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Predictors of perceptions of patient safety culture and frequency of event reporting by critical care nurses in Oman: a model-building approach

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Abstract

***Objectives*: This study was conducted to identify the predictors of critical care nurses' perceptions of patient safety culture and the frequency of event reporting.**

***Methods*: A cross-sectional study design was used. Patient safety culture was assessed using the Hospital Survey on Patient Safety Culture, which was completed by 270 critical care nurses working in two hospitals in Oman.**

***Results*: The results revealed that teamwork within units had the highest positive score (91.8%), followed by organisational learning and continuous improvement (86.3%) and feedback and communication about errors (77.7%). Regression analysis showed that teamwork within units, supervisor/manager expectations and actions promoting patient safety, organisational learning and continuous improvement, management support for patient safety, feedback and communication about errors, teamwork across units, staffing, hospital handoffs and transitions, and patient safety grade were all predictors of the overall perception of patient safety culture among critical care nurses in Oman (R^2=0.462, adjusted R^2=0.186; F=7.83, p<0.0001). Regression analysis showed that openness in communication, income, non-punitive response to errors, organisational learning and continuous improvement, and feedback and communication about errors were predictors of the frequency of events reporting among critical care nurses in Oman (R^2=0.24, adjusted R^2=0.043; F=3.41, p<0.0001).**

***Conclusion*: Patient safety culture is an important indicator of the quality of care, and represents one of the key performance indicators in the healthcare setting.**

Key words: Patient safety culture, HSOPSC, critical care unit, nurse, Oman.

Introduction

According to the World Health Organization (WHO), one in ten hospitalised patients suffer from unnecessary harm, injury or death as a result of unsafe medical practice while they are receiving medical care (WHO, 2018). Human errors have been reported in the healthcare system since 1990, and strategies to avoid and prevent them have become a central topic of research. Patient safety culture is considered an essential strategy to improve patient safety and deliver quality healthcare. (1) It has been defined as "The product of individual and group beliefs, values, attitudes, perceptions, competencies, and patterns of behaviour that determine the organization's commitment to quality and patient safety". (2) Moreover, patient safety culture was defined by the European Society for Quality in Health Care in 2010 as a bundle of actions that are taken to prevent and decrease the risk, harms, and adverse events to patients. (3) Previous studies have investigated the role of construction of a patient safety culture in producing a positive change. It has been reported to be improved by collaboration between health team members, recognition of the risky nature of the health care environment, a respectful relationship between the team, flexibility, the ability to speak up, and use of evidenced-based practices while caring for patients. (3)

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Over the past decade, several instruments have been developed to assess the attitude of health professionals in regard to patient safety, including the Safety Attitudes Questionnaire (SAQ) developed by Sexton in 2006, (4) the Patient Safety Climate in Healthcare Organizations Survey (PSCS) developed by the Patient Safety Cultures in Healthcare Organizations (PSCHO), (5) the Manchester Patient Safety Assessment Framework (MaPSaF), (6) and the Hospital Survey on Patient Safety Culture (HSOPSC). (7)

Patient safety culture from the perspective of healthcare professionals has also been studied over the past decade. The ability of nurses to understand the concept of patient safety culture and act accordingly is known to affect the quality of care provided to patients. Previous research identified several factors that negatively contribute to patient safety culture, including a lack of communication between nurses and administrators and a punitive environment related to mistakes, leading to the underreporting of adverse events or mistakes. (8) This is in line with previous research. (9,10) The benefit of creating a punishment-free environment is that healthcare team members will be encouraged to report adverse events, which will consequently decrease the number of errors and adverse events. (11)

There has been little research into the patient safety culture in Oman. Intensive review of the literature revealed only two studies on this topic conducted in Oman. (12,13) The first one was conducted in 2014 to explore the patient safety culture. (12) All health care providers were invited to participate (n=390). The results of this descriptive study were consistent with previous studies, emphasising the importance of teamwork, a non-punitive environment, and administration support in enhancing the patient safety culture. (12) Another Omani descriptive study was conducted in 2015 to explore nurses' perception of safety culture and identify the factors that might contribute to the patient safety culture (n=414). The results of this study revealed that nurses working in teaching hospitals and those with more years of experience had a greater perception of patient safety culture. (13) However, both of these previous studies recruited nurses irrespective of their specialties, and did not assess all of the factors known to be associated with patient safety culture like organisational structure, staff characteristics, fatigue, workload and burnout. There is a need for a comprehensive understanding of the factors that might affect the patient safety culture. Therefore, aiming to fill this gap, this study explored the predictors of critical care nurses' perceptions of patient safety culture.

