

Drug administration errors by nurses are a common cause of patient harm. Simple steps can be taken to cut distractions and improve nurses' skills in calculating doses

Reducing nurse medicine administration errors

In this article...

- › Scale of medication errors and their effects
- › The causes of drug errors
- › Practical measures to reduce errors

Authors Rose Ofosu is registered nurse, renal unit, St Helier Hospital; Patricia Jarrett is research fellow, School of Health and Education, Middlesex University.

Abstract Ofusu R, Jarrett P (2015) Reducing nurse medicine administration errors. *Nursing Times*; 111: 20, 12-14
Errors in administering medicines are common and can compromise the safety of patients. This review discusses the causes of drug administration error in hospitals by student and registered nurses, and the practical measures educators and hospitals can take to improve nurses' knowledge and skills in medicines management, and reduce drug errors.

Medication errors are one of the most common causes of harm to patients: up to 6.5% of patients admitted to hospitals are affected. In addition to the human suffering involved, the annual cost related to the adverse effects of medication to inpatients has been estimated as £774m (National Patient Safety Agency, 2007).

A key aim of nursing is to ensure patient safety and at the very least do the patient no harm (Smith, 2005). However, patients are often harmed unnecessarily through drug errors by medical and nursing staff (Cleary-Holdforth and Leufer, 2013). In drug administration, the nurse is the last person in the process to rectify and defend against errors, and needs to know the effect, rationale and compatibilities of the drug, and be able to calculate the correct dose for patients (Rainboth and DeMasi, 2006).

Almost all patients admitted to a clinical setting receive medication as part of their treatment (Esi Owusu Agyemang and

While, 2010). Most medication errors occur at the time of administration (Miller and Emanuel, 2010). Many are caused by inadequate prescribing, dispensing, updating of prescriptions and administering of drugs (Royal Pharmaceutical Society, 2009).

There is no specific definition of drug error, as it often depends on the type or classification of mistake (O'Shea, 1999). This can cause confusion and prevent reporting of mistakes and near misses.

Aronson (2009) suggested: "Medication error is failure in drug treatment process that leads to or has the potential to harm the patient." Many studies use this definition, often in tandem with Franklin et al's (2005): "Any error in prescribing, dispensing or administering medication".

Causes of drug errors

The literature identifies four main causes of drug errors by nurses (Table 1).

Interruptions and distractions

Distractions and interruptions are a regular part of nurses' working lives. If these occur when nurses are preparing and administering medicines, they can lead to drug errors that compromise patient safety.

Kreckler et al (2008) observed 38 medication administration rounds by nurses over a five-week period. They noted that interruptions and distractions were common, and included interruptions by patients, phone calls to the ward, nurses looking for equipment and medications, and further interruptions by other nurses and members of the multidisciplinary team.

Fry and Dacey (2007) designed a questionnaire to investigate nurses' own perceptions of the causes of medication errors, and whether experience, work

5 key points

1 Nurse drug administration errors are a cause of morbidity and mortality

2 Distractions and interruptions during hospital drug rounds can affect concentration, resulting in medication error

3 Conceptual difficulties and poor numeracy skills can cause nurses to calculate dosages wrongly

4 Drug calculation and administration skills should be required competencies in students' and registered nurses' education

5 Strategies to minimise interruptions to drug rounds may help reduce errors.



Interruptions on drug rounds cause errors

environment and seniority affect incidence. They questioned 244 registered nurses from 15 hospital disciplines, including surgical and medical wards, high dependency units, care of the elderly, rehabilitation units, and assessment and observation wards. They found that nurses believe distractions contribute to medication errors on drug rounds. Other factors were illegible handwriting by medical staff and changes in manufacturer packaging of medicines.

In a third study using non-participant observation and semi-structured interviews Dougherty et al (2011) explored the decision-making processes of nurses in a specialist cancer hospital when preparing intravenous continuous and bolus intravenous drug therapy. They observed 20 nurses in two wards over one week, and asked them about their procedure and the potential for drug errors. Interruption and distraction during the preparation of drug therapy was highlighted as a main potential cause of error.

Poor drug calculation skills

Nurses' numeracy is known to be deficient compared with their other nursing skills (Wright, 2006), despite this being a key nursing competency (NMC, 2008). Poor numeracy has been highlighted as a contributor to medication errors in hospital and the community (Warburton, 2010).

In a UK-based study the drug calculation and numeracy skills of student nurses and registered nurses were correlated with age, status and experience (McMullan et al, 2010). Using a cross-sectional design, 44 registered nurses and 229 second-year diploma student nurses were asked to complete tests in drug calculation and numeracy.

Worryingly, most student nurses and registered nurses failed the drug calculation test (92% and 89% respectively), while half of both groups failed numeracy tests.

Both groups were less able to calculate drips and infusion rates than solids, oral liquids and injections. The authors suggest drug percentage and infusion rate calculations may be conceptually more complicated than other drug calculations and this may explain poor test performance.

Other explanations might be the increased use of technology – for example, intravenous pumps with electronic drip-rate counters may contribute to the loss of nurses skills. Additionally, nurses in primary care settings may not perform infusion rate calculations and so do not routinely use these skills (McMullan et al, 2010).

Wright (2006) showed student nurses

TABLE 1 CAUSES AND POSSIBLE SOLUTIONS

Main causes of drug errors	Approaches to reduce drug errors
Interruption and distraction of nurses during drug administration	Reduce distractions on drug rounds by nurses wearing special clothing communicating what they are doing – for example, tabards saying: "Drug round in progress – do not disturb!"
Insufficient knowledge and lack of nurse education in pharmacology	Offer structured preceptorship programmes to support newly qualified nurses. Enforce protected time to teach, assess and support newly qualified nurses to achieve competence in medicine administration
Lack of confidence of student nurses in administering medicines	Engage student nurses in the theory and practice of drug administration through objective structured clinical examinations
Difficulties in performing drug calculations	Provide ongoing education for student and registered nurses to boost competence, skills and knowledge in drug calculations and medicine administration

found it challenging to interpret and calculate information involving multiplication of fractions. Their level of ability was associated with their education, confidence, and interest in maths and how much they had enjoyed it at school.

