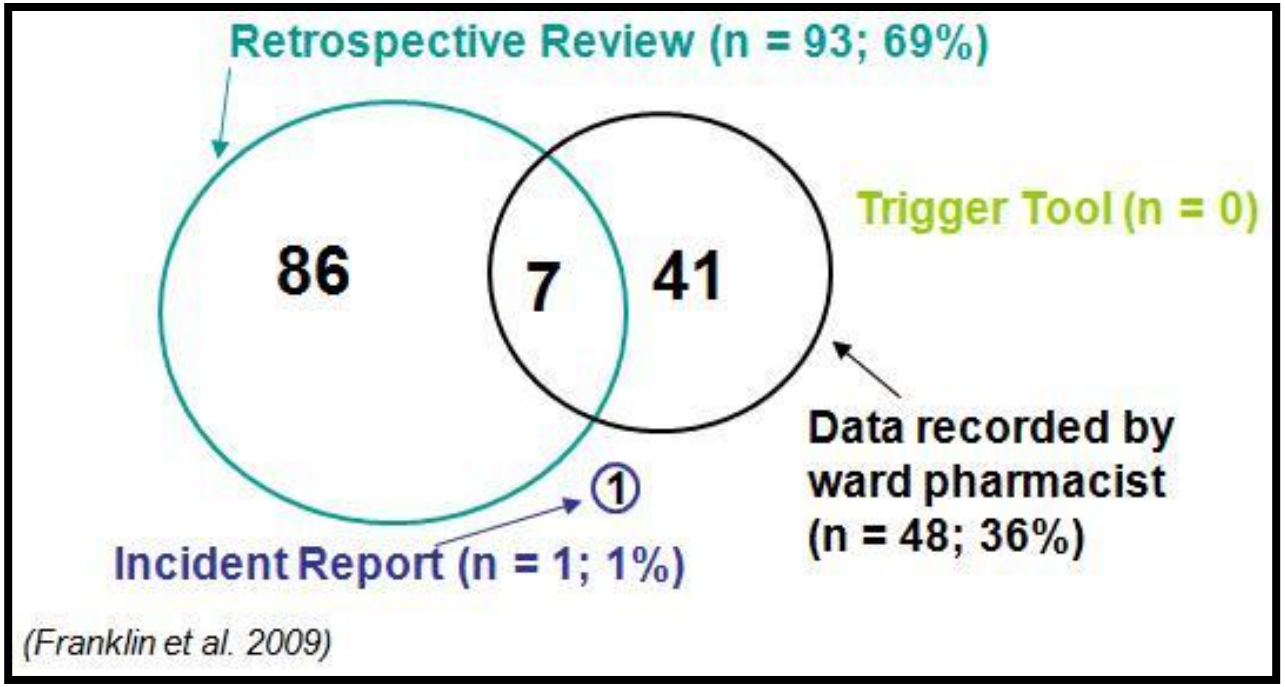
ORIGINAL REPORT

Methodological variability in detecting prescribing errors and consequences for the evaluation of interventions†

Bryony Dean Franklin PhD[1,2,3], Sylvia Birch MPharm[1,3], Imogen Savage PhD[3]*, Ian Wong PhD[4], Maria Woloshynowych PhD[5], Ann Jacklin BPharm[2] and Nick Barber PhD[3]

[1]*Centre for Medication Safety and Service Quality, Imperial College Healthcare NHS Trust, London, UK*
[2]*Pharmacy Department, Imperial College Healthcare NHS Trust, London, UK*
[3]*Department of Practice and Policy, The School of Pharmacy, University of London, UK*
[4]*Centre for Paediatric Pharmacy Research, Institute of Child Health and the School of Pharmacy, University of London, UK*
[5]*Clinical Safety Research Unit, Imperial College, London, UK*

Measurement



Implementation fidelity

Figure 1 Logic model: basic high-level model depicting the planned inputs and intended results.[16]

Reynolds M et al (2016). Improving feedback on junior doctors' prescribing errors: mixed methods evaluation of a quality improvement project. bmjqs-2015-004717

Part 4

WHAT NEXT?

What about our patients?

Patient involvement in their own safety

Patients guiding service development

Patients and the public involved in patient safety research

1. Patient involvement in their own safety

Patient involvement in safety

- Patient involvement in safety increases satisfaction and health outcomes, and reduces avoidable harm (Weingart 2011)
- Medication safety in the inpatient setting
  - Involvement in medication reconciliation?
  - Self administration?
  - Aware of current medication and encouraged to prompt if potential errors identified?

