



Safe medication practice tutorials: a practical approach to preparing prescribers

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Teachers should include patient safety measures

INTRODUCTION

Background

Clinically significant prescribing errors occur in between 0.3 and 39.1 per cent of prescriptions, many of which result in patient harm.^{1,2}

A report by the British government in 2004 reviewed

the causes and frequency of medication errors, which included prescribing errors. The report identified models of good practice to improve medication safety, many of which focus on reducing prescribing errors.³

A recent symposium focused on the importance of education

as the cornerstone in the improvement of the safety of prescribing. Recommendations included enhanced pharmacology and therapeutics training for medical students and junior doctors.⁴ The General Medical Council (GMC) in the UK recommends that graduate doctors have knowledge and understanding of 'the effective

and safe use of medicines as the basis of prescribing' and the ability to write safe prescriptions.⁵ Glavin recommends that clinical teachers should include patient safety messages throughout the medical curriculum.⁶

This paper considers some of the factors underlying prescribing errors, and describes a practical programme of tutorials that has demonstrated improvements in both prescribers' knowledge about safe drug use and their ability to prescribe safely. The questions considered in the paper include:

- What educational methods should be employed?
- Who is best suited to deliver the material?
- What processes for assessment should be used?

Three major reasons why errors occur

James Reason, in his book *Human Error*, proposed that errors occur within complex industries at three levels: (1) the individual level, (2) the system level within which they function and (3) an organisational level.⁷

The individual level

At the individual level, the error, on the part of the prescriber, may result from either lack of knowledge or application of the wrong rule about the drug or the patient, or lack of the appropriate skills for applying knowledge when prescribing.⁸⁻¹⁰ Medical students and junior doctors acknowledge that they lack the confidence, knowledge and ability to prescribe safely; they state that they often felt under-prepared for this task.¹¹⁻¹³ These factors, together with the inherent pressures of time, the need to multi-task and fatigue, all increase the risk of errors.

The system level

At the system level, the pathway of medication management (the pathway in which drugs are prescribed, administered and monitored – Figure 1) involves many stages and a number of different individuals.¹⁴ It is error-prone, complex and high risk. Despite advances in technology, prescribing in hospitals is still largely paper-based and not standardised within or between sites. Junior staff are therefore required to familiarise themselves with numerous disparate processes. A standardised

system, designed to reduce the opportunity for errors, is needed.

An organisational level

At an organisational level, there is a medical culture in the prescribing process that focusses on drug selection. The decision about what to prescribe and when to start treatment is frequently made by more senior doctors.¹⁵ The process of what dose of drug should be given and when appears to less of a focus. For example, 'warfarinise this patient' is a common instruction given to a junior doctor, with no indication of dose or when to start, or no consideration of patient-specific factors. This may contribute to the reason why dosing- and patient-specific errors (such as failure to identify a contra-indication) occur more frequently than drug selection errors.⁸

Additional reasons

In addition, junior doctors, who were interviewed after involvement in prescribing errors, identified generation of prescriptions as often being a task of relatively low importance and low risk.¹⁵ This is not surprising given that the largest proportion of such prescribing involves writing drug charts on admission, transcribing expired charts and generating discharge prescriptions.

In contrast, when junior medical staff are on call for surgical or ward duties, which is often under limited supervision, they are expected to initiate high-risk therapies that often involve anticoagulants, insulin, fluids, electrolytes, antibiotics and analgesics.^{8,15}

To change the culture of prescribing, it has been suggested both that a culture of safety must be led from the top and that safe and effective prescribing be taught, understood and reinforced through demonstration

