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Medication safety in Vietnamese hospitals

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CHAPTER 6

**NURSES' PERCEPTION OF PATIENT SAFETY CULTURE
AND ITS ASSOCIATION WITH MEDICATION ERRORS:
A CROSS-SECTIONAL SURVEY
IN VIETNAMESE HOSPITALS**

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Submitted

ABSTRACT

Background: Establishing a culture of safety is a high priority in healthcare in high-income countries. Limited evidence from low- and middle-income countries shows that there is a deficiency of safety culture and this is compromising patient safety.

Objectives: To measure nurses' perception of safety culture across two public hospitals in Vietnam and to assess the association between this perception and the prevalence of intravenous medication errors.

Methods: A cross-sectional survey was conducted on six wards in two urban public hospitals in Vietnam using the safety attitudes questionnaire (SAQ). Data of intravenous medication errors was collected by direct observation, 12 hours per day on 7 consecutive days, on each ward. Descriptive statistics were used to calculate frequencies/percentages and means with standard deviations. Spearman rank correlation was used to test the relationship between subscales, selected items and the prevalence of intravenous medication errors.

Results: A total of 172 (out of 189, 91%) nurses returned the questionnaires. Overall, subscale scores were between 46.1 ± 29.5 and 92.2 ± 15.6 . The percentage of nurses holding positive attitudes ranged from 17.1% to 100.0%. Teamwork climate and working condition were the most positively perceived domains (i.e., consistently high scores across wards and high percentages of nurses being positive). The domains of perception of management and job satisfaction were also perceived relatively positively. Stress recognition and safety climate were the least positively conceived domains. The prevalence of intravenous medication errors was high across wards with about two thirds of doses involving clinically relevant error(s). There were no significant correlations between the prevalence of medication errors and any of the subscales of the SAQ. A significant correlation between difficulty of discussing errors and the prevalence of errors was found ($r_s = -0.986$, $p < 0.001$).

Conclusions: Nurses in two urban Vietnamese hospitals had concerns about the safety climate and only few recognized stress as a factor which could affect their performance. To improve safety culture these factors should be addressed first. Safety culture was not directly linked to intravenous medication error rates.

Keywords: Safety culture, nurses' perception, medication errors, Vietnam

INTRODUCTION

Safety culture is receiving growing attention in the health care sector. In a hospital, safety culture can be understood as how patient safety is perceived, structured and implemented in the organization (The Health Foundation 2011). Establishing a culture of safety has been a high priority in healthcare in high-income countries (Chassin & Loeb 2011). Usually, safety climate is measured as a diagnostic indicator for safety culture using surveys such as the safety attitudes questionnaire (Colla *et al.* 2005; Pronovost & Sexton 2005; Halligan & Zecevic 2011). A relationship between safety culture (or climate) and hospital morbidity, adverse events and readmission rates has been reported in various studies (Pronovost *et al.* 2005; Clarke 2006; Hofmann & Mark 2006; Singer *et al.* 2009; Valentin *et al.* 2013). Other studies have found no relationships between safety culture and patient outcomes (Rosen *et al.* 2010; Bosch *et al.* 2011). Limited evidence from lower-income countries shows that there is a deficiency of safety culture and this is compromising patient safety (Jha *et al.* 2010; Wilson *et al.* 2012).

Medication administration errors occur frequently in hospitals, in particular with intravenous medication administration (Berdot *et al.* 2013; Keers *et al.* 2013). We found that about two thirds of intravenous doses were erroneous in a study in a large urban hospital in Vietnam. An educational intervention was only partly successful in reducing the errors (Nguyen *et al.* 2014). Some evidence is available linking safety culture with medication errors (Hofmann & Mark 2006; Vogus & Sutcliffe 2007). A cross-sectional survey of nursing staff in 42 hospitals throughout the US found that fewer medication errors occurred in units with higher safety climate (Hofmann & Mark 2006). Another study carried out in 78 nursing units across various states of the US determined that safety climate had a negative relationship with reported medication errors (Vogus & Sutcliffe 2007). In these studies medication errors were investigated using medical records (Hofmann & Mark 2006) and error reporting (Vogus & Sutcliffe 2007). These methods are known to underestimate the rate of medication administration errors due to underreporting/lack of documentation of type of errors in medical records (Flynn *et al.* 2002). More studies investigating the relationship between safety culture and medication administration error rates are needed, to identify appropriate approaches to improve medication safety of this step in the process of drug use. In clinical practice, nurses carry out most of the medication administrations. Furthermore, their perceptions of safety appear to contribute the most