The IMPRESS study

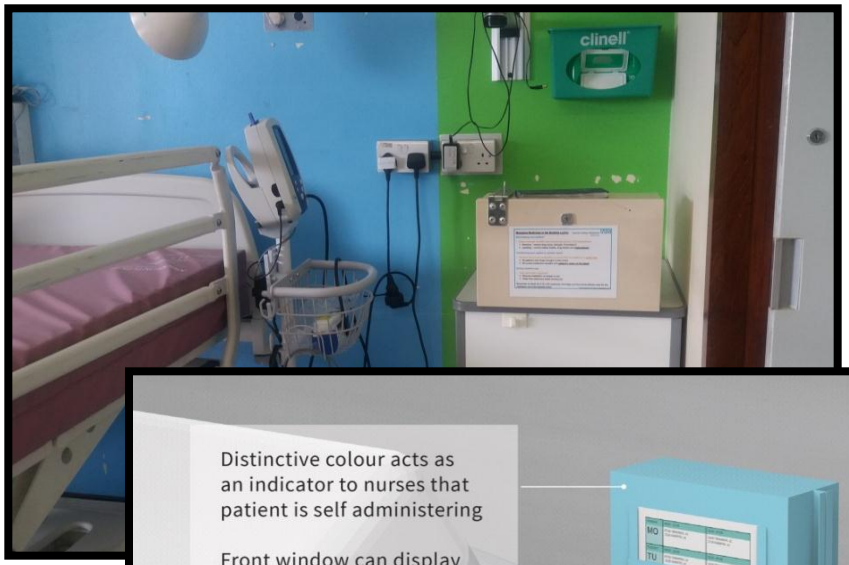
E

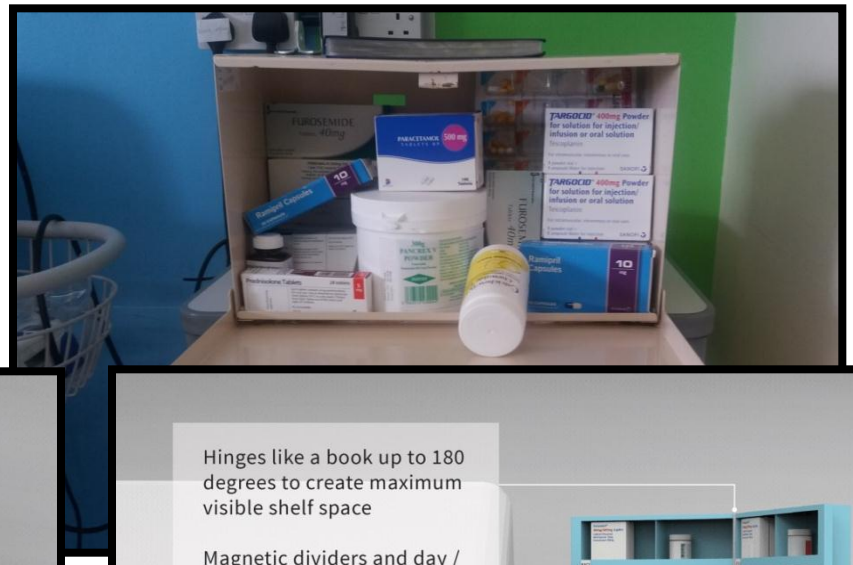
RESEARCH ARTICLE

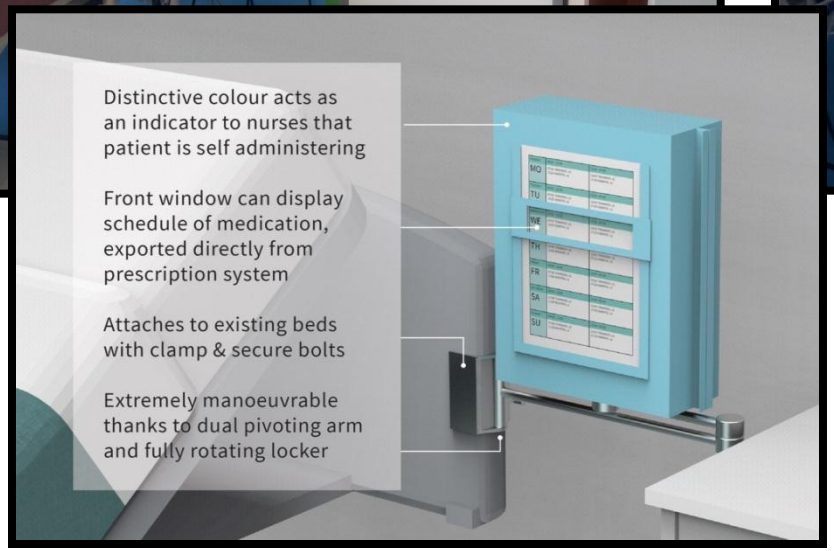
The Role of Hospital Inpatients in Su
Medication Safety: A Qualitative Stu

