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Health professional perspectives of patient safety issues in intensive care units in Saudi Arabia

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Abstract

Aim. Examine attitudes to patient safety in two Intensive Care Units (ICU) from the perspective of healthcare professionals in Saudi Arabia.

Background. Despite adverse errors leading to poor patient outcomes, there is a paucity of literature, including staff perceptions, on adverse errors in Saudi Arabian ICUs.

Methods. Descriptive cross-sectional design. Health professionals (n=144) completed the Safety Attitude Questionnaire-Intensive Care Unit (SAQ-ICU).

Results. Scores from the six safety domains of the SAQ-ICU showed all respondents had a negative attitude towards patient safety, with participants in one ICU scoring lower in all domains. Mean scores across all domains ranged from 47.1 to 70.3 on a 100-point scale, with the lowest score reported in the ‘perceptions of management’ domain. Respiratory therapists reported a significantly higher job satisfaction score than nurses, and physicians rated communication amongst themselves and nurses as high.

Conclusion. There are significant challenges for safety culture in this study, with negative attitudes across all domains.

Implication for nursing management. Managers may need to review and consider policies relating to safety culture including workforce planning, leadership and patient

centred care. Further research into this global health priority is required to contribute to improving patient safety in ICUs.

Keywords: patient safety, Intensive Care Units, safety management, surveys and questionnaires, communication, Saudi Arabia

Introduction

Patient safety in the Intensive Care Unit (ICU) is considered an important challenge around the globe. The ICU is a demanding environment compared to other units in a hospital due to the complexity of patient illnesses and treatment required (Baruch & Messer 2012). Therefore, a consequence of this is the possibility of increased medical errors in the ICU (Garrouste-Orgeas & Valentin 2013). Failure to provide quality care for patient led to an estimated 440,000 deaths annually in the United States of America (USA) alone, mostly due to preventable hospital errors (James 2013). In addition, around 1.3 million patients worldwide per year are injured and over 100,000 deaths were attributed to adverse hospital events (Scott et al. 2006). Adverse events in ICUs are common, serious, complex and preventable. Among 400 patients in one ICU, around 20% had an adverse event and 50% of these were preventable (Needham 2010). In the Saudi Arabia health care system there were a reported 25,000 medical errors between 2001 and 2006. However, these errors were not broken down into specific locations and there is no literature available on safety issues and adverse events in ICUs in Saudi Arabia (Aboshaiqah and Baker 2013).

Indeed, adverse events and a poor work environment are associated with a negative impact on patient safety in ICUs including increased rates of infection (Bae 2012, Cimiotti et al. 2012, Storesund & McMurray 2009). There are multiple elements which have been identified as contributing to unsafe ICU environments including lack of policy and guidelines, insufficient training, lack of or poor supervision, heavy workloads, staff shortages, time pressures, and staff practices, skills and knowledge (Alayed et. al. 2014, Daud-Gallotti et al. 2012). Cultural differences and language barriers can also adversely affect patient outcome and safety (Almutairi et al. 2013,

Chaboyer et al. 2013), potentially a contributing factor in Saudi Arabian ICUs which have a multicultural health care workforce.

The Safety Attitude Questionnaire-Intensive Care Unit (SAQ-ICU) has been used to examine patient safety. The SAQ-ICU was used to identify factors, from a healthcare professional's perspective, that may increase medical errors and near errors in different settings worldwide. These factors included inappropriate unit size and design (Saladino et al. 2013), medical equipment and communication with other departments (Saladino et al. 2013), long work hours and excessive workload (Stahl el al. 2009). Studies showed that a facility with a shortage of nurses and experience in the ICU was more likely to have complications for their patients, such as pulmonary distress, postoperative complications and bloodstream infections (Cimiotti et al. 2012, Ferrer et al. 2014, Penoyer 2010). Physicians identified job dissatisfaction, high stress level, poor working conditions and workload in the ICU as factors contributing to poor patient safety (Chaboyer et al. 2013). Physician workload in the ICU was associated with an increased mortality rate among patients (Neuraz et al. 2015). A multicentre longitudinal study in eight ICUs in France found that when the patient-to-physician ratio exceeded 14, the risk of death among patients increased by 3% ($p= <0.001$) (Neuraz et al. 2015).

This research is in line with World Health Organisation (WHO) priorities, with research into patient safety identified as a global priority (World Health Organization 2017). Furthermore, it is important to explore patient safety in countries with limited research and adverse event reporting systems. The objective of this study was to examine attitudes to patient safety in ICUs from the perspective of healthcare professionals in Saudi Arabia.

Methods

A descriptive, cross-sectional survey design using a paper based, SAQ-ICU- for physicians, nurses and respiratory therapists.

