

Infusion practices from pharmacy to bedside

In 2006, a landmark study by the US Institute of Medicine reported that medication errors occur at the rate of one per patient per day in US hospitals, equating to an additional US\$8,750 (Euros 5,848) for each individual hospital stay due to errors [1]. When considering the impact of additional care, lost income and disability, the total annual cost may be as high as US\$29 billion (Euros 19.384 billion) [2]. In addition to the financial toll, an estimated 7,000 Americans die due to medication errors each year [1].

However, the situation in US hospitals should not be viewed as an isolated problem. Current systems in European hospitals do not minimise patient safety risks [3], with almost a quarter of EU citizens reporting some form of medical error from personal or family experience [4]. The Council of Europe Expert Group on Safe Medication Practices suggested that preventable adverse drug reactions cost an estimated Euros 3,000 – Euros 3,700 per event [5].

Errors in medication delivery can occur at four, distinct stages:

1. Healthcare professional prescribing
2. Transcription at the pharmacy
3. Dispensing from the pharmacy
4. Administration to the patient

Fortunately, many errors generated during the prescribing, transcribing, and dispensing stages are intercepted prior to drug administration. However, there are more opportunities for errors during drug administration and, as any potential error moves closer to the patient, it is less likely to be intercepted (see Table 1) [6].

Table 1: Historical (1995) common places where errors occurred and were prevented [6]

Task	Errors occurring	Events prevented
Physician prescribing	39%	48%
Transcription/verification	12%	33%
Pharmacy dispensing	11%	34%
Patient administration	38%	2%

There are several, simple checks to help reduce medication errors. These ‘five rights’ deal with drug administration and can be utilised at bedside [7]. They comprise the right drug being given to the right patient in the right dose by the right route at the right time (see Table 2) [7]; it has been argued that the ‘sixth right’ is effective documentation.

Table 2: The patient’s ‘rights’ [7]

- The right drug
- The right patient
- The right route
- The right dose
- The right time

It is important to realise that the majority of medical errors do not result from individual recklessness or the actions of a particular group [2]. Most medication errors occur during routine care of patients and not during extraordinary situations, and although an increased workload is associated with a higher risk [8], these errors are usually caused by faulty systems, processes, and conditions that fail to prevent mistakes [2].

Towards improved infusion practice

Up to 90% of all hospitalised patients will receive some form of intravenous (IV) therapy [9] and application of technology can address the potential for medication errors. ‘Intelligent infusion technology’ or smart pumps comprise specialised software (also referred to as safety software) designed to work with ‘intelligent’ bedside IV pumps for both general infusion and patient-controlled analgesia devices. Some devices, such as the Hospira Plum A+® Infusion System, can provide precise delivery of multiple therapies across the general spectrum of clinical care. Other

intelligent technologies, such as barcode point-of-care (BPOC) administration, can act as additional checks before a drug is administered to the patient.

What about bedside safety?

Small but direct changes also have a dramatic impact, especially at the bedside. In a study of 1,465 drug administrations in 92

Figure 1: BPOC with a VeriScan handset



patients attending a US teaching hospital, the medication error rate was significantly reduced by 56% after the implementation of BPOC (19.7% vs. 8.7%, $p < 0.001$) [10].

VeriScan® is a BPOC system for the prevention of medication errors, providing real-time data about individual patient treatment schedules to any clinician using the system (see Figure 1). By confirming the drug, dose, patient, time and route, medication errors at the bedside can be prevented: the five patient rights. VeriScan is also designed to save time by automatically charting drug administration as the medication is given, helping with the sixth right of effective documentation.

When considering error reduction during the actual drug administration at bedside, IV line complications, especially blood reflux, can cause serious problems for all those involved. Blood reflux occurs frequently and may lead to complications such as thrombotic occlusions, infiltrations, and catheter-related bloodstream infections [11]. Approximately 25% of all central venous catheters experience an

occlusion [12], resulting in delayed therapy, catheter replacement, and an increased risk of complications and infections [11], which in turn increase overall management and drug costs.

Hospira's LifeShield® TKO™ anti-reflux device attaches directly to any standard Luer connector and addresses blood reflux by decreasing opportunities for occlusions, improving quality of care and reducing subsequent costs for thrombolytics and pharmacy and nursing time. The bi-directional valve acts as an automatic IV clamp, addressing typical physiological and mechanical issues such as patient respiration and movement (including coughing, sneezing and vomiting), plunger advancing or rebound, clamp confusion, and a dry bag, whilst also reducing fluid loss during dispensing, line connection and detachment.

Drug spillage and aspiration at the pharmacy, during transit, and at the bedside have been recognised as risks, and exposure to hazardous drugs such as anti-neoplastic therapies are a serious concern for healthcare workers. Dermal exposure to anti-neoplastic drugs is a potentially important route of exposure, especially for pharmacists and nurses involved in drug dispensing and administration, and caring for treated patients [13]. Exposure to such hazards may cause serious health effects, such as skin rashes, infertility, leukaemia or other cancers, despite current working practices [14].

In the US, health and safety agencies have identified the problem and offer guidelines for the safe handling of these substances. The Centers for Disease Control (CDC) National Institute for Occupational Safety and Health (NIOSH) states [14]: "Consider using devices such as closed system-transfer devices, glove bags, needleless systems when transferring drugs from primary packaging (such as vials)..."

Hospira have launched Spiros™ IV administration system to address these issues. The product is a closed, needleless transfer system with a fail-safe, self-seal technology that automatically returns to the closed position when there is an accidental or intentional disconnect (see Figure 2).

The Spiros system can be used on any primary, secondary or extension set in place of a standard male Luer, eliminates needles and captures aerosol and vapour, whilst preventing leaks and spills during dispensing and transportation from pharmacy to patient. In addition, the male connector only opens when attached to a female connector (including needle-free connectors), further protecting pharmacists, nurses, patients, and family members against drug exposure and vapour during accidental disconnection, tubing change out, and disposal.

Figure 2: Spiros catheter connector



Conclusion

Medication errors and patient/staff safety are important and recognised issues with a high associated patient and financial cost. Improvements in the safety of drug dispensing and administration, whether it is an intelligent system comprising smart IV pumps, drug libraries and BPOC, or the simple change to anti-reflux devices and catheter disposables, promote patient care and reduce costs associated with complications. Hospira is developing and launching products that add value and safety from preparation to administration for patients and healthcare professionals.

Authorities are starting to not only recognise the issues of improved IV working practices, but are recommending action to protect both the patient and the healthcare professional.

Hospira is a global, independent, specialty pharmaceutical company based near Chicago, Illinois, USA. It has 70 years' service to health care and state-of-the-art technology, and is already the European leader in supplying generic injectable agents.

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