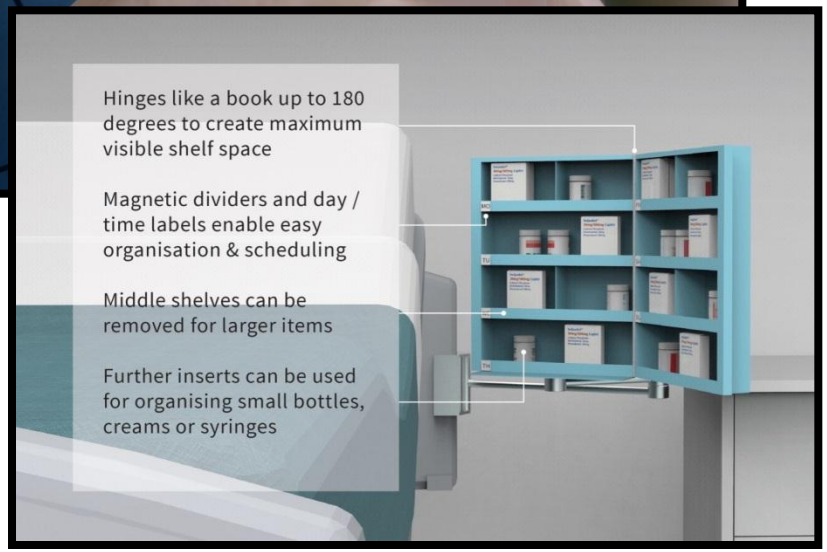
Sara Garfield[1,2]*, Seetal Jheeta[1], Fran Husson[1], Jill Lloyd[1], Alex Taylor[1]
Charles Boucher[5], Ann Jacklin[1], Anna Bischler[3], Christine Norton[1,4],
Rob Hayles[6,7], Bryony Dean Franklin[1,2]

SAMQI project









2. Patients guiding service development

Int J Clin Pharm (2013) 35:332–338
DOI 10.1007/s11096-013-9759-y

SHORT RESEARCH REPORT

Feedback on prescribing errors to junior doctors: exploring views, problems and preferred methods

Jeroen Bertels · Alex M. Almoudaris · Pieter-Jan Cortoos · Ann Jacklin · Bryony Dean Franklin

Focus group with junior doctors

This is what our FY1's think...

I've only had positive experiences of feedback, but I wish there was more of it

I want to know about all of the prescribing errors I make, especially the serious ones

I would like more teaching about prescribing errors

There is no need to tip-toe around prescribing errors

I'm often asked to amend my prescriptions, but I don't realise I have made an error unless I am told

I prefer person-to-person feedback on the ward

The Health Foundation Inspiring Improvement | Shine

And what do the public think?

"…it's OK to screw up once but there ought to be a process that says you've screwed up once and we're going to correct it so that it doesn't happen again. What's unforgivable is if you've got the ability to go on screwing up time and time again"

Patient focus group participant

3. Patients and the public involved in patient safety research

The IMPRESS study

Funded by The Health Foundation, an independent charity working to continuously improve the quality of healthcare in the UK.

Lay involvement in research

Garfield *et al. Research Involvement and Engagement* (2015) 1:8
DOI 10.1186/s40900-015-0006-7