to unit safety culture (Huang *et al.* 2007; Huang *et al.* 2010) and appear to be more related to patient safety outcomes compared to perceptions of other staff (Singer *et al.* 2009).

The aims of this study were (1) to measure nurses' perception of safety culture in two public hospitals in Vietnam and (2) to assess the association between this perception and the prevalence of intravenous medication errors.

METHODS

Setting and sample

This was a cross-sectional survey in two urban public hospitals in Vietnam. In each hospital we studied an intensive care unit (ICU) and a post-surgery (PS) ward, in hospital A we also studied one general internal medicine (GIM) and in hospital B one trauma unit (TU). Data were collected between January and June 2012. The study was conducted in collaboration with the pharmacy departments and approved by Medical Ethics Committee and Management Board of the study hospitals. A pharmacy student and two clinical pharmacists (one in each hospital) contacted the head nurses of the study wards and asked for permission to distribute survey packages, each including a cover letter and a questionnaire. Surveys were handed to ward nurses during the weekly ward meeting. All nurses working for at least one year on the study wards were invited to participate (n=189). Nurses were encouraged to return the completed questionnaires on the same day. In case nurses were too busy, the questionnaires were collected a few days later. Nurses' responses were anonymous and informed consent was assumed when the questionnaires were completed and returned. A small gift of about 1.50 euro was offered to nurses who returned the questionnaire.

Safety culture was measured with the safety attitudes questionnaire (SAQ) – short form (available at: <https://med.uth.edu/chqs/files/2012/05/SAQ-Short-Form-2006.pdf>). This is one of the most frequently used measures, with robust psychometric properties (Sexton & Thomas 2003; Sexton *et al.* 2006; Jackson *et al.* 2010). The SAQ has 36 items and covers six domains: teamwork climate, safety climate, job satisfaction, stress recognition, perception of management (measured at both unit

and hospital level), and working condition. The definitions of subscales have been described previously (Sexton & Thomas 2003; Sexton *et al.* 2006). For example, the subscale of teamwork climate was defined as perceived quality of collaboration between personnel. One researcher translated the SAQ from English into Vietnamese. The clarity was tested by ten volunteer nurses working outside the study wards. Amendments were made according to their suggestions. The questionnaire was then translated back to English by another researcher. Minor differences in wording and/or phrasing were found and revised to ensure the content was the same as the original version. For each item, the Likert response scale, ranking from 1 = disagree strongly, 2 = disagree slightly, 3 = neutral, 4 = agree slightly to 5 = agree strongly was used. Questions about demographic characteristics were added.

On each ward, data on intravenous medication errors were collected for 12 h each day (7:00–19:00) on seven consecutive days (Monday–Sunday) as part of a larger study on the prevalence of medication errors (Nguyen *et al.* 2013). We used the disguised observation technique as described previously (Nguyen *et al.* 2014). Briefly, the observers (pharmacy students) asked nurses for permission to observe, followed the nurses during drug preparation and administration, and recorded details of all intravenous doses. Nurses were not informed about the true purpose of the study to minimize any bias which might be caused by that awareness. The observers were asked to minimize conversation with nurses and avoid the word 'error' during the observation process. For ethical reasons, the observers intervened if they became aware of a severe error potentially affecting a patient. These errors were included in the analysis. After each round of observation, the observers reviewed all observation notes and compared the information with the doctors' prescriptions, hospital policies and procedures, the manufacturer's instructions and available literature to detect any discrepancies. Intravenous medication administration errors were defined as deviations in intravenous drug preparation and administration from the doctor's prescriptions, the hospital policies and procedures or the manufacturer's instructions (Taxis & Barber 2004; Chua *et al.* 2009). The potential clinical relevance of medication errors was judged by a panel of four experienced healthcare professionals using a validated scale between zero (labeled as *no harm*) and 10 (*death*) (Dean & Barber 1999). Clinically relevant intravenous medication administration errors were defined as having a mean score of 3 or higher (Taxis & Barber 2003; Barber *et al.* 2009; Chedoe *et al.* 2012).

