Medication error reporting in Tehran: a survey

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Medication error reporting in Tehran: a survey

Aim The purpose of this study was to evaluate nurses' reporting of medication errors.
Background Improvement in medication error reporting is one of the major challenges in today's health care environments.
Methods This was a descriptive survey of nurses working in medical, surgery, orthopaedic, gynaecology and obstetric wards in hospitals affiliated to Iran University of Medical Sciences, using stratified multistage sampling. Data were collected between November 2008 and May 2009 using a researcher-designed questionnaire. Data were described and explored using Kruskal–Wallis, one-way analysis of variance and Mann–Whitney's test.
Results The response rate was 93% ($n = 286$). The mean number of medication errors 'reported' per nurse during 3 months was 1.33 [standard deviation (SD) = 4.18, median = 0, interquartile range (IQR) = 0–0, range = 70–0]. The mean number of errors made was 19.5 (SD = 30.27, median = 10, IQR = 1–25, range = 181–0). None of the individual and organisational characteristics reported were significantly related to reporting of medication errors. Failure to record vital signs (e.g. pulse, blood pressure etc.) before and after administering certain medicines was the most frequently reported medication error.
Conclusion More errors were made than were reported and this requires further investigation.
Implications for Nursing Management The reporting of medication errors is a problem in health care systems worldwide, including Iran. Considering the significant difference between the nurses' actual and reported medication errors, managers should monitor medication errors. Educational initiatives are needed to improve understanding of the importance of medication administration.

Keywords: Iran, medication errors, nurses, reporting

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Introduction

Medication errors are among the most prominent clinical errors and preventing them will play a key role in promoting patient safety. A medication error is any preventable event that may cause or lead to inappropriate medication use or patient harm while

the medication is in the control of the health care professional, patient or consumer. Such events may be related to professional practice, health care products, procedures and systems, including prescribing; order communication; product labelling, packaging, and nomenclature; compounding; dispensing; distribution; administration; education; monitoring; and use (NCC MERP 2012).

Medication errors present a global problem and can lead to serious consequences, such as increased mortality, longer hospital stay and greater costs (Mihailidis *et al.* 2006, Sanghera *et al.* 2007). Health care providers' concerns about medication errors include fear for patients' safety, fear of license revocation, being judged as incompetent by co-workers, fear of rejection and fear of being disciplined (Serembus *et al.* 2011). The prevention and management of medication errors depend to a great extent on accurate reporting of such errors, which is considered to be an important issue in medical environments (Mayo & Duncan 2004). Most reports indicate that the number of errors declared by nursing staff underestimates the actual number (Gladstone 1995, Osborne *et al.* 1999, Blegen *et al.* 2001). Generally, error reporting procedures and the subsequent learning from such errors are inefficient in health care systems; researchers suggest only 10% of recognised medication administration errors (MAEs) are reported in hospitals (Serembus *et al.* 2011). Improving nurses' error reporting systems is an important step towards the promotion of patient safety in medical care (Sanghera *et al.* 2007). Previous studies have shown that nurses are well placed to monitor and reduce drug-related morbidity (Gabe *et al.* 2011).

The reasons for medication errors are often complex. Situation analyses show that there is usually more than one single error found and the causative problem may not always be recognised. Over time, the adverse effects of medications become increasingly onerous (Jordan 2002).

The US Institute of Medicine (IOM) report on human error and quality of care in 1999 stated that the majority of human errors are as a result of systemic defects and a fundamental revision of the system is required in order to provide safe care. Ideally, systems should be designed so as to minimise the possibility of errors, and, should they occur, recognise errors in time to prevent consequences (Kima *et al.* 2006). Some data indicate that nurses and other health care staff may perceive medication errors differently (Mrayyan *et al.* 2007). Approximately 16% of nurses are not aware of the type of situations that lead

to medication errors, and 14% do not know when to report an error. Nurses themselves believe that only 25% of all errors are reported on 'accidents' sheets' and only 3.5% believe that all medication errors must be reported (Osborne *et al.* 1999, Chiang & Pepper 2006).

Under-reporting of medication errors may reflect shortcomings in the health care system (Hume 1999, Anderson 2003). The first step in the promotion of drug safety is identifying the obstacles nurses believe hinder error reporting (Chiang & Pepper 2006). Low reporting rates are influenced by individual and organisational factors such as fear of being criticised and reporting system complexities (Uribe *et al.* 2002, Chiang & Pepper 2006). The working environment also contributes to the problem through inadequate provision and allocation of the workforce, (difficult) relationships between co-workers and management inefficiencies (Blegen *et al.* 2001, Uribe *et al.* 2002, Mihailidis *et al.* 2006).