Ethical Considerations

The study was approved by the supporting university Human Research Ethics Committee (Project Number: CF15/3671- 2015001592) and the ethics committees at both participating hospitals (Hospital A: no project number, Hospital B [Project Number: REC 2015-19]).

Sample

The study was conducted in two major teaching hospitals in Saudi Arabia throughout November and December 2015. Both hospitals have a 500-bed capacity; Hospital A has 27 ICU beds and Hospital B has 22 ICU beds. The SAQ-ICU was distributed to all 249 eligible healthcare professionals (nurses, physicians and respiratory therapists) in both ICUs. Eligibility criteria were: healthcare professionals with three or more months experience in ICU and ability to read and understand English. Exclusion criteria was staff working on a temporary or locum contract.

Data Collection

The ICU nurse managers posted an announcement on the “unit announcement board” to invite staff to join the study. Clinical instructors distributed questionnaires and explanatory statement to all respondents to prevent coercion and ensure privacy. Clinical instructors placed a provided box in the staff common room, and respondents were instructed to return their anonymously completed questionnaire in the box. After five weeks, the questionnaires were collected by the researcher and securely stored. Returning the completed questionnaire was considered implied consent to participate.

The SAQ-ICU

The SAQ-ICU was used as a data collection instrument in this study. Permission was obtained in 2015 from the author, Sexton et al with collaboration of the University of Texas at Austin (The University of Texas 2015). The SAQ-ICU was adopted from the Safety Attitude Questionnaire

(SAQ) which has been used in different countries around the world, including Australia, the USA, Cyprus and Sweden, to measure patient safety from the perspective of healthcare professionals (Chaboyer et al. 2013 Nordén-Hägg et al. 2010, Raftopoulos & Pavlakis, 2013). Higher scores on the SAQ across a range of settings have been correlated with patient outcomes characterised by fewer adverse outcomes, fewer medication errors, lower ventilator associated pneumonia and shorter ICU stays [Abdi et al. 2015, Alayed et al. 2014].

The SAQ-ICU used in the study had three sections: 30 items measuring attitudes to patient safety, rating of communication and collaboration with colleagues and an open-ended question. The 30 items were allocated under six domains; safety climate, teamwork climate, stress recognition, perception of management, working condition and job satisfaction (Supplementary material Table 1). The six domains were determined during the development of the SAQ-ICU, through pilot testing and exploratory factor analysis, to aid with data analysis (Sexton, 2006).

The attitude statement were rated using a 5-point statement: (1) disagree strongly; (2) disagree slightly; (3) neutral; (4) agree slightly; and (5) agree strongly, which is then converted to a 0-100 scale for analysis. A score greater than 75 is identified as a positive attitude towards patient safety. Experiences of the ‘quality of collaboration and communication’ with other staff members in their clinical area was measured using a six-point Likert scale: (1) very low; (2) low; (3) adequate; (4) high; (5) very high; and (6) not applicable. The open-ended question invited respondents to identify their “top three recommendations for improving patient safety in this ICU”.

The SAQ-ICU is valid and reliable tool. Cronbach’s alpha was used to measure the internal consistency, with a reliability coefficient in this study of 0.78, an acceptable value (Polit & Beck 2010). In a previous study, the Cronbach’s alpha of SAQ-ICU was 0.9 (Sexton et al. 2006). Convergent validity was also established previously for the SAQ-ICU; climate scores were correlated with the scores of the Checklist for Assessing Institutional Resilience (CAIR) tool (Sexton et al. 2006).

Data analysis

All data items were entered into the Statistical Package for Social Sciences (IBM SPSS-ver23) for analysis. Demographic data were reported using frequencies and percentages. Parametric tests (mean SD, independent sample *t* tests) were performed on normally distributed data, with nonparametric tests (median, IQR) performed on data not normally distributed. Chi-square (χ^2) test was used to examine associations between categorical variables while the relationships between all three groups (nurses, physicians and respiratory therapists) were tested by the analysis of variance [ANOVA] with a post-hoc test applied to identify where the differences lie. The Pearson (r) Correlation Coefficient test was used to find out if there was any linear correlation between selected independent variables. Statistical significance was considered with a *P* value <0.05. Negatively worded items were reversed and all missing data were replaced with mean option in SPSS statistical procedures. For simplifying the analysis, those nurses who identified themselves as, Charge Nurse or Nurse Manager/Head Nurse were categorised as leaders. Critical care registered nurses were identified in the analysis as bedside nurse. Hospitals were compared to examine if factors such as size of ICU, staffing numbers, organizational culture and infrastructure may impact patient safety issues.

The open-ended question responses were analysed using qualitative content analysis. Content analysis involves the systematic coding and categorising of data (Hsieh & Shannon 2005). Three categorises were identified: Participant's attitude to the SAQ-ICU; Quality of collaboration and communication experienced among ICU healthcare professionals in two ICUs; and Recommendations for improving patient safety in ICUs.