Data analysis

After reversing two items (2 and 11) with negative wording, we calculated the score of each subscale for each nurse (by taking the average of each set of items). A higher score suggests more positive attitude to the specific domain. The scores were then transformed to a 100-point scale by subtracting 1 from the mean and multiplying by 25. For each ward, we calculated means of subscales and the percentage of nurses having positive perception, i.e. score of 75 or higher, which is equal to “agree slightly” or “agree strongly” (Chaboyer *et al.* 2013).

The prevalence of clinically relevant errors per ward was calculated by dividing the number of doses with clinically relevant error(s) by the number of opportunities for errors, which is the sum of given doses plus omitted doses (i.e. prescribed but not given).

Data were analyzed using SPSS statistical package (SPSS 20.0, SPSS Inc., IBM Corporation, Somers, NY, USA). A significant level of 0.05 was used. Reliability of subscales was assessed using Cronbach’s alpha (α). Descriptive statistics were used to calculate frequencies/percentages and means with standard deviations. Spearman’s rank correlation was used to test the relationship between subscales and the prevalence of intravenous medication errors at ward level. Furthermore, we used Spearman’s rank correlation to test the relationship between the three items from the questionnaire which referred specifically to medication/medical errors and the prevalence of intravenous medication errors. The three items were:

- Item 8: “Medical errors are handled appropriately in this clinical area.”
- Item 11: “In this clinical area, it is difficult to discuss errors.”
- Item 13: “The culture in this clinical area makes it easy to learn from the errors of others.”

RESULTS

Participants

In total, 172 (out of 189, 91%) nurses returned the questionnaires. The reasons for not participating in the survey were sick/maternity leave or being on holiday. Most of them were long-term employees (76.2%) involved in direct patient care (85.5%) with a median of 5-years working experience. During each shift, each nurse was assigned around 4 patients (Table 1).

Table 1. Demographic characteristics of nurses responding to the Safety Attitudes Questionnaire (SAQ)

	Characteristics	n	%
Hospital	A	90	52.3
	B	82	47.7
Gender	Female	156	90.7
	Male	16	9.3
Position	Direct patient care	147	85.5
	Administration/management function	25	14.5
Employment condition	Permanent	131	76.2
	Contract	41	23.8
Working type	Rotating three shifts	75	43.6
	Fixed shift (office hour only)	25	14.5
	Fixed shift and occasional night shifts	72	41.9
Age	Median	28.0 (24.0–34.8)	
Experience years	Median	5 (2–10)	
Number of patients/ nurse/shift	Median	4 (3–6)	

Results of safety culture-related domains and intravenous medication errors

The internal consistency of the subscales was acceptable with Cronbach's alpha ranging from 0.61 to 0.91 (Table 2). Overall, subscale scores were moderate (46.1 ± 29.5) to high (92.2 ± 15.6). The percentage of nurses holding positive attitudes ranged from 17.1% to 100.0%. Teamwork climate and working condition were the most positively perceived domains (i.e. consistently high scores across wards (means were in ranges of 72.3–83.3, and 68.5–88.5, respectively) and a large percentage of nurses having positive perceptions). In contrast, stress recognition and safety climate were the least positively conceived domains, i.e. having the lowest/second lowest scores on five out of six wards. Between 17.1% and 57.1% of nurses acknowledged that stress would influence their performance. On four out of six wards, only around a quarter of nurses had positive attitudes about safety climate (i.e. perceived a strong and proactive organizational commitment to safety), but the range was wide, 21.2% to 81.3%. The scores of the two remaining domains (perception of management and job satisfaction) were in the middle with a tendency of being positive, i.e. scores ranging around 60 to approximately 90 (Table 2).

