The nine rights of medication administration: an overview

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Abstract

Nurses are responsible for ensuring safety and quality of patient care at all times. Many nursing tasks involve a degree of risk, and medication administration arguably carries the greatest risk. Unfortunately, patients are frequently harmed or injured by medication errors. Some suffer permanent disability and for others the errors are fatal. Nurses have traditionally followed the five rights of medication administration (patient, drug, route, time, dose) to help prevent errors, and more recently, the seven rights (including documentation and reason). This article identifies nine rights of medication administration.

Key words: Medication administration ■ Patient safety ■ Quality of care

Patient safety and quality of care are essential aspects of clinical nursing practice. When people are admitted to hospital, they expect to have their illness or disease treated, and to receive quality nursing care. They do not expect to be harmed.

The primary goal of nursing care is to maximize health and wellbeing, and so optimize the quality of people's lives (Wilson, 2009). However, hospitals can carry a risk to patients. In the UK as many as 10% of hospitalized patients may experience an adverse event, and some may experience multiple events (Vincent et al, 2001, Sari et al, 2007). Studies from other countries suggest that up to 30% of patients will experience an adverse event, and these come at a very high cost (Ehsani et al, 2006; Fowler et al, 2008; Griffin and Classen, 2008).

The cost of adverse events

Vincent et al (2001) reported that patients experiencing an adverse event in British hospitals are admitted for an extra 8.6 days, with additional costs of £290 268 to the trusts concerned. In 1999, it was estimated that the total annual cost of preventable adverse events in North America was between £10 billion and £17 billion (Thomas et al, 1999).

Today, these costs may be even higher. Research in Australia and New Zealand cited costs ranging from £3179 to £4616 per adverse event (Ehsani et al, 2006; 2007). One of these studies examined adverse events in acute admissions for cardiac disease. The sum total cost of adverse events for each diagnostic category was £23.6 million, representing 21.6% of total expenditure on cardiac surgery, and adding 27.5% to the cardiac surgery budget (Ehsani et al, 2007).

A more significant cost of adverse events is the human one: the cost to the patient. Patients experiencing an adverse event are 4—7 times more likely to die than those who do not (Ehsani et al, 2006; 2007). Vincent et al (2001) found that 19% of adverse events result in moderate physical impairment, 6% in permanent impairment and 8% in death.

One of the reasons adverse events are so common is that clinicians are human, and thus prone to error. The seminal study by Wilson et al (1999) found that human error was a significant factor. The majority (81%) of adverse events in their study were associated with one or more human factors, such as lack of knowledge, care or attention. Of the events that were considered highly preventable, less than 1% were not associated with human error. Vincent et al (2001) labelled 48% of adverse events as preventable, while Neale et al (2001) found that 53% of preventable events occurred in general ward care. Other studies have also found human error to be a key factor contributing to adverse events (Regenbogen et al, 2007; McQuillan et al, 1998; Rex et al, 2000).

The nurse's role

Nurses have an important role in patient surveillance and error prevention (Rothschild et al, 2006). One of the most common types of adverse event is medication error, which is the most frequent cause of morbidity and preventable death in hospitals (Adams and Koch, 2010). Gurwitz et al (2003) reported that 38% of medication errors are serious or fatal, and 42% of those are preventable. A recent study in the UK found that 26% of medication errors were potentially grave (Dean et al, 2002), with fatal events including aspiration pneumonia and intracranial haemorrhage (Gurwitz et al, 2005).

Medication errors can take many forms, and may occur at different phases of the medication administration process (from prescription by the medical officer, to dispensing by the pharmacist, or administration by the nurse). Examples of factors contributing to these errors are:

- Poor medication labelling
- Miscommunication among clinicians
- Lack of verification
- A disorganized medication trolley
- An incomplete medication prescription

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- Inadequate staffing levels (Anderson and Webster, 2001; Brown, 2001).

The vast majority of medication errors are multifaceted and happen as a result of failures within the system in which clinicians work (Cohen and Shastay, 2008). In a study of medication errors in intensive care units, most of the errors occurred during routine patient care, and not during extraordinary situations such as cardiac arrest (Valentin et al, 2009).