Materials and methods

Ethical consideration

Permissions to undertake the study were granted from the ethical committees of the college of nursing, the Ministry of Health-Oman (MOH) and Sultan Qaboos University Hospital. In addition, permission to use the tool was obtained. Participation was voluntary, and no identification data was collected. Written consent was obtained from all participants.

Design and purpose

A descriptive cross-sectional design was used to assess the critical care nurses' perception of patient safety culture in Oman and the frequency of event reporting.

Sample and setting

The study was conducted in two major governmental hospitals in Muscat, the capital city of Oman. All nurses working in critical care units, including the Neonatal ICU, Pediatric ICU, Adult ICU, Coronary Care Unit, and Post Cardiac Surgery Unit, were invited to participate in the study, totalling around 500 nurses. Slovin's formula was used to estimate the sample size required for the current study using a confidence interval of 95%. The estimated sample size was 222 participants; however, the survey was circulated to 300 participants to reduce the influence of attrition rates.

A convenience sampling strategy was used. The study survey was distributed between June and September 2018, and responses were received from 270 participants. The researchers discussed and provided the managers of critical care units in each hospital setting with an overview of the study purposes, methods, and significance. The researchers then identified participants who met the eligibility criteria (Oman and non-Oman nurses, agreed to participate, and had worked in critical care units for at least 6 months) and agreed to participate. Following this, the researcher approached the potential participants in person and obtained their permission to participate. A package comprising an information sheet, consent form and the survey instrument was given to each eligible participant. Consenting participants were asked to complete the questionnaire, which would be later coded to enable the researcher to complete the data collection process.

Measurements

Hospital Survey on Patient Safety Culture (HSOPSC)

The HSOPSC instrument was used to measure patient safety culture in the current study. This in-

strument was developed by the Agency for Healthcare Research and Quality in 2004. It consists of 42 items grouped into 12 composites including communication openness, feedback and communication about errors, frequency of event reporting, handoffs and transitions, management support for patient safety, non-punitive response to errors, organisational learning and continuous improvement, overall perceptions of patient safety, staffing, supervisor/manager expectations and actions promoting patient safety, teamwork across units and teamwork within units. In addition to the composites, the survey included two questions that asked respondents to provide an overall patient safety grade for their work unit, and to state the number of events they reported over the past 12 months. It also asked participants to provide limited background demographic information. Most items were answered on a 5-point Likert-type scale, on which they reflected their level of agreement from "I strongly disagree" (1) to "I strongly agree" (5), with a neutral category "I neither agree nor disagree" (3). Other items in the survey are answered on a 5-point frequency scale from "never" (1) to "always" (5). The psychometric proprieties for this survey showed Cronbach's alpha values higher than 0.7 for 8 of the 12 dimensions. The instrument as a whole achieved a high Cronbach's alpha (0.91). (14) In the current study, the results indicated that HSOPSC was valid and reliable with showed Cronbach's alpha (0.85).

Demographic data

Demographic data were collected via a self-report questionnaire comprising questions including age, gender, education level, income, nationality, hospital type, experience in years, and weekly working hours.

Statistical analysis

SPSS version 23 was used to manage and analyse the data. Data cleaning and verification was performed prior to conducting the analyses. Descriptive analysis included the mean, standard deviation, frequency and percentage. Correlation analyses and regression analyses were also conducted.

