

Article

Reporting of medication administration errors by nurses in South Korean hospitals

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Abstract

Objective: To identify differences in what nurses consider as medication administration errors, to examine their willingness to report these errors and to identify barriers to reporting medication errors by hospital type.

Design: Cross-sectional, descriptive design. The questionnaire comprised six medication administration error scenarios and items related to the reasons for not reporting medication errors.

Setting: Two tertiary and three general hospitals in a metropolitan area, and five general hospitals in K province, in South Korea.

Participants: Registered nurses working at tertiary and general hospitals in South Korea ($n = 467$).

Main outcome measures: Consideration of medication administration errors, intention to report medication errors and reasoning for not file an incident report.

Results: There were no significant differences in what nurses considered as medication administration errors between nurses working different in hospital types. The rate of incident reporting was very low; it ranged from 6.3% to 29.9%, regardless of hospital type. Korean nurses were more likely to report an error to a physician than file an incident report. The primary reason for not reporting medication errors was fear of the negative consequences of reporting the error and subsequent legal action.

Conclusions: The rate of filing an incident report among nurses was very low, regardless of hospital type or whether nurses perceived the incident as a medication administration error. These results may have significant implications for improving medication safety in hospitals, and more efforts are needed at the organizational level to improve incident reporting by nurses.

Key words: medication errors, Korea, patient safety, incident reporting

Introduction

Globally, patient safety is a central issue in the current healthcare system. Medication errors, the most common type of medical error [1–5], result in negative consequences, including long hospital stays, increased economic burden [6] and threat to patients' lives [1, 7, 8]. In view of this, medication errors have been used as a barometer of patient safety [9].

Healthcare organizations in South Korea are not immune to medication errors. In a previous study, 98.7% of Korean nurses reported that they had committed medication errors within the previous 3 months, with an average of 13.57 medication errors

reported [10]. However, approximately 88% of medication errors are intercepted by nurses [11]. These findings suggest that nurses are the healthcare professionals who could contribute the most toward the reduction of medication errors by performing checks at the final stage of medication administration. Furthermore, the number and severity of medication errors could primarily depend on the ability of nurses to manage the medication administration process. Thus, assessing nurses' knowledge and behavior with regard to medication administration is critical for enhancing patient safety in healthcare systems.

While most nurses perceive themselves as knowledgeable about medication errors, previous studies have indicated disagreement

among nurses concerning the definition of a medication error [12–16]. A medication administration error is defined as a 'deviation from the prescriber's medication order as written on a patient's record, manufacturers' preparation, administration instructions or institutional policies/procedures' on medication administration' [17]. Identifying what nurses consider as medication administration errors would be an important first step towards enhancing medication administration safety [1]. Without a coherent understanding of medication administration errors, differing decisions as to whether to file an incident report will likely persist among nurses.

Medication error reporting provides an opportunity to identify and correct errors that threaten patient safety by communicating and sharing knowledge stored in an incident reporting system. Nurses must be able to learn from their own and others' errors. However, the rate of medication error reporting described over the past decade has been very low internationally [2–4, 8, 12, 18–20]. In Korea, the rate may be even lower, as only 50.8% of hospitals have adopted an electronic incident reporting system [21].

Little research has been conducted to directly examine what nurses consider as medication administration errors, their behavior with regard to medication error reporting, and any differences that exist among nurses working at different types of hospitals. Most studies on medication administration errors have focused on safety culture or climate, factors that contribute to the errors, work environment and incident reporting [3–5, 7, 8, 10]. Additionally, previous research has been mainly implemented in tertiary hospitals [3, 4, 10, 18], with a dearth of studies in mid-sized, or less acute hospitals, especially in South Korea.

Therefore, this study aimed to identify differences by hospital type in what nurses in South Korea consider as medication administration errors, and in their intention towards reporting these errors. Based on these data, educational programs to improve safety on medication administration error could be developed. In addition, these data can help to inform strategies that could be implemented in an effort to eliminate or remove barriers to reporting errors.