Nurses are responsible for 26%—38% of medication errors in hospitalized patients (Leape et al, 2002; Bates, 2007), and have an important role in ensuring safety in the medication administration process. The nurse is the last person who can check the medication is correctly prescribed and dispensed before it is administered (Davey et al, 2008).

As medication administration is probably the highest risk task a nurse can perform (Anderson and Webster, 2001), many policies and guidelines have been devised to help prevent medication errors occurring. Most nurses will be familiar with the five rights of medication administration: the right patient, drug, dose, route and time (Eisenhauer et al, 2007). However, quality in medication administration is not simply a matter of adhering to these five rights (Cox, 2000). In recent years, seven rights (the five rights plus right response and documentation) have been proposed, but errors still occur. To decrease the incidence of medication errors even further, the authors propose the nine rights of medication administration.

The aim of this manuscript is to outline these nine rights, and highlight how they can be implemented in clinical practice. The nine rights do not guarantee that medication errors will not occur but following them will help ensure safety and quality of patient care during the medication administration process. This manuscript seeks to advise the graduate nurse who, because of their limited clinical experience, may not recognize high-risk situations or medications (Benner et al, 2002; Ebright et al, 2004).

The nine rights

Right patient

This right is self-evident: the medication must be administered to the patient for whom it is prescribed. Administering a medication to the wrong patient is, however, a common error. A possible reason for this is identified in a study by Lisby et al (2005) on medical and surgical wards in a Danish university hospital, where an alarming 36% of medication doses were administered without any previous verbal verification of the patient's identity. Verbal verification of the 'right patient' is one method of correct identification, but it should not be the only method used.

Asking the patient 'Are you Mr Smith?' involves a degree of risk, because two patients could have the same surname. 'Please tell me your full name' is a better way to confirm a patient's identity. Both name and medical record number (or hospital identification number) should be verified on the patient's wristband and medication chart.

Not all patients wear identification bands, particularly mental health patients, or those in nursing homes. In these situations extra vigilance may be needed, as some patients may be confused or unable to identify themselves.

Box 1. The nine rights

1. Right patient
2. Right drug
3. Right route
4. Right time
5. Right dose
6. Right documentation
7. Right action
8. Right form
9. Right response

Right drug

Research has shown that as many as one third of medication errors involved the patient being given the wrong medication (Selbst et al, 1999; LaPointe and Jollis, 2003). Nurses are not legally qualified to prescribe medications, but if they are unsure of the name of the medication prescribed (or think it is the wrong one), they should not administer it before checking with the prescriber.

A possible reason that the wrong medication may be administered is that many medications have similar names. Although medication names need to be unique, medications that share an indication, mechanism of action, or chemical constituent are often intentionally given the same prefix or suffix such as Atenolol and Metroprolol (United States Pharmacopeial Convention USPC, 1996).

An example of two different medications with a similarity is Losec (Omeprazole; proton-pump inhibitor) and Lasix (Frusemide; loop diuretic). Not only do the names have similarities, but also both can be administered orally and intravenously, and in similar doses. To avoid confusion, generic names should be used when medications are prescribed. Some medication charts now require the prescriber to write the generic medication name and reason for prescribing (see the Australian National Medication Chart; Australian Commission on Safety and Quality in Health Care [ACSQHC], 2006).

Sloppy handwriting and shorthand abbreviations in prescriptions are also subject to misinterpretation. If the prescriber's handwriting is unclear, they should be contacted to verify the prescription. Hospital managers should consider replacing written prescriptions with computerized prescriber order entry (CPOE), a very effective technology, which has been demonstrated to reduce prescribing errors (Institute of Medicine, 2000, Bates, 2007). In China, CPOE has been implemented nationally for a number of years. There has been a marked decrease in medication errors during that time (Jiacheng, 2003).

The right medication should also be one the patient is not allergic to. When administering a medication, the patient must be asked if they have any known allergies, and these must be documented in the appropriate place. Ask the patient about the allergic reactions they have experienced, as some may confuse a side-effect with an allergic reaction. Side-effects such as nausea, diarrhoea and sedation are frequently reported as allergies, when in fact there is no immunological mechanism involved at all (Benjamin, 2003).