Results

Sample characteristics

A total of 270 participants from Sultan Qaboos University Hospital and Royal Hospital were included in the study, with an overall response rate of 90%. Of the respondents, 38 were male (14.1%) and 232 were female (85.9%). The majority of nurses had a bachelor's degree (62.6%), whereas only 4.1% had a postgraduate diploma. The maximum age of participants was 56 years and the minimum age was 24 years (M=33.06, SD=5.82). Most participants were non-Omani (81.5%), with Omani nurses accounting for 18.5% of participants. The number of years of experience in their units ranged from 1 to 30 years (M=7.01, SD=5.05). The other characteristics of participants are summarised in **Table 1**.

Nurses' perception of patient safety culture

Critical care nurses' perception of patient safety culture was assessed in the survey. The frequency and mean were calculated to identify their responses. The results showed that teamwork within units had the highest positive score (91.8%), followed by organisational learning and continuous improvement (86.3%), and feedback and communication about errors (77.7%). However, the results showed that hospital handoff and transition dimensions had the lowest positive response (15.3%), followed by communication openness (45.6%) and teamwork across hospital units. **Table 2** details these results.

Correlations between overall perception of patient safety, sociodemographic variables and patient safety culture composites

Pearson correlation analysis was undertaken to determine the relationship between selected sociodemographic variables (age, years of experience, weekly working hours and income), patient safety culture composites, overall perception of patient safety, and frequency of events reported. The results revealed a significant positive relationship between teamwork within units, supervisor/manager expectations and actions promoting patient safety, organisational learning and continuous improvement, management support for patient safety, feedback and communication about errors, teamwork across units, staffing, hospital handoffs and transitions, patient safety grade and overall patient safety culture. **Table 3** details these results.

Chi-square analysis was performed to assess the relationship between selected categorical variables including hospital type, nationality, gender and overall patient safety culture. The results did not identify any significant relationships between variables.

Predictors of overall perception of patient safety

A standard multiple regression (R^2) analysis was used to establish the relative contribution of the predictors. A structured, three-phased approach was used to achieve a parsimonious regression model for this sample. First, statistical assumptions related to normality, linearity, heteroscedasticity

and independence of residuals were assessed. Second, the independent variables that showed a significant correlation with overall patient safety culture were entered into the initial regression model. Third, only the variables that were correlated in the initial regression model were entered into the parsimonious regression model. This regression analysis was conducted to determine the magnitude of the interactions of independent variables in relation to the correlation matrix, beta weights and their significance level (t-statistic and p value). The independent variables that were correlated with overall patient safety culture in the bivariate analyses (teamwork within units, supervisor/manager expectations and actions promoting patient safety, organisational learning and continuous improvement, management support for patient safety, feedback and communication about errors, teamwork across units, staffing, hospital handoffs and transitions and patient safety grade) were included in the initial regression model. Regression analysis showed that teamwork within units, supervisor/manager expectations and actions promoting patient safety, organisational learning and continuous improvement, management support for patient safety, feedback and communication about errors, teamwork across units, staffing, hospital handoffs and transitions and patient safety grade were predictors of overall perception of patient safety culture among critical care nurses in Oman (R^2=0.462, adjusted R^2=0.186; F=7.83, p<0.0001). **Table 4** details the regression results.

Predictors of frequency of events reported

A standard multiple regression (R^2) analysis was used to identify predictors of the frequency of event reporting among critical care nurses in Oman. Five variables that were correlated in the bivariate analysis were entered into the regression model, including communication openness, income, non-punitive response to errors, organisational learning and continuous improvement, and feedback and communication about errors. Regression analysis showed that these variables were predictors of the frequency of events reported among critical care nurses in Oman (R^2=0.24, adjusted R^2=0.043; F=3.41, p<0.0001). **Table 5** details these results.

Discussion

This study was conducted to investigate the perception of patient safety culture among critical care nurses in selected hospitals in Oman, and to identify to what extend these variables predict the nurses' perceptions of patient safety culture. The results showed that critical care nurses mostly perceived patient safety culture in the dimension of teamwork within units, followed by organisational learning and continuous improvement and feedback and communication about errors.

