Intravenous (IV) medication administration errors in hospitals

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Highlights

- Of 568 IV medication administrations observed at two Sydney teaching hospitals 70% had at least one clinical error and 26% of these were rated as potentially serious errors
- Wrong IV rate was the most frequent error and accounted for 94% of all the serious errors identified
- Nurse experience was associated with the frequency and severity of errors made
- Each year of additional experience gained by a nurse (up to six years) reduced their error rate by 11% and their rate of serious errors by 19%
- Nurses who did not check a patient's identification were also significantly more likely to make an IV error

IV administrations have a high risk and severity of error. A significant proportion of errors suggest skill and knowledge deficiencies, with errors and severity reducing as clinical experience increases. Not correctly checking a patient's identification may be an indicator of generally poor medication practice.

Background

Medication administration errors occur frequently and are more likely to result in serious harm and death than other types of medication errors. Intravenous (IV) medications pose particular risks because of their greater complexity and the multiple steps required in their preparation, administration and monitoring.

Serious patient outcomes are over-represented among IV medication administration errors compared with other adverse incidents.

Methods

We prospectively observed 107 nurses preparing and administering 568 IV medications on six wards across two teaching hospitals. Procedural failures (eg, not checking patient identification) and clinical IV errors (eg, wrong IV administration rate) were identified and categorised by severity on the five point Severity Assessment Code (SAC) scale. Nurses were shadowed by a researcher who recorded information using a handheld computer (See Figure 1). Researchers recorded what procedures were followed and details of the drug administered. After the observational session, these data were compared with the patients' medication charts to determine whether the patients received the drugs as ordered on the medication charts.

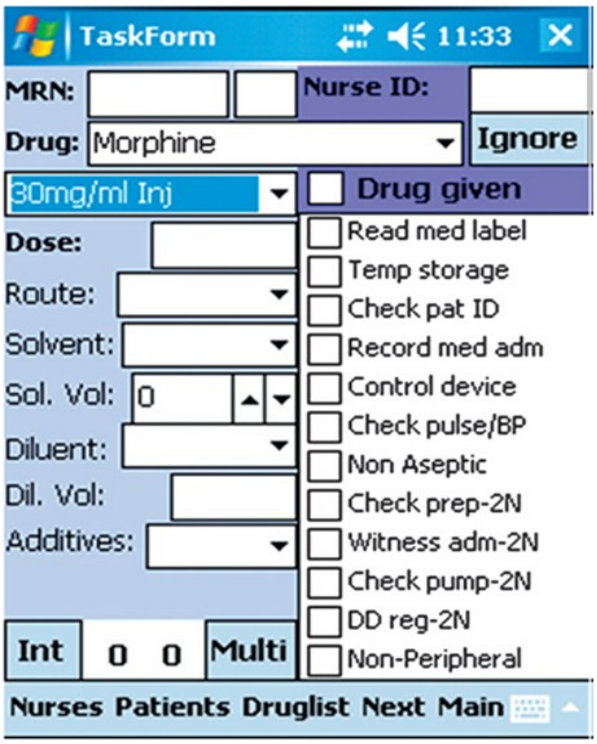

Figure 1: Handheld computer for recording observational data

Results

At least one procedural failure was recorded for 73.9% of 568 IV medication administrations. Patient identification was checked in less than 50% of all IV administrations.

Four error types (wrong mixture, wrong volume, wrong rate or drug incompatibility) accounted for 91.7% (n=363) of all clinical errors, 99 of which were rated as potentially serious.

IV administrations performed via bolus (n=312) had higher error rates than infusions (n=256)(77.2% vs 47.7%; p<0.0001) and also higher serious error rates (23.4% vs 10.6%; p<0.0001).

Nurse experience and errors

The median nursing experience of the 107 nurses was 6 years (range <1 - 43 years). Logistic regression showed that during the first 6 years of nursing experience the risk of error declined by 10.9% with each successive year of experience. After this point, further experience provided no additional benefit.

Checking a patient's identification correctly reduced clinical error risk by 56%, while administration via IV bolus increased it by over 300%.

The risk of serious clinical error declined by 18.5% each year during the first 6 years of experience, with no additional benefit thereafter. Checking a patient's identification reduced risk of serious error, while administration via IV bolus greatly increased the risk of serious error (Table 1).

Parameter	OR (95% CI)	p Value
Effect of nurse experience per annum up to 6 years	0.815 (0.731 to 0.908)	0.0002
Effect of nurse experience per annum at 6 years and over	1.028 (0.994 to 1.062)	0.1110
Intravenous administration type—bolus	2.700 (1.648 to 4.426)	<0.0001
Patient identification checked	0.423 (0.260 to 0.689)	0.0005

Table 1: Odds ratios from model for risk of serious IV clinical error

Discussion and implications for practice

Nearly 70% of all IV medications administered had at least one clinical error, and a quarter of these were potentially serious errors likely to result in permanent harm to patients. Few comparative studies are available. Direct observational studies in the UK and Germany have revealed overall error rates of 49% (212/430 IV administrations) and 48% (58/122).

Few studies have examined the association between nurse experience and IV medication errors. We found that as nurses gained experience up to 6 years, their rates and severity of errors declined significantly. This is an important finding and clearly suggests that inexperienced nurses should be a target for training and supervision with a focus on correct IV rates.

We found a significant relationship between failing to check a patient's identification and making an IV administration error. While failing this check does not cause a clinical error, we hypothesise that it is an indicator of a general failure to follow correct administration protocols, whether this is because the nurse is under stress, time pressures, or selects to not comply.

We used an undisguised observational technique and nurses were aware that our study was investigating problems in medication administration procedures and errors. It is possible that nurses changed their behaviours when observed. The outcomes of this possible bias would be to lead to an underestimation of the 'true' error and procedural failure rates.

Further information

This summary is based upon the following published paper which presents full details of the research and is the correct citation for this information.

Westbrook JI, Rob MI, Woods A, Parry D (2011) **Errors in the administration of intravenous medications in hospital and the role of correct procedures and nurse experience**. *BMJ Quality and Safety***. 20**:1027-1034 doi:10.1136/bmjqs-2011-000089.

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Centre for Health Systems and Safety Research, Australian Institute of Health Innovation
Faculty of Medicine, University of New South Wales, Level 1, AGSM Building
UNSW SYDNEY NSW 2052
Email: chssr@unsw.edu.au
Web: www.aihi.unsw.edu.au