Nurses should also be aware that there may be circumstances in which a medication is administered even though the

patient is allergic to it. In this situation, the decision is made to administer the medication because the benefits of administering the medication outweigh the allergic reaction (such as administering an antibiotic to a patient with meningococcal meningitis even though they previously experienced an allergic reaction).

Right route

Nurses are only allowed to administer medications by the route prescribed, though sometimes the prescriber may give a choice (IV/PO). The nurse must understand the differences between these routes such as the rate of absorption or onset of action. Nurses do have the choice of the form of medication to be administered (eg tablets, syrup). The form of the medication though must be correct for the route of administration (see *Right form*).

Numerous errors have been reported involving the correct medication being administered to the correct patient but by the incorrect route. Cases involving Vincristine (vinca alkaloid; antineoplastic) being administered intravenously instead of intrathecally (and vice versa) have resulted in patient deaths (ACSQHC, 2005). Of the few patients who survive this type of error, devastating neurological consequences, such as quadriplegia, are experienced. Unfortunately this specific error involving Vincristine has been occurring for many decades (Donaldson, 2008).

The labelling of medications may also be to blame for many medications errors (Tissot et al, 2003). Negative labels such as 'not for intrathecal use' can easily be misread as 'for intrathecal use' (ACSQHC, 2005). It is up to the manufacturer and governing bodies to ensure that this type of labelling does not occur. But research has shown that other factors such as neglect, workload and new staff commonly contribute to medication errors (Tang et al, 2007). In the landmark 'Colorado case' where a newborn infant died after being given a tenfold dose of penicillin, an inquiry identified more than fifty different system failures which allowed the error to occur (Smetzer, 1998).

The correct route of administration has become a more challenging area for clinical nurses. There was once a time when medications were primarily administered by the oral or intramuscular routes, but nurses today may encounter other routes or methods of administration. Examples include patient-controlled analgesia (PCA), epidural infusions, central venous catheters or subcutaneous infusion ports. In a case in North America an experienced nurse administered a bag of epidural analgesia by the intravenous route resulting in the death of the sixteen-year-old patient (American Nurses Association, 2006). Nurses thus need to be far more knowledgeable than in the past as each of these routes has associated technology or equipment that must be understood. The increases in medication complexity and technological advancements increases the risks associated with medication administration (Tang et al, 2007; Keohane et al, 2008).

Right time

Medications must be administered at the correct time to ensure therapeutic serum levels. Administering the medication at the wrong time is therefore one type of error. In one study, administration at the incorrect time accounted for 31% of all medication errors (Dean, 2005). Antibiotics are a group of medications associated with medication errors, perhaps because they are commonly prescribed but administration intervals are varied (Tang et al, 2007). A study of medication errors in 36 healthcare facilities in North America found that nearly half (43%) of the errors involved medications being administered at the wrong time (Barker et al, 2002).

Graduate nurses may wonder how close to the prescribed time a medication should be administered. There is no absolute answer to this question and practical or system factors will influence the actual time of administration. The guiding principle is that medications should be administered as closely to the prescribed time as possible. Bullock, Manias and Galbraith (2007) state that if a medication is ordered to be given at particular time intervals, the nurse should never deviate from this time by more than half an hour. If administration occurs outside this thirty minute window period, bioavailability of the medication may be affected. If system factors, such as workload, resulted in a medication being administered before or after the prescribed time, a medication error or incident form may need to be completed. This will allow the contributing factors to be investigated and hopefully eliminated in the future.

Administering medications at the right time also involves preparing the medication at the appropriate time. Medications should not be prepared many hours (or even one hour) before they are administered, unless the manufacturer recommends this. Intravenous infusion of Phenytoin, for example, must begin within one hour after preparation (Lim, 2008). Preparing medications well in advance of the administration time creates many risks. In one study, nurses on the day shift admitted they prepared medications for the evening shift out of 'friendship during under-staffing situations' (Tang et al, 2007). Nurses must be aware of the risks of doing this and avoid such practices.