The importance of teamwork within the healthcare system, and in the critical care setting in particular, has been recognised as one of the most important predictors of patient safety, as a collaborative environment reduces the workload by helping and sharing responsibilities among critical care nurses. The results of the current study are consistent with the findings of other studies in the literature, (15-17) which found that effective teamwork in a clinical setting promotes patient safety. On the other hand, a lack of collaboration can significantly threaten patient safety and patient care outcomes. (18)

The results of the current study support those of previous studies, which found that an improvement in patient safety is dependent on having an organisational culture that embraces continued learning to increase staff qualifications and competencies. (19-21) The availability of learning policies focussed on the sharing of information and exchange of work experience among the team can increase the patient safety culture in a clinical setting. (21) Importantly, having a supportive, learning organisation is related to a decreased incidence of medication errors and increased patient safety. (20)

Active feedback and communication about errors was perceived by critical care nurses as being an important predictor for patient safety culture. The previous literature confirmed that good and effective feedback would theoretically improve staff performance by decreasing the number of incidents. (22-24) The WHO highlighted the importance of positive and constructive feedback after incident reporting, as it increases staff awareness and enhances their perception of the patient safety culture. (25)

The current study also showed that communication openness, income, non-punitive response to errors, organisational learning and continuous improvement, and feedback and communication about errors were all predictors for the frequency of events reported.

Having a non-punitive environment was identified as a predictor for the reporting of accidental errors. It is important for health organisations to consider errors made by staff as learning and improvement opportunities, thereby increasing their perception of patient safety culture and helping to prevent future errors. (26) These results are in line with previous studies. (27,28) Hospital administrators should recognise the importance of having a blame-free environment as this increases the nurses' confidence to report medical errors, and will

consequently improve patient safety and decrease the percentage of unreported errors. (27)

Another dimension which had an effect on the patient safety culture and reporting of errors among critical care nurses in Oman was communication openness. In the USA, an analysis of 2455 adverse event incidences indicated that a failure in communication was responsible for 70% of the incidents. (29) The WHO declared that improvement in communication in the clinical setting would improve patient safety, enhance quality of care, decrease length of stay, improve patient outcomes, and increase the satisfaction level among patients and their families. (25) In addition, communication increases nurses' knowledge and allows them to share their experiences. (25)

In interpreting the results of this study, some limitations should be acknowledged. This study used a convenience sample and recruited critical care nurses from only two institutions, which limits the generalisability of the results. Future national research is recommended to build a national framework for patient safety culture in Oman.

Conclusion

Patient safety culture is an important indicator of quality of care, and is one of the key performance indicators in the healthcare setting. The ability of the organisation to create a collaborative working environment, promoting staff development through continued learning, having a blame-free environment, and creating an environment of open communication increases the perception of patient safety culture and frequency of event reporting by critical care nurses in Oman.

Compliance with ethical standards

Ethical compliance: Approval was obtained from the institutional review board.

Conflict of interest: The authors declare that they have no conflicts of interest.

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Table 1. Sample characteristics (n=270)

	Variable	Frequency (n)	Percentage (%)	Mean	Standard deviation
1	Hospital type - University hospital (SQUH) - Royal hospital	 130 140	 48.1 51.9		
2	Gender - Male - Female	 38 232	 14.1 85.9		
3	Nationality - Omani - Non-Omani	 50 220	 18.5 81.5		
4	Units - Pediatric ICU - Neonate ICU - Adult ICU - Cardiac ICU - CCU	 55 45 134 8 28	 20.4 16.7 49.6 3.0 10.4		
5	Education level - Diploma - Bachelor - Postgraduate	 90 169 11	 33.3 62.6 4.1		
6	Age			33.06	5.82
7	Experience in your unit (years)			7.01	5.05
8	Monthly income (in Omani Rial [OMR])			1068.6 OMR	291.65 OMR
9	Working (hours/week)			36.84	3.19

Legend: SQUH=Sultan Qaboos University Hospital; ICU=intensive care unit; CCU=cardiac care unit.