A third study assessed the drug calculation skills of 124 registered nurses in five teaching hospitals in the Republic of Ireland. Participants were given a drug calculation test and questionnaire about their drug calculation education. These were used to evaluate their numeracy skills and cognitive processes in calculating drug dosage and rates (Fleming and Brady, 2014).

Overall, 60% of nurses passed the drug calculation test, and only four achieved the top score. As McMullan et al (2010) found, errors seemed to relate to a lack of conceptual understanding, rather than mathematical mistakes. Many nurses had difficulty calculating intravenous infusion drip rates. Fewer than 7% had sat any formal exam on drug calculation in their undergraduate education. The researchers recommended mathematical and conceptual drug calculation skills become a competency in the nursing curriculum.

Inadequate education and compliance

Poor adherence to medicines policy and lack of compliance with prescriptions ordered by the medical team, particularly for dependent and vulnerable patients, may also contribute to medication errors.

Kelly and Wright (2011) assessed the severity of drug administration errors in

nurses caring for older patients, observing 62 nurses administering medicines to 625 patients in a stroke unit and a care of older people ward. The rate and severity of medicine administration errors was higher than in studies of patients in care homes or general medical and surgical wards. The most common errors were late or early administration of drugs or drug omission.

These errors were a particular problem for some patients – for example, those with Parkinson's disease, who need medication on time. A main reason for late administration or omission of drugs was the extra time needed for "difficult" patients. Another factor was nurses leaving drugs on bedside tables to administer to later, which often failed to happen.

Another study by Kelly et al (2011) found higher rates of medication errors for patients with dysphagia compared with those who had no swallowing difficulties. Errors included nurses using the wrong formula and the incorrect preparation of medicines.

Discussion

Drug administration error by nursing staff is a problem in the UK and contributes greatly to patient morbidity and mortality (Wright, 2013). We have identified four factors in drug errors by nurses in hospitals in the UK and Ireland (Table 1).

Nurses work in complex clinical environments that are usually busy, noisy, prone to distraction and interruption, and which often require them to multi-task.

Biron et al (2009) reviewed sources, characteristics and rate of work interruptions that might contribute to medication administration errors. From 23 research articles they found other nurses in face-to-face interactions of short duration to be the most frequent source of interruption.

However, Byron et al (2009) criticised the articles for failing to define "interruption". Other methodological issues were inadequate sample size and lack of representativeness. These reviewers suggest there is limited evidence on the contribution interruptions make to medical administration errors. Other studies highlight interruptions and distractions that reduce nurses' concentration during drug rounds (Cleary-Holdforth and Leufer, 2013).

Suggestions have been made on how to reduce nursing medication errors (Choo et al 2014). Bennett et al (2010) advocate interventions such as protocol checklists, clothing for nurses with slogans advising not to disturb as administration of medicines are in progress and signage to reduce or limit talking during drug rounds.

Insufficient knowledge and lack of pharmacology education among nurses is another factor. One way to reduce errors might be for each clinical area to have an established and structured preceptorship programme in medicines administration to support nurses who are newly qualified or less experienced in drug administration.

Student nurses have identified that they were not adequately prepared to administer and manage medications safely through their education (Vaismoradi et al, 2014). The transition of the newly qualified nurse from novice to expert could be supervised under the guidance of an experienced nurse or practitioner (Fowler, 2011).

Each clinical practice area should also give new and experienced nurses protected time to improve their learning and professional development in drug calculation and administering medicines. This would produce more knowledgeable and confident practitioners, create a safer environment for patients and increase patient and staff satisfaction (Morgan et al, 2012).

Student nurses' knowledge and competence in medicines management could also be improved by engaging them in the theory and practice of drug administration through objective structured clinical examinations (Hemingway et al, 2011).

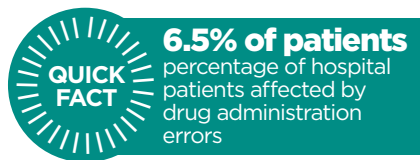
Education and professional development for student and registered nurses should be used to improve nurses' competence in drug calculation, which the literature shows is lacking. Education programmes are essential to fulfil nurses'

professional and legal obligations, and for patient safety (Miller and Emanuel, 2010).

Technology

Technology will play a part in reducing error in the future. Programmable secure cabinets, similar to vending machines, are likely to replace the drug trolley. The software controls access and maintains records of all issues and receipts. The systems can be interfaced to the hospital patient administration and pharmacy information systems to report on costs at patient and procedural level.

For hospitals with electronic prescribing systems, an interface between the electronic prescription and the secure cabinet can create a "closed loop" of medicines administration, which is thought to offer the best chance of eliminating administration error.



Conclusion

Safe practice in medicine administration is crucial, yet errors by nurses are compromising patient care. Errors can happen at different stages of the administration process, and nurses play a key role in checking the medication is correctly prescribed, signed and dated by the prescriber before administration, and that it is administered as prescribed, following the correct protocols.

Nurse educators need to give registered and student nurses the opportunity to maintain and improve their numeracy and drug calculation skills. Work interruptions while nurses calculate and administer medicines are inevitable, but can be reduced. Hospitals and educators can improve nurses' knowledge and skills in medicines management and reduce errors (Table 1). **NT**

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