Methods

Design

This study employed a descriptive, cross-sectional design using a questionnaire measure.

Settings and population

The healthcare system in South Korea is predominantly private [22], with private clinics and hospitals representing more than 95% of all healthcare facilities [23]. Currently, the numbers of tertiary and general hospitals in Korea are 44 and 281, respectively [23]. In addition, the majority of healthcare facilities are located in urban and metropolitan areas, which results in a disproportionate amount of acute care hospitals in South Korea [22, 23].

Participants were registered nurses (RNs) working in two tertiary and three general hospitals in a metropolitan area, and in five general hospitals in the K province of South Korea. These 10 hospitals were located in geographically diverse regions of Korea. Hospital size varied, with bed capacities ranging from 100 to 900. The number of nurses working in each hospital also varied from approximately 70 to 600 nurses per hospital. Only two tertiary hospitals had an electronic incident reporting system, and the others had a paper-based incident reporting system. All RNs engaged in direct patient care were invited to participate. Sample size was calculated

using the G*Power 3.1 program [24]. In total, 470 participants were required for an effect size of 0.03, with a power ($1 - \beta$) of 0.90, and a two-tailed alpha of 0.05 [24, 25], with an allocation ratio of 3:1 in an independent *t*-test analysis.

Questionnaire development

A questionnaire was used to identify what Korean nurses consider as medication administration errors, and to examine their intention to file an incident report and to report the error to the physician. The questionnaire comprised three parts. The nurses were presented six scenarios and were first asked whether each scenario could be categorized as a medication administration error. Subsequently, using the same scenarios, nurses were asked if they would report the error to the physician, and, finally, they were asked if they would file a report in the incident reporting system. For each question, the nurses were asked to answer 'Yes,' 'No' or 'Do not Know.' Finally, nurses were asked to cite the reasons for not reporting medication administration errors in the incident reporting system.

Translation and validation of medication administration scenarios into Korean language

Six medication administration scenarios, developed by Mayo and Duncan [12] based on theoretical or hypothetical medication administration errors, were adopted in this study. First, the six scenarios were translated into Korean by a bilingual researcher, and then they were back-translated into English by another bilingual professor who had majored in English. These two versions were reviewed by a Korean American professor in a college of nursing in the USA, and minor revisions were made to minimize confusion and improve clarity. Then, the revised scenarios were reviewed by five RNs in Korea to ensure face validity. All the RNs had Master's degrees in nursing, with 5–18 years of experience in direct patient care. As these RNs reported that the Korean version of the scenarios was clear to understand, they were adopted in the study without any further changes.

After the questionnaire was designed, pilot testing was conducted with six RNs with more than 5 years of work experience in the medical intensive care unit (MICU) in order to identify any misunderstandings or confusion by the participants regarding the questionnaire. These nurses approved use of the questionnaire without changes.

Reasons for not reporting medication errors using an incident reporting system

On the basis of the Modified Gladstone Survey [16], a literature search, and input from five experts, each with more than 10 years of clinical nursing experience in tertiary hospitals, 14 items were developed to determine the reasons for frequent failure by Korean nurses to report medication errors.

Each item was rated on a 6-point Likert-type scale ranging from 1 (*Very Strongly Disagree*) to 6 (*Very Strongly Agree*), to enable comparisons with previous studies [26, 27]. A pilot test was then conducted with six RNs, each with more than 5 years of work experience in the MICU, to ensure face validity. Several items were revised to increase clarity.

Data collection procedures

A convenience sampling method was employed to select participants. The researcher visited three of the hospitals and explained the study purposes and data collection procedures to the directors

of the nursing departments. Owing to geographical barriers, the other seven hospitals were contacted by telephone. After obtaining permission, the questionnaires were delivered to the respective nursing departments by express mail. The total number of questionnaires distributed to each hospital was primarily based on the

number of nurses working and input from the nursing director at each hospital. A total of 650 questionnaires were distributed, and 480 were returned, resulting in a response rate of 73.8%. Thirteen questionnaires were excluded from analyses because of insufficient information. The response rate of the participating units ranged from 69% to 90%.