Table 2. Critical care nurses' response to patient safety culture (n=270)

Item	Negative response Strongly disagree/disagree n (%)	Neither n (%)	Positive response Strongly agree/agree n (%)	Average positively respond %
Team work within units				94.2
- People support one another in this unit	4 (1.4)	7 (2.6)	259 (95.9)	
- When a lot of works need to be done quickly, we work together as a team to get the work done	4 (1.5)	7 (2.6)	259 (96)	
- In this unit, people treat each other with respect	6 (2.3)	19 (7.0)	245 (90.7)	
- When one area in this unit gets really busy, others help out.	18 (6.6)	23(8.5)	229 (84.8)	
Organizational learning - continuous improvement				86.3
- We are actively doing things to improve patient safety	3 (1.1)	7 (2.6)	260 (96.3)	
- Mistakes have led to positive changes here	13 (4.8)	61 (22.6)	196 (72.6)	
- After we make changes to improve patient safety, we evaluate their effectiveness	6 (2.3)	21 (7.8)	243 (90.0)	
Non-punitive response to errors				54.8
- Staffs feel like their mistakes are held against them (R)	69 (25.6)	72 (26.7)	129 (47.8)	
- When an event is reported, it feels like the person is being written up, not the problem (R)	77 (28.5)	68 (25.2)	125 (46.3)	
- Staff worry that mistakes they make are kept in their personnel file (R)	33 (12.3)	46 (17)	191 (70.4)	
Staffing				57.0
- We have enough staff to handle the workload	41 (15.2)	43 (15.9)	186 (68.8)	
- Staff in this unit work longer hours than is best for patient care (R)	52 (19.2)	46 (17)	172 (63.7)	
- We use more agency/temporary staff than is best for patient care (R)	112 (41.5)	62 (23)	96 (35.6)	
- We work in "crisis mode" trying to do too much, too quickly (R)	52 (19.3)	56 (20.7)	162 (60)	

Overall perceptions of patient safety				61.4
- Patient safety is never sacrificed to get more work done	26 (9.6)	28 (10.4)	216 (80)	
- Our procedures and systems are good at preventing errors from happening	10 (3.7)	29 (10.7)	231 (85.6)	
- It is just by chance that more serious mistakes don't happen around here (R)	63 (23.4)	61 (22.6)	146 (54.1)	
- We have patient safety problems in this unit (R)	145 (53.7)	57 (21.1)	68 (25.2)	
Supervisor/manager expectations and actions promoting patient safety				59.9
- My supervisor/manager says a good word when he/she sees a job done according to established patient safety procedures	20 (7.4)	34 (12.6)	216 (80)	
- My supervisor/manager seriously considers staff suggestions for improving patient safety	12 (4.4)	26 (9.6)	232 (85.9)	
- Whenever pressure builds up, my supervisor/manager wants us to work faster, even if it means taking shortcuts (R)	137 (50.7)	71 (26.3)	62 (23)	
- My supervisor/manager overlooks patient safety problems that happen over and over (R)	76 (28.1)	57 (21.1)	137 (50.8)	
Communication openness				45.6
- Staff will freely speak up if they see something that may negatively affect patient care	25 (9.3)	57 (21.1)	188 (69.6)	
- Staff feels free to question the decisions or actions of those with more authority	62 (22.9)	92 (34.1)	116 (43)	
- Staffs are afraid to ask questions when something does not seem right (R)	97 (35.9)	108 (40)	65 (24.1)	
Feedback & communication about error				77.7
- We are given feedback about changes put into place based on event reports	19 (7.1)	73 (27)	178 (65.9)	
- We are informed about errors that happen in this unit	5 (9.1)	39 (14.4)	226 (83.7)	
- In this unit, we discuss ways to prevent errors from happening again	8 (3)	36 (13.3)	226 (83.7)	