Results

Demographic Information

In total, 240 questionnaires were distributed. Response rates were 63.5% at Hospital A (94/148) and 54.3% at Hospital B (50/92) with an overall response rate of 62% (n=149). However, only 144

questionnaires (60% response rate) were eligible for the study: 106 from nurses (60%), 15 from respiratory therapists (65%), and 23 from physicians (56%). The five excluded questionnaires had incomplete demographic information or did not meet the inclusion criteria.

The mean age of respondents was 29.5 years (SD 6.3). Four respondents (2.8%) did not provide their age. The majority of respondents were female (n= 118, 81.9%). The largest number were of Asian ethnicity (n= 106, 73.6%), while all respondents identified the ICUs as being mixed medical/surgical (Table 1).

INSERT TABLE 1 HERE

Participant's attitude to patient safety issues

Of the total number of respondents (n = 144), 53.5% (n = 77) responded to the 30 questionnaire items positively (>75), which means those respondents rated items with scores of between 75 and 100. The total mean of safety attitude according to six domains was 61.2 (SD 7.3) which indicated that respondents in both ICUs had a negative attitude towards patient safety. The highest mean score was 70.3 (SD 14.9) for the job satisfaction domain and the lowest mean score was 47.1 (SD 19) towards perception of management (Table 2).

INSERT TABLE 2 HERE

Nurse leaders showed an overall higher attitude in all domains (mean 65.3, SD 8.6) compared to bedside nurses (mean 60.6, SD 7.1, $p = 0.052$). There was one significant difference between both groups related to the perception of management domain, where leaders rated higher than bedside nurses (mean 58.1 and 44.3 respectively, $p = 0.015$). There were no significant differences between nurses and physicians attitudes towards patient safety in their ICUs, except that physicians had higher attitude scores towards patient safety than nurses (mean 61.9 and 59.6 respectively, $p =$

0.28). Similarly, there were no significant differences between physicians (mean 61.9, SD 9.1) and respiratory therapists (mean 61.1, SD 5.3, $p = 0.76$), except stress recognition where physicians rated higher (mean= 66.5, SD 20.3) than respiratory therapists (mean 50.4, SD 17.5, $p = 0.016$). Noticeably, respiratory therapists had a positive attitude to patient safety in the job satisfaction domain (mean 79, SD 13.7) than physicians (mean 72.7, SD 10.7, $p = 0.12$). Male and female respondents shared almost similar attitudes with no significant differences (mean 62.1 and 60 respectively, $p = 0.25$) (Table 3).

INSERT TABLE 3 HERE

There was only one significant difference between the three groups in the job satisfaction domain ($p = 0.017$). Post-hoc comparisons using the least significant difference test revealed that the significant differences in job satisfaction were between respiratory therapists (mean 79, SD 13.7) and nurses (mean 68.1, SD 15.0) with a mean difference of 10.8. The Pearson (r) Correlation Coefficient showed that from the six domains, only stress recognition had a statistical significance (a positive correlation) between year of experience in specialty ($p = 0.01$) and age ($p = 0.01$), indicating that the increases in age and years of experience in specialty areas is associated with high stress recognition among staff.

Perception of collaboration and communication

In terms of collaboration and communication, the results revealed that the respondents rated their experiences as adequate (mean 2.7, SD 0.8) (Table 4). When comparing collaboration and communication between Hospital A and Hospital B, it showed that both ICUs had similar overall scores with a mean of 2.8 (SD 0.6) for Hospital A and 2.7 (SD 1.0) for Hospital B, $p = 0.79$. Also, bedside nurses and leaders rated the quality of collaboration and communication experienced with

all professions as adequate with no statistically significant differences (mean 2.6, SD 0.7; and mean 2.4, SD 0.6 respectively, $p = 0.31$).

However, physicians ranked collaboration and communication higher than nurses with almost all professions. In fact, the results showed that physicians rated the communication and collaboration with all professions as high (mean 3.4, SD 0.9), while nurses rated them as adequate with statistically significant difference (mean 2.6, SD 0.7, $p = 0.000$). Similarly, male respondents rated the communication and collaboration with others as high (mean 3.2, SD 0.9), while female respondents rated communication and collaboration as adequate with statistically significant difference (mean 2.6, SD 0.7, $p = 0.001$).

INSERT TABLE 4 HERE

Recommendations for improving patient safety in ICUs

In the open-ended question, 13% ($n = 19$) of respondents provided recommendations to improve patient safety. Five categories were extracted from the identified recommendations: staffing level; communication and teamwork skills; training and education; resources and guidelines; and administration support (Table 5).