Each potential participant received a letter containing information explaining the purposes of the study along with the questionnaire. The consent form clearly stated that participants were free to decide to participate in the study and were not compelled to do so in any way or by anyone. The participants were informed of their right to withdraw from the study at any time. The final sample reflected those who agreed to participate in the study by completing the questionnaires.

In order to increase the response rate, three reminder calls were made to the directors of the nursing departments of the participating hospitals. A locked box for the completed questionnaires was placed in the nursing lounge of each unit for 2 weeks. The participants were asked to return the completed questionnaires within 2 weeks. A research assistant visited three of the hospitals to retrieve the questionnaires, while the other hospitals returned the questionnaires by express mail. All of the data collected were stored to ensure confidentiality and anonymity.

Analysis

The data were analyzed using SPSS 19.0 (SPSS Inc., IL, USA). A chi-square test was used to examine differences between hospital types in terms of the demographic variables of nurses, what they

Table 1 Demographic characteristics of participants

	Tertiary hospital <i>n</i> = 349	General hospital <i>n</i> = 118	<i>P</i>
Gender			
Female	342 (98.0%)	115 (97.5%)	0.73
Male	7 (2.0%)	3 (2.5%)	
Age (years)			
≤25	111 (32.2%)	37 (31.4%)	0.98
26–30	132 (38.3%)	44 (37.3%)	
31–35	45 (13.0%)	17 (14.4%)	
≥36	57 (16.5%)	20 (16.9%)	
Educational degree			
Diploma	210 (60.5%)	100 (84.7%)	<0.001
Above BSN	137 (39.5%)	18 (15.3%)	
Years working as an RN			
<1 year	28 (8.1%)	8 (6.9%)	0.49
≥1 and <4 years	108 (31.3%)	39 (33.6%)	
4–7 years	85 (24.6%)	33 (28.4%)	
7–10 years	45 (13.0%)	18 (15.5%)	
Over 10 years	79 (22.9%)	18 (15.5%)	

Table 2 What nurses consider a medication administration error: difference between hospital types

Scenarios: drug error	Hospital type		<i>P</i>
	Tertiary	General	
A patient misses the midday dose of oral Ampicillin because the patient was in X-ray for 3 h.			
Yes	158 (46.6%)	50 (42.4%)	0.55
No	156 (46.0%)	61 (51.7%)	
Don't know	25 (7.4%)	7 (5.9%)	
Four patients in a busy surgical unit receive their 6 PM dose of IV antibiotics 4 h late.			
Yes	235 (68.7%)	79 (66.9%)	0.62
No	94 (27.5%)	32 (27.1%)	
Don't know	13 (3.8%)	7 (5.9%)	
A patient receiving TPN feeding via an infusion pump is given 200 ml/h instead of the correct rate of 125 ml/h for the first 3 h of the 24-h infusion. The pump was reset to the correct rate after the change of shift at 7 AM, when the incoming nurse realized that the pump was set at the incorrect rate.			
Yes	312 (91.5%)	108 (92.3%)	0.74
No	20 (5.9%)	5 (4.3%)	
Don't know	9 (2.6%)	4 (3.4%)	
A patient admitted with status asthmaticus on 08/13 at 2 AM is prescribed albuterol (Ventolin) nebulizers every 4 h. The nurse omits the 6 AM dose on 08/13 as the patient is asleep.			
Yes	198 (58.2%)	69 (58.5%)	0.70
No	123 (36.2%)	40 (33.9%)	
Don't know	19 (5.6%)	9 (7.6%)	
A physician orders oxycodone hydrochloride and acetaminophen (Percocet) 1–2 tablets to manage postoperative pain every 4 h. At 4 PM the patient complains of pain, requests 1 pill, and is medicated. At 6:30 PM the patient requests a second pain pill. The nurse administers the pill.			
Yes	107 (31.6%)	39 (33.1%)	0.95
No	204 (60.2%)	69 (58.5%)	
Don't know	28 (8.3%)	10 (8.5%)	
A patient is receiving a routine 9 AM dose of digoxin every day. Yesterday's digoxin level was 1.8 (the high side of normal). Another sample was drawn at 6 AM today, to test the digoxin level. At 9 AM the nurse withholds the digoxin administration because the lab value is not available yet.			
Yes	79 (23.2%)	15 (12.7%)	0.05
No	242 (71.2%)	95 (80.5%)	
Don't know	19 (5.6%)	8 (6.8%)	