Table 2. Results of subscales presented as mean (M) with standard deviation (SD) and percentage of nurses with positive perception (%), Cronbach's alpha (α), and prevalence of intravenous (IV) medication errors (%)

	Teamwork climate ($\alpha = 0.61$)		Safety climate ($\alpha = 0.73$)		Job satisfaction ($\alpha = 0.82$)		Stress recognition ($\alpha = 0.87$)		Perception of management ($\alpha = 0.91$)		Working condition ($\alpha = 0.83$)		IV medication errors (%)
	M (SD)	%	M (SD)	%	M (SD)	%	M (SD)	%	M (SD)	%	M (SD)	%	
<i>Hospital A</i>													
ICU (n = 38)	74.8 (9.7)	60.5	64.7 (15.7)	21.1	72.0 (19.2)	68.4	55.9 (28.0)	42.1	69.6 (14.2)	47.4	74.8 (15.7)	73.7	76.0
PS (n = 35)	72.3 (14.7)	51.4	57.0 (15.9)	25.7	62.9 (14.1)	45.7	48.8 (22.8)	17.1	60.0 (24.8)	37.1	73.8 (17.0)	65.7	67.8
GIM (n = 17)	77.2 (8.1)	58.8	72.9 (7.0)	29.4	87.1 (10.6)	100.0	66.9 (15.7)	47.1	82.6 (8.7)	100.0	75.5 (7.5)	94.1	76.0
<i>Hospital B</i>													
ICU (n = 38)	81.1 (13.3)	81.6	75.5 (15.6)	60.5	80.9 (18.5)	89.5	46.1 (29.5)	36.8	72.7 (17.1)	47.4	77.4 (19.1)	68.4	67.9
PS (n = 28)	76.5 (8.2)	64.3	68.0 (12.0)	25.0	68.6 (15.5)	42.9	69.0 (23.6)	57.1	65.7 (11.3)	21.4	68.5 (14.9)	50.0	70.5
TU (n = 16)	83.3 (9.0)	93.8	78.1 (14.6)	81.3	92.2 (15.6)	93.8	51.2 (44.6)	50.0	87.9 (15.7)	93.8	88.5 (15.2)	87.5	71.1
<i>Range</i>	72.3–83.3	51.4–93.8	57.0–78.1	21.1–81.3	62.9–92.2	42.9–100.0	46.1–69.0	17.1–57.1	60.0–87.9	21.4–100.0	68.5–88.5	50.0–94.1	

The prevalence of intravenous medication errors was high across wards with about two thirds of doses involving clinically relevant error(s) (Table 2).

Relationship between subscales, selected items and prevalence of intravenous medication errors

There were no significant correlations between the prevalence of medication errors on the different wards and any of the subscales of the SAQ. The Spearman's rank correlation coefficients (r_s) were between 0.203 and 0.580, $p > 0.05$. There was a significant correlation between item 11 ("In this clinical area, it is difficult to discuss errors.") and the prevalence of errors ($r_s = -0.986$, $p < 0.001$). The scores ranged between 3.24 and 4.09 (the lower the score the more difficult to discuss errors, reversed score). On the wards where nurses found it more difficult to discuss errors, more errors were made. About a third of nurses were either neutral or found it difficult to discuss errors on their wards (34.3%, ranging from 11.4%–52.9%).

DISCUSSION

Our survey of safety attitudes in two Vietnamese urban hospitals showed that nurses were positive about teamwork and working condition and relatively satisfied with management and their own job. They had concerns about the safety climate and relatively few recognized stress as a factor which could affect their performance. We observed a high prevalence of intravenous medication errors, but error rates were not correlated with safety attitudes at ward level. There was one exception, higher error rates were observed on wards where nurses found it more difficult to discuss errors.