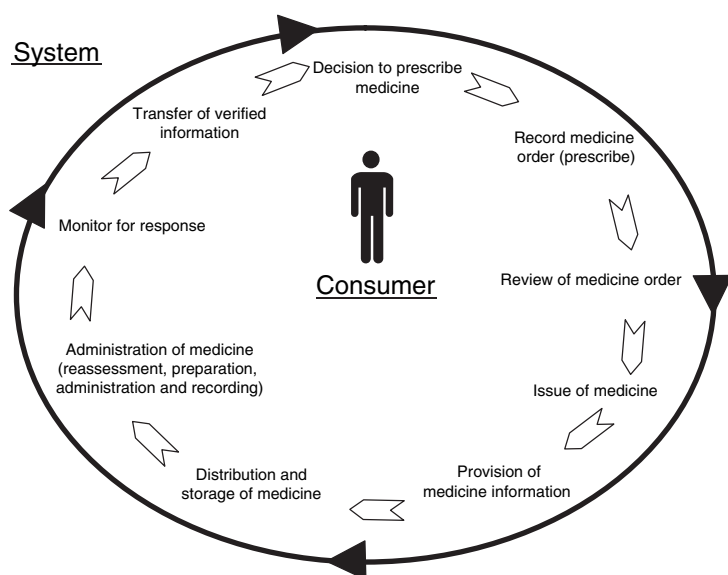


Figure 1. Drug management pathway describing the continuum of patient monitoring, prescribing, review, drug distribution and administration involving medical, pharmacy and nursing staff

They demonstrated a greater ability to choose a treatment

by senior staff using medical role-models.^{16,17}

Improving the safety of medical students' prescribing – the evidence

Successful educational interventions have made use of structured, practical, interactive tutorials that involve the application of pharmacological knowledge in clinical scenarios.^{10,18} A pharmacist-led, controlled study of 40 students demonstrated that the use of five 20-minute sessions could enhance skills such as drug history taking and generation of inpatient prescriptions.¹⁹ Two interactive educational sessions, each of two hours' duration, with 28 students resulted in a significant improvement in the legibility of prescriptions.²⁰ In a larger Dutch study, the intervention group was provided with training in cognitive therapeutic skills in addition to the normal curriculum, and they demonstrated a greater ability to choose a treatment and monitor its effects.²¹ Although web-based systems are being developed to deliver prescribing

curricula, there have been no reports of their effect on the improvement of the safety of prescribing.²²

OUR INTERVENTION: SAFE MEDICATION PRACTICE UNIT

The Safe Medication Practice Unit (SMPU), in Queensland, Australia, was established to develop, evaluate and implement interventions, at both a system and an individual level, to reduce medication errors and prevent patient harm. One of the fundamental philosophies adopted by the SMPU is that interventions that are safe and effective depend upon an understanding of the medication management pathway (see Figure 1). One of the outcomes of this process has been standardisation of inpatient drug charts. The same chart is now in use in all 120 Queensland state hospitals, and has been associated with a reduction in medication errors.²³ The existence of a standardised prescribing system has facilitated the development of

safe medication management training programmes for all disciplines, including medical students in their final year. The drug chart formed the basis of the Australian National Medication Chart.

The Safe Medication Practice Programme in Queensland

A series of eight, interactive, problem-based tutorials, each lasting 90 minutes, was developed after holding focus groups with junior doctors and structured interviews with those who had made prescribing errors. A wide array of topics associated with safe medication management was covered (Box 2). A controlled trial was devised to evaluate the effect on students' knowledge of safe drug use and their ability to prescribe safely.

The therapeutic areas commonly associated with high risk of patient harm were specifically selected. These focused on areas in which junior doctors are frequently left to manage unsupervised (Box 2). For each area, scenarios were developed which meant that the doctor had to

Box 1. Objectives of the safe medication practice tutorials

- Introduce the medication management pathway and roles of medical, pharmacy, nursing staff and patients
- Raise awareness of common risks and errors within the medication systems, the key underlying factors and how to reduce re-occurrence
- Introduce the process of 'graded assertiveness' or effective communication in order to escalate concerns with colleagues in the context of drug safety
- Prepare graduates to prescribe safely and effectively using the standard inpatient prescribing systems in all Queensland public hospitals
- Discuss limitations and benefits of information sources used when taking, confirming and reconciling a drug history and identifying drug-related problems
- Develop key skills and knowledge to enable a minimum standard for the mechanics of safe prescribing: communicating a decision to treat to nurses and pharmacists, with particular reference to generic areas, such as ensuring the correct drug form, route, dose, frequency and duration, and ensuring that the right patient gets the right drug
- Specifically work through the rationale for and the errors related to prescribing, monitoring, optimising and stopping medication
- High-risk drug groups include: antibiotics, in particular gentamicin; anticoagulants, e.g. warfarin, heparin; intravenous fluids and electrolytes; variable dose insulin; discharge medication
- Impart key messages related to effective patient communication on discharge

Box 2. Topics covered in the safe medication practice programme

1. Introduction to human error and drug safety and role of graded assertiveness
2. Effective drug history taking and how to identify problems with drug-taking behaviour and drug-related clinical problems; introduction to the standard drug chart
3. Safe and effective use of the standard drug chart, changes to drugs, errors and adverse drug reactions, prescription of gentamicin and monitoring and dosing
4. Anticoagulation: thromboembolic prophylaxis, therapeutic uses of intravenous heparin, enoxaparin and warfarin
5. Oral hypoglycaemics and insulin management
6. Intravenous fluids and electrolytes
7. Analgesia for acute and chronic pain
8. Provision of discharge drugs and information for all members of the healthcare team

balance the risks and benefits for the patient, before the generation of prescriptions.