TPN, total parenteral nutrition.

considered as medication administration errors, and their willingness to report these errors. Independent *t*-tests were used to compare nurses' reasons for not reporting medication errors in the incident reporting system between hospital types. Results were considered to be statistically significant when $P < 0.05$

Results

Demographic characteristics of the participants

A total of 467 RNs participated in this study. The numbers of nurses working in tertiary and general hospitals were 349 and 118, respectively. In both types of hospitals, most participants were female, less than 30 years of age, and only about 17% were older than 36 years. Almost 40.5% of nurses had above a Bachelor of Science in Nursing (BSN) degree in tertiary hospitals, whereas almost 85% of nurses in the general hospitals had a diploma. There were no differences in gender, age or years of experience between hospital types, but education level was higher among nurses working in tertiary hospitals (Table 1).

What Korean nurses consider as medication administration errors by hospital type

The data on what nurses considered as medication administration errors by hospital type are presented in Table 2. There were no significant differences in what nurses considered as medication administration errors between tertiary and general hospitals.

Intent to report medication administration errors to the physician by hospital type

There were no significant differences in physician reporting between nurses in tertiary and general hospitals in all six medication administration error scenarios. Thus, regardless of whether nurses classified an incident as a medication error, more than 50% of the nurses responded that they would notify a physician (Table 3).

Intent to report medication administration errors in the incident reporting system by hospital type

There were no significant differences in filing a report in the incident reporting system between nurses in tertiary and general hospitals in all six medication administration error scenarios (Table 4). In five of the scenarios, with the exception of the infusion pump issue, more than 70% of nurses indicated that they would not file an incident report. Furthermore, in three of the six scenarios, fewer than 10% reported that they would file an incident report.

Reasons for not reporting medication errors by hospital type

Korean nurses' reasons for not reporting medication errors are presented in Table 5. Only three items significantly differed between nurses in tertiary and general hospitals. These items were related to criticism and responses from peers or other professionals, and fear of managers. The nurses in general hospitals were typically less afraid of criticism and of their nurse manager than the nurses in

Table 3 Willingness of nurses to notify medication administration errors to physicians: difference between hospital types