There is no established system for error reporting in Iran and few studies have addressed this subject. This highlights the importance of dealing with the issue. A good system of recording and reporting errors provides correct information on the reasons for the occurrence of errors and allows changes to be made within an organisation to reduce errors (Ross *et al.* 2000). Such a system is vital not only for patient safety, but also for the organisation itself, as it allows for better recognition of errors and thus their prevention (Alanko & Nyholm 2007).

Aim

The aim of this study was to evaluate error reporting by the nursing staff and the relationship between some individual and organisational characteristics such as the type of ward, type of shift, type of employment (permanent or temporary) and formal training in drug administration.

Method

This was a cross-sectional, descriptive-analytical self-report questionnaire survey.

Setting

The study was conducted between November 2008 and May 2009 in teaching and non-teaching hospitals affiliated to Iran University of Medical Sciences in Tehran, Iran.

Sample

The participants were 300 nurses, from morning shift ($n = 107$), afternoon shift ($n = 95$) and night shift ($n = 98$) in different wards of selected university hospitals. Nurses were selected using stratified, multistage, randomised sampling based on the number of nurses employed in each hospital. At the time there were 691 nurses working in the hospital wards under consideration.

Sampling process

After the approval of the study by the Research and Ethics Committee of Iran University of Medical Sciences and formal permission of the university and authorities at six selected hospitals, respondents were chosen from the list of nurses in the nursing office by taking odd and even numbers from alternating pages. Using the number of nurses working in each hospital, the samples were selected from the list of names until the number calculated for each type of ward (internal, surgical, orthopaedic and obstetric/gynaecology) was achieved. Inclusion criteria for the nurses were having a Bachelor of Science (BSc) degree and having worked in general adult wards for at least 6 months. For data gathering, the researchers entered the hospitals with pre-arranged appointments during different shifts. Respondents were given information regarding the objectives of the study, and their voluntary participation was requested. They were also assured about the anonymity of the data.

Written consent was obtained from each individual and a questionnaire with explanations was given. Two days after that the questionnaire was delivered to staff nurses for self-reporting medication errors, the researcher referred to them and collected completed questionnaires. The response rate was 93% ($n = 286$).

Data collection

We used a two-part questionnaire designed by the researcher. This was based on previously conducted studies and a comprehensive literature review [California HealthCare Foundation (US) (2001a,b), Mrayyan *et al.* 2007].

The first part of the questionnaire collected demographic information. The second part consisted of 19 statements about medication errors and related reports by nurses collected over the previous 3 months. Nurses noted the number of actual incidents and reports for each statement in columns titled 'number of incidents of medication error' and 'number of medication errors that were reported'.

Reliability and validity

After editing by fellow researchers and the consulting statistician, the questionnaire was reviewed by 19 faculty members of Iran School of Nursing and Midwifery for content and face validity. To confirm the questionnaire's reliability, a test re-test was conducted. Twenty nurses were selected randomly and completed the questionnaire twice with a 2-week interval and a 0.8 correlation coefficient showed acceptable reliability (between 25 December 2008 and 9 January 2009). The 20 nurses were excluded from the sample. Internal consistency was also confirmed using Cronbach's alpha ($\alpha = 0.84$).

Data analysis

The statistical analysis was carried out using descriptive statistics, one-way analysis of variance, Kruskal–Wallis and Mann–Whitney's test. Data were entered into the Statistical Package for the Social Sciences version 16 for WINDOWS (SPSS Inc., Chicago, IL, USA).

Results

Findings showed that the mean number of reported medication errors during 3 months in the wards under study was 1.3 per nurse, whereas the mean number of medication errors that nurses recalled during the same period was 19.5 (Table 1 details each type of error). Most respondents reported making and reporting 0 errors. A small number made up to 40 errors of certain types and reported up to 20 (Table S1).

There was no significant difference between error reporting and age ($P \geq 0.82$), type of shift ($P \geq 0.80$) or employment ($P \geq 0.68$), type of ward ($P \geq 0.80$), nursing work experience ($P \geq 0.43$), work experience in the current ward ($P \geq 0.08$), employment in other jobs in addition to nursing ($P \geq 0.06$), or working overtime in one or more hospitals ($P \geq 0.57$) and formal training in drug administration ($P \geq 0.75$) (Table S2).

The mean number of reported medication errors of nurses who had participated in drug administration training courses was more than that of the nurses who had not attended such training, although no significant difference was observed.

According to the findings, the most frequently reported errors were related to medications requiring special attention to vital signs during administration.