The sessions were facilitated by a senior doctor and pharmacist, and three also involved a clinical nurse.

The tutorials assumed a minimum level of pharmacological and therapeutics knowledge, and

were designed to complement the medical curriculum. After a brief introduction of objectives, the sessions followed a similar pattern, using a case to raise questions and stimulate group discussion and interaction.

The sessions involved activities such as analysis of videos, participation in role-play, identification of drug errors and, most frequently, 'hands-on'

prescribing. The same patient was followed through a succession of scenarios. For example, for the first patient this involved admission, a ward round, development of pneumonia, of deep vein thrombosis, and discharge. A second patient with diabetes was admitted for a surgical procedure, which required management of blood glucose, fluids, electrolytes and pain.



The doctor had to balance the risks and benefits

Participants had to consider drug selection

Participants had to consider drug selection, including relative or absolute contraindications, dose, and selection of form, frequency, route and duration of drug treatment. Requirements were also covered for appropriate monitoring of drugs with a high risk for toxicity or clinical effect. The participating students were introduced to the standard drug chart and systems designed for safer management of warfarin, heparin, insulin, and fluids and electrolytes.

After each prescribing scenario, students exchanged their drug charts for their neighbours' charts in order to detect errors. By reading someone else's prescription, awareness is

increased of the need to ensure correct communication of information through legible, accurate and complete prescribing.

At the end of each session, students were provided with correct examples of all of the prescribing that they had undertaken, together with supporting information and key messages associated with each scenario.

OUTCOMES OF THE PROCESS

During the first year (2004), 109 of the 233 students in the final year were allocated to the 'intervention site'; 99 consented to the study and 81 voluntarily

attended at least 75% of the tutorials offered. The tutorials were well received and appeared to provide education and training not covered elsewhere in the curriculum (Box 3).

KNOWLEDGE AND SAFE PRESCRIBING SKILLS

An evaluation of the participants' knowledge and ability to prescribe safely was tested in the examination at the end of the final year. The four sections of the short answer questions are shown in Box 4. A comparison of the means of the students' scores demonstrated a significantly higher score in intervention students when compared with controls (Table 1).

Box 3. Qualitative feedback from students undergoing the course

Quotes:

- 'I think it's extremely valuable preparation for next year'
- 'Even after three years of med school, I have had no experience with writing prescriptions'
- 'This has been the most useful thing in 3.5 years'
- 'The program was invaluable! I think it should be reinforced throughout the whole of 3rd and 4th year'
- 'This is the first time I have had to do this. I am glad it wasn't really a patient today'

General themes:

- Innovative, interactive, relevant and useful
- Important information not previously covered in the MBBS curriculum
- Should be mandatory and occur earlier in the course, over a longer period of time
- Hands-on nature of the course most effective
- Raises profile of drug safety and error awareness

Box 4. Knowledge and skills tested in summative and practical examination at end of year for all intervention and control participants

- Documentation of issues that they wished to discuss with their registrar, having been asked to initiate perindopril to a patient with a documented previous severe adverse reaction to captopril
- Prescription of a series of drugs including: weekly medication, sustained-release verapamil, once only, as required, and six other regular medications on the standard inpatient drug chart
- Discussing the risks and benefits of warfarin versus aspirin for this patient's atrial fibrillation; the patient was 72, lived alone, would have been difficult to arrange regular INRs (international normalised ratios) and drank large amounts of alcohol erratically
- Assessment of the benefits and risks of the request for a non-steroidal anti-inflammatory drug for an acute attack of gout, where the patient has three relative contraindications

All students are now expected to attend

Table 1. Results of assessment of safe medication practice examination and prescribing scenario

Question	Mean score – control (<i>n</i> = 134)	Mean score – intervention (<i>n</i> = 99)	Maximum score	Significance (<i>t</i> -test, two-tailed)
ADR identification and rationale for not prescribing	4.22	4.94	6	0.01
Prescribing scenario score (significant errors made)	11.30 (2.70)	12.52 (1.48)	14	0.01
Warfarin or aspirin in AF	4.50	4.98	7	0.011
NSAIDs	6.33	7.02	11	0.041
Sum of mean scores	26.35	29.46	38	<0.05

ADR, adverse drug reaction; AF, atrial fibrillation; NSAID, non-steroidal anti-inflammatory drug.