Scenarios: notify the physician	Hospital type		<i>P</i>
	Tertiary	General	
A patient misses the midday dose of oral Ampicillin because the patient was in X-ray for 3 h.			
Yes	215 (64.4%)	80 (67.8%)	0.56
No	109 (32.6%)	33 (28.0%)	
Don't know	10 (3.0%)	5 (4.2%)	
Four patients on a busy surgical unit receive their 6 PM dose of IV antibiotics 4 h late.			
Yes	167 (50.5%)	67 (56.8%)	0.38
No	145 (43.8%)	47 (39.8%)	
Don't know	19 (5.7%)	4 (3.4%)	
A patient receiving TPN feeding via an infusion pump is given 200 ml/h instead of the correct rate of 125 ml/h for the first 3 h of the 24-h infusion. The pump was reset to the correct rate after the change of shift at 7 AM when the incoming nurse realized that the pump was set at the incorrect rate.			
Yes	235 (70.6%)	77 (65.8%)	0.37
No	87 (26.1%)	33 (28.2%)	
Don't know	11 (3.3%)	7 (6.0%)	
A patient admitted with status asthmaticus on 08/13 at 2 AM is prescribed albuterol (Ventolin) nebulizers every 4 h. The nurse omits the 6 AM dose on 08/13 as the patient is asleep.			
Yes	181 (54.7%)	73 (62.4%)	0.07
No	140 (42.3%)	37 (31.6%)	
Don't know	10 (3.0%)	7 (6.0%)	
A physician orders oxycodone hydrochloride and acetaminophen (Percocet) 1–2 tabs for post-operation pain every 4 h. At 4 PM the patient complains of pain, requests 1 pill, and is medicated. At 6:30 PM the patient requests a second pain pill. The nurse administers the pill.			
Yes	233 (69.8%)	88 (74.6%)	0.46
No	85 (25.4%)	27 (22.9%)	
Don't know	16 (4.8%)	3 (2.5%)	
A patient is receiving a routine 9 AM dose of digoxin every day. Yesterday's digoxin level was 1.8 (the high side of normal). A digoxin level was drawn at 6 AM today. At 9 AM the nurse withholds the digoxin because the lab value is not available yet.			
Yes	288 (86.0%)	96 (81.4%)	0.46
No	37 (11.0%)	18 (15.3%)	
Don't know	10 (3.0%)	4 (3.4%)	

Table 4 Willingness of nurses to report medication administration errors in the incidence reporting system: difference between hospital types

Scenarios: filing an incident report	Hospital type		P
	Tertiary	General	
A patient misses the midday dose of oral Ampicillin because the patient was in X-ray for 3 h.			
Yes	21 (6.3%)	14 (12.1%)	0.14
No	259 (78.2%)	84 (72.4%)	
Don't know	51 (15.4%)	18 (15.5%)	
Four patients on a busy surgical unit receive their 6 PM dose of IV antibiotics 4 h late.			
Yes	31 (9.3%)	22 (18.6%)	0.02
No	249 (75.0%)	82 (69.5%)	
Don't know	52 (15.7%)	14 (11.9%)	
A patient receiving TPN feeding via an infusion pump is given 200 ml/h instead of the correct rate of 125 ml/h for the first 3 h of the 24-h infusion. The pump was reset to the correct rate after the change of shift at 7 AM when the incoming nurse realized that the pump was set at the incorrect rate.			
Yes	99 (29.7%)	35 (29.9%)	0.84
No	187 (56.2%)	63 (53.8%)	
Don't know	47 (14.1%)	19 (16.2%)	
A patient admitted with status asthmaticus on 08/13 at 2 AM is prescribed albuterol (Ventolin) nebulizers every 4 h. The nurse omits the 6 AM dose on 08/13 as the patient is asleep.			
Yes	41 (12.4%)	20 (17.1%)	0.27
No	253 (76.7%)	81 (69.2%)	
Don't know	36 (10.9%)	16 (13.7%)	
A physician orders oxycodone hydrochloride and acetaminophen (Percocet) 1–2 tabs for postoperation pain every 4 h. At 4 PM the patient complains of pain, requests 1 pill, and is medicated. At 6:30 PM the patient requests a second pain pill. The nurse administers the pill.			
Yes	27 (8.2%)	8 (6.8%)	0.88
No	267 (80.7%)	96 (81.4%)	
Don't know	37 (11.2%)	14 (11.9%)	
A patient is receiving a routine 9 AM dose of digoxin every day. Yesterday's digoxin level was 1.8 (the high side of normal). A digoxin level was drawn at 6 AM today. At 9 AM the nurse withholds the digoxin because the lab value is not available yet.			
Yes	35 (10.6%)	9 (7.6%)	0.29
No	259 (78.2%)	90 (76.3%)	
Don't know	37 (11.2%)	19 (16.1%)	

Table 5. Nurses' reasons for not reporting medication errors in the incident reporting system (*n* = 467)