The right time of administration also involves administering the medication at the right rate. A recent study found that medications being administered too quickly or too slowly accounted for 7.5% of all errors (Dean, 2005). While some intravenous medications can be bolused ('pushed'), others need to be administered over 5—10 minutes and some even longer. Failure to do so can have serious consequences. For example, Vancomycin should be given by slow intravenous infusion to decrease the risk of a hypersensitivity reaction, while rapid intravenous infusion of Digoxin may cause vasoconstriction and hypertension (Tiziani, 2006).

Right dose

Most nurses do not prescribe medications. The rare exceptions are nurse prescribers, who are allowed to prescribe in limited circumstances, with the relevant qualifications. In clinical practice, nurses must only administer the dose prescribed by the medical officer. Studies have found that a third or more of medication errors involve the incorrect dose being administered (LaPointe and Jollis, 2003; Tang et al, 2007). Nurses must be cautious when reading the patient's medication chart. A decimal point in the wrong place could result in either one tenth or ten times the correct dose being administered. If the nurse calculates that 20 tablets instead of

twp are to be administered, the dose should be checked with the prescriber. As nurses are responsible for ensuring patient safety, they must also ensure that the prescribed dose is within the known dose range.

Errors can also occur if the prescriber uses incorrect or misleading units. For example, writing µg instead of mcg for micrograms can be confusing. Abbreviations and inappropriate use of decimal points (eg 10.0mg) are factors that commonly contribute to prescribing errors (Williams, 2007). Similarly, when the nurse calculates the volume of medication to administer, the correct units of measurement must be used. If 5mg of a medication is prescribed, but the nurse mistakes this for 5mls, an error will obviously occur. In one case, a nurse administered 5mls of morphine 20mg/ml, instead of 5mg. The patient was given 100mg of morphine and consequently died (Cohen, 2006).

Right documentation

When a nurse administers a medication, he or she must sign the medication chart. This provides evidence that the medication has been administered to the patient. Signing the medication chart before the medication has been administered is a risk, as the patient may refuse their medication or, in some cases, forget to take them. Similarly, failing to sign when a medication has been administered creates the risk that another nurse may assume that it has not been administered, and repeat that dose.

When administering medications 'as needed' (prn), the nurse should make a note of it in the patient's medical record as well as signing the chart. Documentation should include the medication's generic name, dose, time, route, reason for administration and the effect achieved. Nurses should be aware that accuracy of documentation is an important legal responsibility (Woodrow, 2007).

Right action

When a nurse is administering a medication, he or she must ensure it is prescribed for the appropriate reason. For example, it is not appropriate to administer an antibiotic for a viral infection, nor an antiviral for a bacterial infection. Similarly, administering a sedative to a patient who already appears sedated may be harmful. When a nurse is administering a medication, he or she should state to the patient the action of the medication and the reason for which it is prescribed, for example, 'Here is your antibiotic for your chest infection'. If the patient states 'I don't have a chest infection', then a medication error may have been avoided. However, a child or confused patient may not give correct feedback, and in these situations nurses should check the patient's file to make sure the medication is prescribed for the right reason.

Schiff et al (2000) identified hundreds of cases where hyperkalaemic patients were prescribed potassium supplements. The consequences of this were not examined in their study, but cardiac arrest is a possible outcome. Although these cases occurred in an outpatients department, possibly without nurse involvement, the case serves as a reminder for nurses to consider the action of the medication before administering it.

Right form

Many medications are available in different forms for administration by various routes. For instance, paracetamol comes as tablets, capsules, caplets, syrup, suppositories and ampoules for intravenous administration.

Some forms of medication can be confused. Indeed, a case where cough medication for oral administration was mistakenly given intravenously has been described (Cohen 2006). In this case the prescription did not specify a route of administration, the medication was dispensed by the pharmacist in a syringe, the nurse was not familiar with oral syringes and the patient had an intravenous cannula, so the nurse assumed the medication should be given this way. A pharmacy label covered the manufacturer's warning 'for oral use only'. Fortunately, the patient was unharmed. This example highlights the various factors that can contribute to a medication being administered by the incorrect route. When administering medication the nurse must ensure that he or she gives the right medication in the right form to the right patient. If there is any doubt, the nurse should contact the prescriber, a pharmacist or a colleague.