DISCUSSION

As a result of the success of this study, all students are now expected to attend the course, delivered at the four teaching sites of the University of

Queensland Medical School. The SMPU has developed a facilitator's kit of all the material and updates the course annually in line with changes to the drug system. Programmes for training the trainers are conducted for

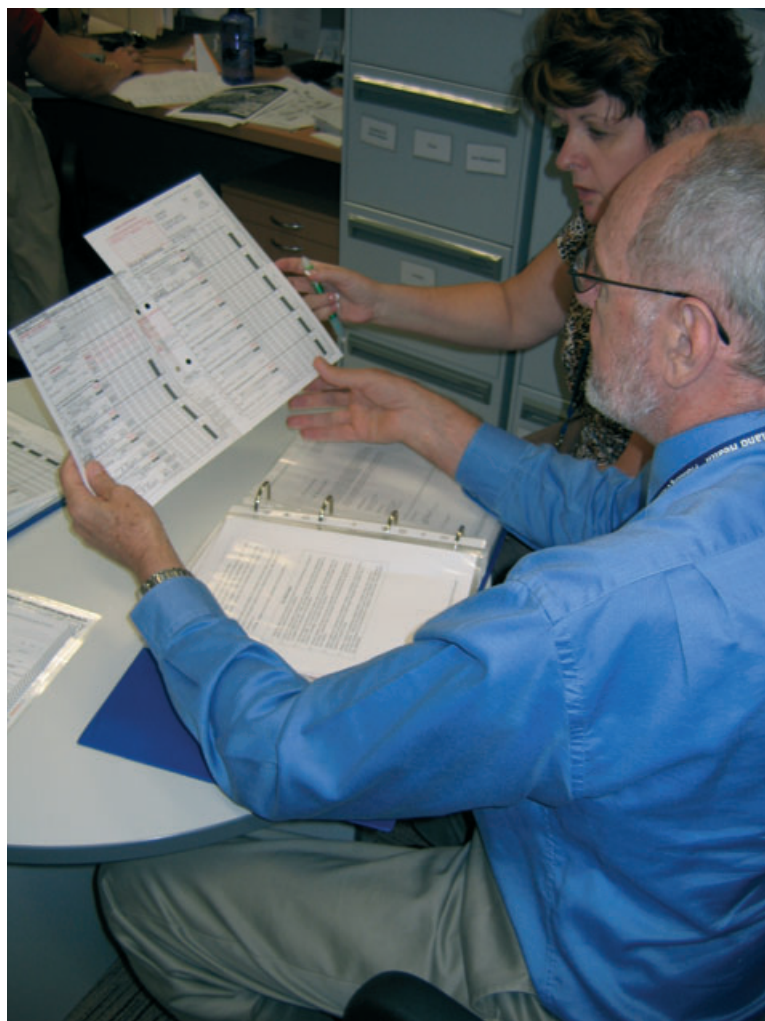
teams of pharmacists, doctors and nurses who deliver the course.

One of the key learning messages is the interactive role of medical, pharmacy and nursing staff in ensuring the safe and effective management of medications. This is demonstrated by the interaction between those involved in the presentation of the course.

The results confirm that discussion of errors and constructive feedback are an invaluable component of any educational programme.^{24,25} A core component of our programme was learning from errors. Errors were frequently set within the scenarios, for example, being asked to prescribe penicillin when there is a pre-existing penicillin allergy. Errors made were then discussed within a secure environment, with honest discussion about the solutions and processes involved in safe and effective prescribing.

CONCLUSION

The results of the controlled study have demonstrated an increased ability of medical students to prescribe safely in commonly encountered situations. This multidisciplinary-led programme was well received by students



and has now become a component of the medical curriculum. The study suggests that inclusion of the processes used by the SMPU may be of benefit if incorporated into existing curricula aimed at safe and effective prescribing.

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