Items	Hospital type		P
	Tertiary <i>mean</i> (SD)	General <i>mean</i> (SD)	
1. Nurse managers tend to focus on the individual, rather than system factors, as a potential cause of error.	2.34 (0.88)	2.25 (0.92)	0.33
2. The error was not serious enough to be reported.	2.60 (1.03)	2.55 (0.98)	0.64
3. There was no clear definition or standard for medication error reporting.	3.00 (1.04)	3.12 (0.87)	0.25
4. Fear of legal action by patients or families.	3.08 (0.98)	3.02 (0.88)	0.55
5. Criticism from peers or other professionals.	2.34 (1.03)	1.97 (1.03)	0.001
6. Responses to medication errors do not match the severity of the medication errors.	2.27 (1.00)	2.03 (1.05)	0.03
7. Fear of reprisal or penalties from manager.	2.54 (1.04)	2.27 (1.17)	0.02
8. Medication error is overemphasized as an example of low quality nursing care.	2.90 (1.04)	2.75 (0.98)	0.15
9. Nurses do not recognize or identify medication errors that occur.	2.72 (1.01)	2.53 (1.04)	0.07
10. No feedback is given for error reporting.	2.26 (1.10)	2.11 (1.18)	0.22
11. Other nurses will consider me incompetent.	2.82 (1.05)	2.75 (0.98)	0.56
12. I do not agree with the medication error as defined.	2.57 (1.02)	2.52 (1.10)	0.64
13. It would take too much time to report the error.	2.62 (0.94)	2.59 (0.94)	0.76
14. I would be afraid of the negative consequence of reporting	3.16 (1.01)	3.09 (0.87)	0.50

Means were calculated using a 6-point Likert scale: 1 (*Very Strongly Disagree*) to 6 (*Very Strongly Agree*).

tertiary hospitals. Fear of the negative consequences of error reporting and legal action were the main reasons for not reporting errors across both hospital types.

Discussion

This study identified that the majority of participants would not report an error using an incident reporting system, no matter how

they classified the scenario. The rate of filing an incident report was lower for Korean nurses than for US nurses [12] in all of the scenarios presented. In a recent study on medication errors in Korea, 22% of the nurses responded that they would inform only the physician, and not the nurse manager, and 19% indicated that they would not report medication errors committed by anyone else [3]. Thus, in general, Korean nurses were less likely to report an error to a nurse manager than they would to a physician, and an even lower number of these nurses indicated that they would file an incident report.

In studies performed by Ulanimo *et al.* [20] and Mayo and Duncan [12], US nurses believed that only 28.9% and 25% of medication errors, respectively, were being reported to the nurse manager through filing of an incident report. In a study by Güneş *et al.* [13], 66.7% of nurses stated that they had made medication errors in the past 6 months and had not reported the errors, and 29.6% said that they did not know how to file a report. Potylycki *et al.* [19] also reported that 50–96% of errors go unreported because nurses are afraid of the negative consequences of reporting an error and distrust their employer's ability to be constructive and to provide support.

However, the rate of reporting using an incident reporting system in this study was even lower than that revealed in previous studies [12, 13, 19, 20], as only approximately 10% of Korean nurses in this study responded that they would file an incident report. This finding raises questions as to why Korean nurses are more reluctant to report medication errors through an incident report than nurses in the USA. A possible reason for this lower tendency to report errors to the nurse manager than to the physician may be a result of the hierarchical relationship between the nurse and the nurse manager in Asian cultures. In a study conducted in Taiwan by Chiang and Pepper [26], it was reported that fear was the main barrier to reporting and that this fear was related to the organizational power hierarchy. Nurse managers directly supervise and evaluate the performance of nurses in their wards, but they do not have clinical treatment authority like physicians do, such as prescribing treatments or necessary procedures to affected patients. Thus, nurses may feel that physicians could resolve or decrease any adverse patient reactions, and they feel more comfortable reporting medication errors without worrying about penalty and performance evaluation by nurse managers.