Table 1
The mean nurses' medication errors and reports

Medication error	Errors made				Errors reported			
	Mean ± SD	Median	IQR	Range	Mean ± SD	Median	IQR	Range
Not administering a prescribed drug to the patient	0.57 ± 1.55	0	0–0	10–0	0.09 ± 0.56	0	0–0	5–0
Administering drug without doctor's orders	1.38 ± 3.56	0	0–1	30–0	0.22 ± 1.07	0	0–0	10–0
Administering drug before or after appointed time	3.32 ± 6.3	0	0–4	31–0	0.19 ± 1.09	0	0–0	10–0
Inappropriate time (before/after meal) for administering drug	1.44 ± 4.42	0	0–0	31–0	0.03 ± 0.34	0	0–0	5–0
Not taking necessary steps (e.g. determining pulse, BP, etc.) regarding particular drugs	1.22 ± 3.69	0	0–0	30–0	0.08 ± 0.74	0	0–0	10–0
Mixing two or more drugs in giving set without considering interactions	0.51 ± 2.57	0	0–0	30–0	0.05 ± 0.66	0	0–0	10–0
Infusing drug faster than should be infused	1.32 ± 4.07	0	0–0	31–0	0.09 ± 1.22	0	0–0	20–0
Administering biting sublingual drug to be swallowed	0.52 ± 3.02	0	0–0	31–0	0.02 ± 0.2	0	0–0	3–0
Administering several oral drugs simultaneously	5.58 ± 7.6	2	0–10	40–0	0.28 ± 1.85	0	0–0	20–0
Administering painkiller without doctor's order	1.46 ± 3.86	0	0–1	30–0	0.16 ± 0.97	0	0–0	10–0
Administering the wrong drug	0.26 ± 0.99	0	0–0	10–0	0.05 ± 0.6	0	0–0	10–0
Administering drug more/less than prescribed dose	0.41 ± 1.34	0	0–0	10–0	0.02 ± 0.2	0	0–0	2–0
Administering drug without a defined route	0.10 ± 1.2	0	0–0	20–0	0.01 ± 0.12	0	0–0	2–0
Not considering appropriate position of patient based on type of drug	0.34 ± 2.17	0	0–0	20–0	0.03 ± 0.59	0	0–0	10–0
Not diluting drug which must be diluted	0.51 ± 2.6	0	0–0	30–0	0	0	0	0
Intravenous injection of subcutaneous drug	0.05 ± 0.3	0	0–0	5–0	0	0	0	0
Subcutaneous injection of intravenous drug	0.01 ± 0.14	0	0–0	2–0	0	0	0	0
Intramuscular injection of intravenous drug	0.02 ± 0.16	0	0–0	2–0	0	0	0	0
Intravenous injection of intramuscular drug	0.23 ± 1.07	0	0–0	10–0	0	0	0	0

IQR, interquartile range.

Discussion

Reporting of medication error

The mean number of reported medication errors during 3 months was 1.3 errors per nurse, whereas the mean number of medication errors per nurse during the same period was 19.5.

Errors were reported less frequently than in Jordan, 42.1% (Mrayyan *et al.* 2007), and in the USA, 4.9% (Mayo & Duncan 2004). The lower reporting rate in this study compared with what actually occurs is worrisome, even although other studies have yielded similar results (Gladstone 1995, Wakefield *et al.* 1996, 2001, Osborne *et al.* 1999, Blegen *et al.* 2001). Stratton *et al.* (2004) reported a 67% and a 56% reporting rate in paediatric and adult wards respectively, in Colorado. The difference between the results of this study and those of Western countries could be as a result of insufficient medication monitoring or lack of a standard system of documentation and error reporting. These problems depend to a large extent on the management of health care systems. Formalised medication monitoring schedules have been proposed as one strategy to diagnose and act on side effects and the problems emanating from adverse drug reactions, including interpretation of vital signs (Jordan *et al.* 2004). Medication errors are an important threat to the safety of patients and their prevention relies on correct reporting of such errors (Mayo & Duncan

2004). Therefore, it is very important to understand why nurses tend to evade the reporting of medication errors. There are many reasons why such errors are underreported. 95% of medication errors are not reported owing to fear of reprimand (Gladstone 1995, Osborne *et al.* 1999, Wakefield *et al.*1999, Uribe *et al.* 2002). Fear of managers' and coworkers' reactions, fear of being criticised, being perceived as inefficient, causing a negative perception in the patient's view (Osborne *et al.* 1999, Uribe *et al.* 2002, Blegen *et al.* 2004, Mayo & Duncan 2004), being unaware of or the lack of consensus over the definition of medication error were listed as reasons for under-reporting (Wakefield *et al.* 1996, Uribe *et al.* 2002). 16% of nurses were unaware of which situations may lead to medication errors and 14% did not know when to report an error (Osborne *et al.* 1999).