In your hospital working area/unit, when the following mistakes happen, how often are they reported?				61.7
- When a mistake is made, but is caught and corrected before affecting the patient, how often is this reported?	50 (18.5)	55 (20.4)	165 (61.1)	
- When a mistake is made, but has no potential to harm the patient, how often is this reported?	50 (18.5)	70 (25.9)	150 (55.6)	
- When a mistake is made that could harm the patient, but does not, how often is this reported?	41 (15.2)	44 (16.3)	185 (68.6)	
Management support for patient safety				65.9
- Hospital management provides a work climate that promotes patient safety	10 (3.7)	28 (10.4)	232 (86)	
- The actions of hospital management show that patient safety is a top priority	9 (3.4)	23 (8.5)	238 (88.2)	
- Hospital management seems interested in patient safety only after an adverse event happens (R)	149 (55.2)	57 (21.1)	64 (23.7)	
Teamwork across units				50.2
- There is good cooperation among hospital units that need to work together	14 (5.2)	47 (17.4)	209 (77.4)	
- Hospital units work well together to provide the best care for patients	9 (3.4)	18 (6.7)	234 (90)	
- Hospital units do not coordinate well with each other (R)	170 (63)	57 (21.1)	43 (15.9)	
- It is often unpleasant to work with staff from other hospital units (R)	137 (50.7)	85 (31.5)	48 (17.8)	
Hospital handoffs & transitions				15.3
- Things "fall between the cracks" when transferring patients from one unit to another (R)	144 (53.3)	79 (29.3)	47 (17.4)	
- Important patient care information is often lost during shift changes (R)	180 (66.7)	49 (18.1)	41 (15.1)	
- Problems often occur in the exchange of information across hospital units (R)	135 (50)	80 (29.6)	55 (20.4)	
- Shift changes are problematic for patients in this hospital (R)	195 (72.2)	52 (19.3)	23 (8.5)	

Table 3. Pearson correlation results between study variables and overall of patient safety culture perception and frequency of event reported (n=270)

Variable	Overall of patient safety perception r	Frequency of event reported r
Age	0.75	0.03
Experience	0.27	0.01
Income	0.98	-0.13*
Working hours	0.02	0.04
Teamwork within units	0.22*	0.04
Supervisor/manager expectations & actions promoting patient safety	0.28*	0.10
Organizational learning - continuous improvement	0.23*	0.12*
Management support for patient safety	0.33*	0.47
Feedback & communication about error	0.35*	0.21*
Communication openness	0.10	0.12*
Frequency of events reported	0.47	1
Teamwork across units	0.31*	0.08
Staffing	0.19*	0.01
Hospital handoffs & transitions	0.36*	0.07
Non-punitive response to errors	0.15	0.15*
Patient safety grade	0.25*	0.04
Overall of patient safety	1	0.47
Number of events reported	-0.15*	0.01

Legend: *=$p<0.05$.

Table 4. Multiple regression analysis of patient safety culture composites on overall patient safety culture (n=270)

Predictor	Standardized coefficients beta	SE	t	95.0 % CI interval for B	
				Lower bound	Upper bound
Teamwork within units	0.04	0.06	0.40	-0.09	0.16
Supervisor/manager expectations & actions promoting patient safety	0.10	0.06	0.11	-0.12	0.21
Organizational learning - continuous improvement	0.03	0.10	0.43	-0.15	0.24
Management support for patient safety	0.12	0.08	1.5	-0.38	0.28
Feedback & communication about error	0.20	0.07	2.8	0.06	0.37
Teamwork across units	-0.04	0.07	-0.50	-0.15	0.14
Staffing	0.04	0.04	0.74	-0.05	0.13
Hospital handoffs & transitions	0.11	0.05	1.50	-0.02	0.18
Patient safety grade	0.04	0.17	0.66	-0.23	0.46

Legend: R^2 46% dependent variable: overall perception of patient safety.

Table 5. Regression model for frequency of events reported predictors (n=270)

Predictor	Standardized coefficients beta	SE	t	95.0 % CI interval for B	
				Lower bound	Upper bound
Communication openness	-0.09	0.02	-1.3	-0.07	0.15
Income	-0.04	0.00	-0.81	0.00	0.00
Non-punitive response to errors	-0.05	0.02	-0.90	-0.05	0.02
Organizational learning - continuous improvement	-0.03	0.03	-0.46	-0.07	0.04
Feedback and communication about error	-0.14	0.02	-1.9	-0.10	0.00

Legend: R^2 24% dependent variable: frequency of events reported.

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