In general, there were few significant differences in the reasons for not reporting medication errors between hospital types. The primary reason for not reporting errors in this study was fear. Similarly, Ulanimo *et al.* [20] reported that US nurses do not report certain medication errors because they fear the reactions of their nurse managers (60%) and peers (65%). In a study that Petrova [28] conducted in Malta, nurses perceived that the focus on the individual, rather than the system, was a barrier to reporting medication errors. In other studies, the reasons for not reporting medication errors included lack of positive feedback, as well as the concern that patients and families or the physician might develop a negative attitude toward the nurses [1, 3, 26, 29, 30].

Using focus groups and in-depth interviews with risk managers, Hartnell *et al.* [1] categorized barriers to reporting medication errors according to the following five themes: reporter burden, professional identity, information gaps, organizational factors, and fear. In previous studies performed across Korea, nurses have consistently reported that fear is the primary reason for not reporting medication errors [4, 31, 32]. Therefore, the development of a supportive organizational environment to encourage the reporting of medication errors and a nonblaming organizational culture are prerequisites for promoting patient safety.

There were no differences in what Korean nurses considered as medication administration errors or their intent to report medication administration errors in terms of educational degree, years of work experience, hospital type, or electronic incident reporting system in this study. A strength of this study is the relatively large sample size collected from geographically diverse regions. Most previous studies on medication errors performed in South Korea have utilized data from only a few hospitals, which were mainly tertiary, and from limited regions.

Limitations

The study had several limitations. First, the use of convenience sampling limits the generalizability of the results. Second, educational level was higher among nurses working in tertiary hospitals compared to those in general hospitals. Third, the data collection method differed across hospitals due to geographical barriers, which may have influenced the results of the study. Finally, the response rate in this study was 78.3%, which although relatively high, cannot guarantee nonresponse bias. This factor needs to be taken into consideration when interpreting the present results.

Conclusions

There were no significant differences based on hospital type in terms of what nurses considered as medication administration errors. Additionally, the rate of filing an incident report among nurses was very low, regardless of hospital type or whether nurses perceived the incident as a medication administration error. However, nurses felt more comfortable reporting issues directly to the physician rather than filing an incident report. The primary reason cited for not reporting medication errors was fear. Therefore, in order to remove barriers to error reporting, greater efforts should be made at the administrative and organizational levels to create a positive environment that removes fear of penalties and eliminates blame from others.

References

- Hartnell N, MacKinnon N, Sketris I *et al.* Identifying, understanding and overcoming barriers to medication error reporting in hospitals: a focus group study. *BMJ Qual Saf* 2012;21:361–8.
- Classen DC, Resar R, Griffin F *et al.* 'Global trigger tool' shows that adverse events in hospitals may be ten times greater than previously measured. *Health Aff* 2011;30:581–9.
- Kim KS, Kwon SH, Kim JA *et al.* Nurses' perceptions of medication errors and their contributing factors in South Korea. *J Nurs Manag* 2011; 19:346–53.
- Kim M. Effects of safety climate and work environment on barrier to medication administration error reporting. *Unpublished Master's thesis*. Busan: Busan National University; 2013.
- Chang Y, Mark B. Effects of learning climate and registered nurse staffing on medication errors. *Nurs Res* 2011;60:32–9.
- Sens BL, Achusim LE, Genest RP *et al.* Practical approach to determining cost and frequency of adverse drug event in a health care network. *Am J Health Syst Pharm* 2001;58:1126–32.
- Chuo J, Lambert G, Hicks RW. Intralipid medication errors in the neonatal intensive care unit. *Jt Comm J Qual Patient Saf* 2007;33:104–11.
- Stratton KM, Blegen MA, Pepper G *et al.* Reporting of medication errors by pediatric nurses. *J Pediatr Nurs* 2004;19:385–92.
- Pham JC, Story JL, Hicks RW *et al.* National study on the frequency, types, causes, and consequences of voluntarily reported emergency department medication errors. *J Emerg Med* 2011;40:485–92.
- Kim E, Lee E, Eom M. DICS behavior pattern and medication errors by nurses. *J Korean Acad Nurs Adm* 2013;19:28–38.