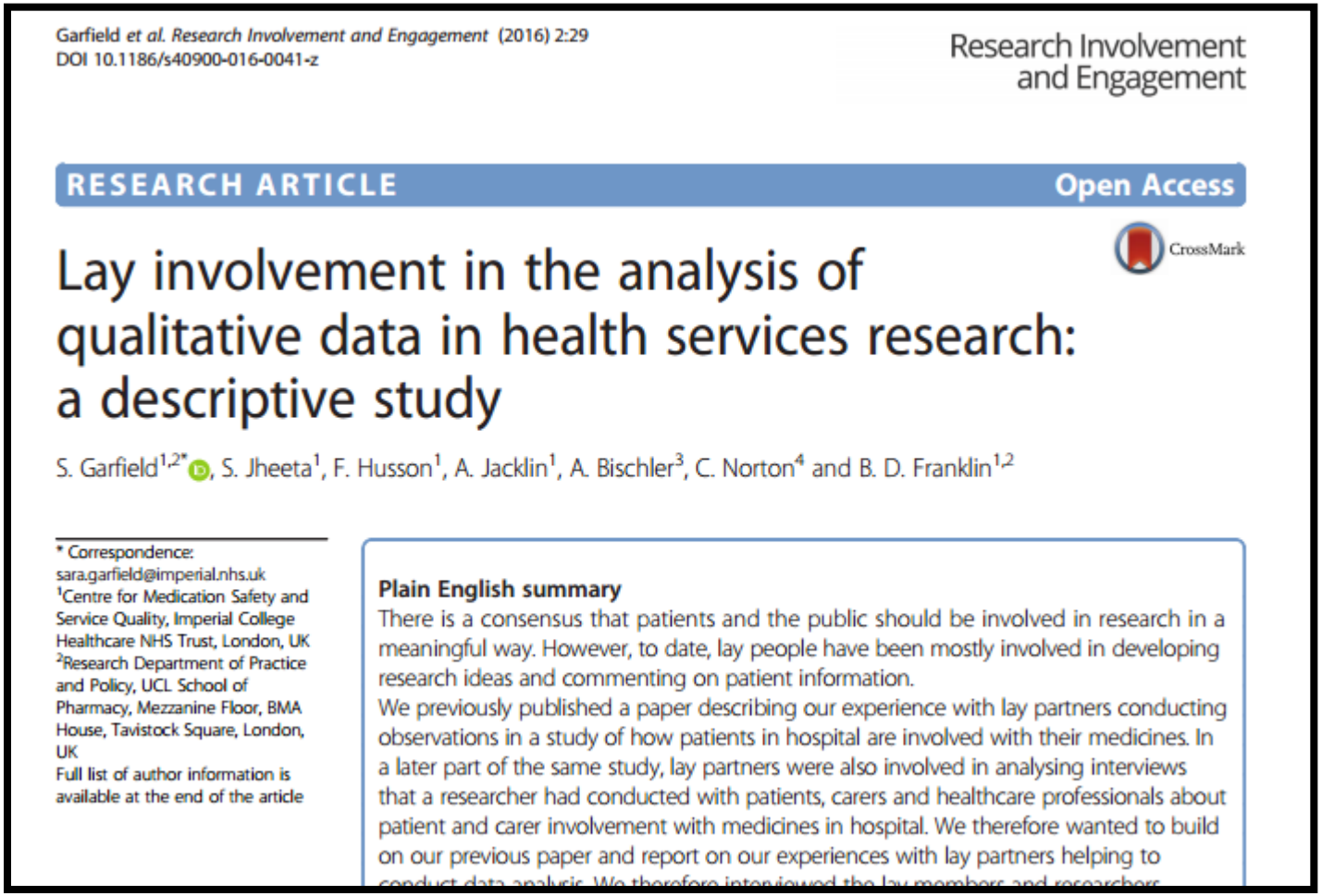
RESEARCH INVOLVEMENT AND ENGAGEMENT

RESEARCH ARTICLE Open Access

Patient and public involvement in data collection for health services research: a descriptive study

Sara Garfield[1,2*], Seetal Jheeta[1], Ann Jacklin[1], Anna Bischler[3], Christine Norton[1,4] and Bryony D. Franklin[1,2]

Lay involvement in research



Garfield *et al. Research Involvement and Engagement* (2016) 2:29
DOI 10.1186/s40900-016-0041-z

Research Involvement and Engagement

RESEARCH ARTICLE Open Access

Lay involvement in the analysis of qualitative data in health services research: a descriptive study

S. Garfield[1,2*], S. Jheeta[1], F. Husson[1], A. Jacklin[1], A. Bischler[3], C. Norton[4] and B. D. Franklin[1,2]

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Plain English summary

There is a consensus that patients and the public should be involved in research in a meaningful way. However, to date, lay people have been mostly involved in developing research ideas and commenting on patient information.