We found that global scores and percentages of nurses having positive attitudes to safety domains were approximately the same as the ranges that have been reported previously (Huang *et al.* 2010; Lee *et al.* 2010; Profit *et al.* 2012). However, the overall patterns of safety attitudes are in contrast to studies from Western/developed countries where lower scores were observed for perception of management and working condition and higher scores for safety climate and stress recognition (Huang *et al.* 2007; Huang *et al.* 2010; Chaboyer *et al.* 2013; Profit *et al.* 2012), but similar to a recent study from Taiwan (Lee *et al.* 2010). This may partly be explained by differences in traditional values between Asian and Western countries (Wagner *et al.* 2013). More work has to be done to explore this issue and examine the practical relevance of possible differences. For example, if culture specific interventions are needed to change safety attitudes. Efforts to

improve safety culture should focus on safety climate and stress recognition. There is limited evidence that poor safety climate can be improved by leadership walk-rounds or comprehensive unit-based safety programs (Morello *et al.* 2013). Ward/hospital managers should help nursing staff, especially those working in critical care units (ICUs and PSs), to recognize that stress can have a negative impact on performance (Huang *et al.* 2007). Crew resource-management training has been successful for this in the past (Haller *et al.* 2008).

We observed differences in safety attitudes between wards, but these were not related to intravenous medication error rates. This is in contrast to a few previous studies which found that a better safety culture was related to fewer medication errors (Hofmann & Mark 2006; Valentin *et al.* 2013; Vogus & Sutcliffe 2007). Studies are difficult to compare as previous studies investigated medication errors using record review (Hofmann & Mark 2006) or incident reporting (Vogus & Sutcliffe 2007). As has been already highlighted, both methods underestimate the prevalence of medication administration errors. Our finding is also in contrast with some other studies showing a relationship between safety culture and patient outcomes/adverse outcomes (Pronovost *et al.* 2005; Clarke 2006; Hofmann & Mark 2006; Singer *et al.* 2009; Valentin *et al.* 2013; Wang *et al.* 2013). There may be several reasons to explain our findings. First, safety culture is a complex concept and we used the SAQ which is a commonly used measure. Other aspects of safety culture not covered by the SAQ may be more important with respect to medication errors. An indication for this is the fact that we found a relationship for one item of the SAQ. Wards where nurses were able to discuss errors had lower error rates. Further, theoretical work is needed to investigate which aspects of safety attitude are (if at all) related to medication errors. Secondly, in the analysis we did not adjust for possible confounding factors such as workload, complexity of patient conditions or nurse-related factors. These factors are known either to affect the medication error rates (Tissot *et al.* 2003; Berdot *et al.* 2012) or to moderate the relationship between safety climate and medication errors/adverse events (Hofmann & Mark 2006; Wang *et al.* 2013). However, we did stratify the data by type of preparation (i.e. simple vs. complex), but no significant correlations were found (data not shown). A larger study including more wards allowing more sophisticated analysis is needed.

Our study contributes to the body knowledge of patient safety in lower-income countries (Jha *et al.* 2010; Wilson *et al.* 2012). This study is one of the first measurements of nurses' perception of safety attitudes in resource-restricted setting hospitals using a robust psychometric instrument, the SAQ. We obtained a very good response rate (91%) which is higher than recommended (Sexton & Thomas 2003; Sexton *et al.* 2006). We found that the SAQ had acceptable reli-

ability with Cronbach's α above 0.70 (except for teamwork climate, $\alpha=0.61$) (Huang *et al.* 2007; Chaboyer *et al.* 2013), but further psychometric testing is required with larger samples to test the validity of the instrument in Vietnam. Results in non-urban hospitals and other clinical specialties may be different due to different staffing levels and training of staff. The SAQ can then be used for benchmarking for internal/external comparisons, preparation and evaluation of national/regional patient safety policies.

CONCLUSIONS

Nurses in two urban Vietnamese hospitals had concerns about the safety climate and only few recognized stress as a factor which could affect their performance. To improve safety culture these factors should be addressed first. Safety culture was not directly linked to intravenous medication error rates.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to disclose.

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