11. Young K, Cochran K, Mei M *et al.* Ensuring safe medication administration through direct observation. *Qual Prim Care* 2015;23:167–73.
12. Mayo AM, Duncan D. Nurse perceptions of medication errors: what we need to know for patient safety. *J Nurs Care Qual* 2004;19:209–17.
13. Güneş ÜY, Gürlek Ö, Sönmez M. Factors contributing to medication errors in Turkey: nurses' perspectives. *J Nurs Manag* 2014;22:295–303.
14. Hsiao G, Chen I, Yu S *et al.* Nurses' knowledge of high-alert medications: instrument development and validation. *J Adv Nurs* 2010;66:177–90.
15. Lan Y, Wang K, Yu S *et al.* Medication errors in pediatric nursing: assessment of nurses' knowledge and analysis of the consequences of errors. *Nurse Educ Today* 2014;34:821–8.
16. Osborne J, Blais K, Hayes JS. Nurses' perceptions: when is it a medication error? *J Nurs Adm* 1999;29:33–8.
17. The Joint Commission. Preventing pediatric medication errors. Sentinel Event Alert 2008 April 10; 39.
18. Kim CH, Kim M. Defining reported errors on web-based reporting system using ICPS from nine units in a Korean university hospital. *Asian Nurs Res* 2009;3:167–76.
19. Potylycki MJ, Kimmel SR, Ritter M *et al.* Nonpunitive medication error reporting: 3-year findings from one hospital's Primum Non Nocere initiative. *J Nurs Adm* 2006;36:370–6.
20. Ulanimo VM, O'leary-Kelley C, Connolly PM. Nurses' perceptions of causes of medication errors and barriers to reporting. *J Nurs Care Qual* 2007;22:28–33.
21. Kim M. Medication error management climate and perception for system use according to construction of medication error prevention system. *J Korean Acad Nurs* 2012;42:568–78.
22. Oh Y. Problem with policy agenda for public health services in Korea. *Health Welfare Policy Forum* 2013;6:62–82.
23. Korean Nurses Association. Hospitals in Korea. 2015. Available from: http://www.koreanurse.or.kr/resources/hospital_stats.php (11 March 2015, date last accessed).
24. Faul F. G*power version 3.0.5. Germany: Universitat Kiel, 2006.
25. Cohen J. *Statistical Power Analysis for the Behavioral Sciences*, 2nd edn. New Jersey: Lawrence Erlbaum Associates, 1988.
26. Chiang H, Pepper G. Barriers to nurses' reporting of medication administration errors in Taiwan. *J Nurs Scholarship* 2006;38:392–9.
27. Wakefield DS, Wakefield BJ, Uden-Holman T *et al.* Perceived barriers in reporting medication administration errors. *Best Pract Benchmarking Healthc* 1996;1:191–7.
28. Petrova E. Nurses' perceptions of medication errors in Malta. *Nurs Stand* 2010;24:41–8.
29. Barach P, Small SD. Reporting and preventing medical mishaps: lessons from non-medical near miss reporting systems. *Br Med J* 2000; 320:759.
30. Hosseinzadeh M, Ezate Aghajari P, Mahdavi N. Reasons of nurses' medication errors and perspectives of nurses on barriers of error reporting. *Hayat* 2012;18:66–75.
31. Seo S. Medication error reporting of nurses and perceived barriers to reporting. *Unpublished Master's thesis*. Suwon: Sungkyunkwan University; 2013.
32. Kim M, Kim M. Canonical correlation between organizational characteristics and barrier to medication error reporting of nurses. *J Korea Acad Industr Coop Soc* 2014;15:979–88.