We previously published a paper describing our experience with lay partners conducting observations in a study of how patients in hospital are involved with their medicines. In a later part of the same study, lay partners were also involved in analysing interviews that a researcher had conducted with patients, carers and healthcare professionals about patient and carer involvement with medicines in hospital. We therefore wanted to build on our previous paper and report on our experiences with lay partners helping to conduct data analysis. We therefore interviewed the lay members and researchers

Lay involvement in research

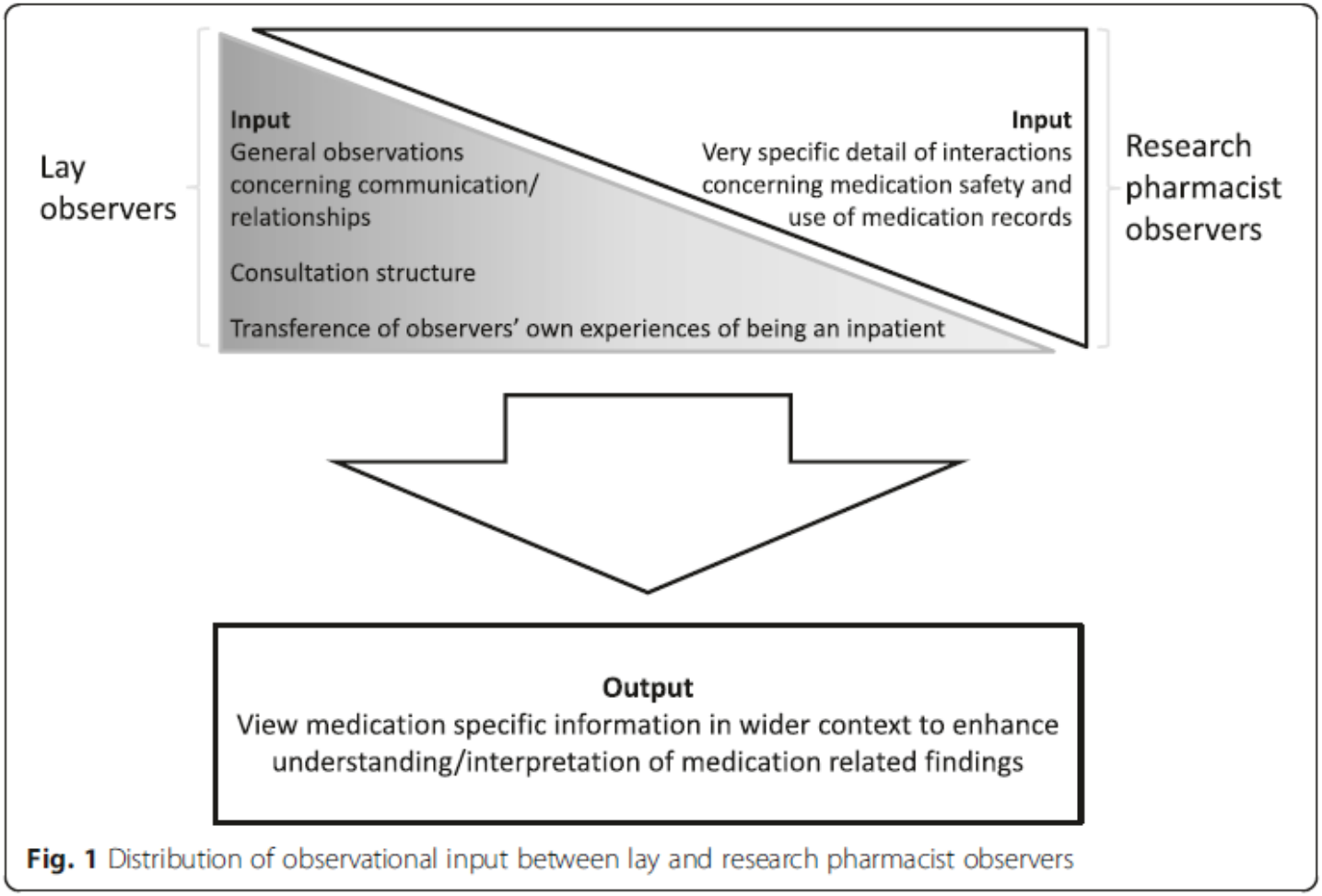

Fig. 1 Distribution of observational input between lay and research pharmacist observers

Concluding thoughts

- Understand the local problems
- Be aware of context
- Likely to need multi-faceted solutions
- Look for and mitigate unintended consequences
- Involve patients and carers