Error reporting rates also depend on the methods by which they are reported (Barker *et al.* 2002). Studies in western societies have demonstrated that medication error reporting rates have increased in recent years (Osborne *et al.* 1999, Mayo & Duncan 2004), which may beas a result of an increase in the number of errors made or better reporting systems. Considering the significance of the matter and the lower-than-expected rates of error reporting, there is an urgent need for this issue to be addressed so as to facilitate error reporting. Redesigning work procedures, such as accurate documentation using profiles and checklists

(Jordan *et al.* 2004), the implementation of standards in work procedures and better inter-coworker communications can help to reduce medication error rates and improve reporting (Karow 2002). Excessive workload, insufficient workforce, unsupportive physical environment, poor communication among co-workers, shortage of time and complex reporting procedures prevent physicians and nurses from reporting errors (Uribe *et al.* 2002, Holmström *et al.* 2012).

Organisational and individual characteristics related to reporting of medication errors

There was no significant difference between error reporting and nurses' age, type of employment and work shifts, type of ward, nursing work experience and current-ward working experience. Chiang and Pepper (2006) did not report any significant relationship between error reporting obstacles and age, level of education, employment time and nursing work experience. However, some previous studies have shown that nurses' age, duration of employment and their work experience affected their reporting of errors, i.e. nurses with a higher age and more work experience were less affected by reporting obstacles (Blegen *et al.* 2004), but had lower tendencies to report MAEs (Walters 1992). In recent studies, nursing work experience had a positive effect on the percentage of reported MAEs (Mayo & Duncan 2004). This does not seem to be because of lower rates of error occurrence, but it is possible that newly employed nurses are unlikely to report their errors because they do not know or trust their managers and co-workers well enough.

In this study, taking drug administration courses had no significant impact on medication error reporting ($P \geq 0.75$). This could be as a result of the fact that such courses put less emphasis on the importance of error reporting and its role in the safety of patients than understanding what one's errors are. Therefore, there is no meaningful difference in error reporting between those nurses who have had training courses and those who have not, which is not consistent with the findings of an earlier part of the research, which clearly showed the positive effect of training on occurrence of medication errors (Joolaee *et al.* 2011).

As none of the individual or organisational characteristics had any significant influence on medication error reporting, it seems that nurses, regardless of their individual or organisational characteristics, were not aware of the necessity of error reporting and the consequences of not reporting the errors.

'Nurses not taking necessary steps (e.g. measuring pulse, BP, etc.) before/after providing particular drugs' was the medication error reported most frequently in this study. This might be because of nurses' heavy workload and/or poor knowledge of the patient monitoring required. Preventing these very important errors will necessitate employing more nurses, using standardised checklists or profiles and focusing on continuing education programmes for nurses (Jordan 2002).

Limitations of the study

This was a cross-sectional survey from a metropolitan area of one country. It's vulnerability to volunteer bias is limited by the high response rate.

Self-reporting is believed by many researchers to limit a study, but with regard to medication errors, it still remains one of the most common and practical means of detecting and estimating error incidence (Balas *et al.* 2004, Mrayyan *et al.* 2007). However, it is unlikely that nurses would over-report errors. Another limitation was the lack of a comprehensive standard questionnaire of the Iranian clinical context.

The number of participants was too low to explore small differences hence we may have overlooked small but clinically important differences between groups in commission and reporting of errors. Interpretation of our test re-test data would have benefitted from closer analysis, such as a Bland Altman plot.

Conclusion

In this study, nurses revealed that fewer medication errors occurred than were reported. An open policy in relation to reporting medical errors enables organisations to gather vital information about the factors that contribute to the medication errors. It seems that establishing a comprehensive reporting system free of fear and punishment can make a significant difference in encouraging nurses and other health care providers to report the potential errors and help the system to learn from those errors.

Implications for Nursing Management

The reporting of medication errors is a problem in health care systems worldwide, including in Iran. Considering the significant difference between the nurses' actual and reported medication errors, managers should plan and monitor mechanisms for medication error reporting. Educational approaches might increase understanding of the importance of medication administration.

The most frequently reported medication error related to failure to monitor patients for the possible adverse effects of medicines on vital signs. Training nurses in medication safety issues and interpretation of vital signs, and auditing practice, may reduce these errors.

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Ethical approval

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Supporting information

Additional Supporting Information may be found in the online version of this article:

Table S1. Medication errors made and medication error reported, as self-reported on the questionnaire.

Table S2. Medication error reporting according to demographic and situational variables.