A further potential source of error is when medications must be crushed to be administered (via a nasogastric tube, for instance). Textbooks traditionally state that some medications should never be crushed. Enteric-coated tablets are designed to dissolve in the alkaline environment of the small intestine, and some drugs are enteric-coated because the active ingredient will irritate the stomach mucosa if they dissolve there (Adams and Koch, 2010). However, if the medication only comes in tablet form, and it is essential that it be administered, the nurse may have little choice. If faced with this problem, the nurse should discuss the medication with the prescriber (or a pharmacist), as there may be another drug in an alternate form. Nurses should not simply choose to not administer a drug or crush it regardless of the consequences.

The way in which medications are packaged can also contribute to medication errors. Pathak et al (2004) cited a case of an elderly patient with chronic renal failure being admitted to hospital with heart failure and atrial fibrillation. Two days later the patient developed hypotension and bradycardia. This occurred because she was given Acebutolol (selective beta1 antagonist) instead of Amiodorone (class III anti-arrhythmic). The error occurred because these medications were packaged in similar looking blister packs. Although nurses cannot influence the packaging medications are dispensed in, they should become aware of medications frequently administered in their clinical area which have similar packaging.

Right response

Once a medication is administered, the nurse should monitor the patient to it medication has the desired effect or response. This right of medication administration involves an evaluation of the effectiveness of the medication's intended purpose which is crucial for some high-risk medications such as anticoagulants, anti-arrhythmics and insulin. Monitoring for the right response for example could involve assessment of the patient's blood glucose level, vital signs or other physiologic parameters such as urine output (Wilson and Devito-Thomas, 2004).

This 'right' could thus be labelled the 'right observations'. In a study of adverse drug events among older patients, inadequate patient monitoring after medication administration occurred in 36% of adverse drug events (Gurwitz et al, 2003). Side-effects, adverse effects and allergic reactions must also be monitored for. Nurses should not forget that their role and responsibility in ensuring medication safety does not cease once the right medication has been administered.

Conclusion

Medication errors are common in clinical practice. Nurses must aim to provide high quality, safe, evidence-based care. Patient safety and quality of care must be priorities at all times in all clinical situations. Given the environment, this is not always easy. Lack of light on a night shift, or three admissions to a busy ward in a short interval can create circumstances where an error acn occur. Nurses need to consider how to manage the environment in which they work to reduce the possibility of error.

As medication errors can occur at different phases of the administration process, nurses have a vital role in prevention. Ensuring that the right drug form and the right response, in addition to following the established seven rights, can help enhance patient safety.

These medication rights are designed to ensure patient safety and prevent harm. The list of medication rights described here can help clinical nurses perform their vital role in patient safety. The list is not exhaustive, and there are may others aspects to patient safety.

Hospital wards should consider conducting regular education sessions for staff, covering medications frequently prescribed in that clinical area, as well as topics like indications, dose range, drug forms and routes of administration. Nurses should follow recommended guidelines on medication administration (even if they have no history of error), like 'triple checking' the medication during preparation, immediately before administration and afterwards (Xingming and Guimei, 2003).

Medication errors have been defined as deviations from a physician's order (Mayo and Duncan, 2004). This definition is flawed, because a nurse should not 'blindly follow' what has been prescribed. If the prescriber has made an error, such as ordering a toxic or fatal medication dose, the nurse should not administer it. Although the human error factor cannot be eliminated, the conditions in which humans function can be modified to make error less likely. An example of such conditions is the provision of guidelines to follow when certain high risk procedures are being performed. Medication administration is one such high risk procedure. BJN

KEY POINTS

- Patients frequently suffer harm or permanent disability because of their health care.
- Medication errors are one of the most common types of adverse events.
- The seven rights have been used to minimize the occurrence of medication errors.
- Other rights of medication administration further help ensure safety during the medication administration process.

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