INSERT TABLE 5 HERE

Discussion

In this study in two Saudi Arabian ICUs, respondents had a negative attitude to patient safety based on six safety domains. These findings are similar to another study in Saudi Arabia using the SAQ-ICU. In this study nurses also had an overall negative attitude to patient safety, rating the domains from 45 – 71 (Alayed et al. 2014). A further study using the SAQ-ICU in an Iranian ICU also found nurses reported a negative attitude to patient safety with responses of <75 in all domains (Abdi et al. 2015).

The two domains of perception of management and working condition were rated extremely low by respondents. The findings were consistent with previous studies where respondents rated the domains of perception of management and working condition at 54.3 (mean) and 59.1 (mean) respectively (Choboyer et al. 2013). Likewise, nurses rated the two domains with a mean of 48.9 for perception of management and 53.9 for working conditions (Huang et al. 2010). These two domains consist of items related to staff ratio, leadership, staff recognition and management. The low score in these two domains indicates that respondents had poor attitudes towards hospital environment, logistics supports, training and reward systems. A previous study suggests that ICU staff view hospital administration as a problem which could impact negatively on patient safety (Choboyer et al. 2013).

The job satisfaction domain items were rated the highest among items in other domains. The domain was rated significantly higher in Hospital A than Hospital B, which was almost close to the positive point. Respondents from both settings identified positively to the statement “like their job”. Hospital A respondents were positive that they felt “proud to work at their hospital”, and they felt that “morale in their ICU high”. In this regard, the current study concurs with a similar study where nurses in five ICUs in Cyprus offered extremely high scores to “like my job” (mean 98.4), “proud to work at their hospital” (mean 81.4) and perceived a high morale (mean 75.8) (Raftopoulos & Pavlakis 2013).

The variation in the two hospitals could be related to hospital management attitudes and culture of the ICU. Hospital B respondents felt negatively about the item “morale in this ICU is high”, which may indicate poor commitment to their job in their ICU. That may be related to staff shortage, dissatisfaction with managers or lack of teamwork. Raftopoulos and Pavlakis (2013) found in their study that respondents rated the morale in ICU with positive scores indicating a strong commitment to their job. Two positively scored items, “like my job” and “the hospital is good place to work”, were correlated to high morale among nurses despite their negative responses to fatigue and

exhaustion. Other factors relating to high morale could be large ratios of nurses in the ICU and the cultural diversity in the country (Raftopoulos & Pavlakis 2013).

The differences in culture may influence the responses of participant in this study. Almost half of participants reported that they would not feel safe being treated in their hospitals as a patient. The feeling of insecurity could be also related to the lack of communication among staff in their ICUs (Almutairi et al., 2013). The median years of work experience of respondents in this study was two years, which may at least in part may explain the scores of teamwork climate and stress recognition domains. When ICU staff have more years of experience, their perception on teamwork will be positive (Raftopoulos & Pavlakis 2013). A safety climate in ICUs reflects on the safety of patient, and the management of adverse events and errors (Raftopoulos & Pavlakis 2013).

The stress recognition domain was rated low by all respondents and very low by Hospital B respondents. Over 80% of respondents in this study were under the age of 29, which may explain the low scores in stress recognition. Such findings could be attributed to certain coping mechanisms that can be applied during stressful events, with young nurses being significantly more likely to cope with stressors than older nurses (Raftopoulos & Pavlakis 2013). As indicated in the current study, there was a significant association between years of experience and age of respondents and their stress recognition. When the years of experience in speciality and age increases, the stress recognition among staff would be significantly more likely to be recognised (Raftopoulos & Pavlakis 2013).

Nurses and leaders shared similar attitudes to patient safety, as did physicians and nurses. However, overall, the results showed that leaders had better attitudes than bedside nurses towards patient safety, particularly in the perception of management domain. This is consistent with the Huang et al. (2010) study where leaders rated the six domains higher than bedside nurses. One explanation could be that leaders have more involvement in quality projects and educational and safety programs (Chaboyer et al. 2013). The findings form this study showed that physicians tended to

rate the majority of domains higher than nurses. Another study revealed similar findings where physicians rated all domains (mean 81.2 - 69.1) higher than nurses did (mean= 72.5-59.9) (Huang et al 2010). Variation between nurses and physicians have previously been attributed to several factors such as status, gender, qualifications, training and responsibilities, which may influence their decisions (Chaboyer et al. 2013).

Respiratory therapists and physicians shared similar attitudes except on stress recognition. Respiratory therapists rated five domains similar to physicians, but not stress recognition, where the latter rated it higher (mean 74.9) than respiratory therapists (mean= 60.5) in a previous study (Thomas et al. 2003). However, the reasons for these differences were not discussed. In this study, the majority of respiratory therapist respondents were originally nurses, and they were assigned to the respiratory units to cover staff shortages and bypass certain requirements of the accreditation agency. Thus, whilst they responded differently to nurses in some questions, their responses to the questionnaires may not reflect the overall safety culture of the registered respiratory therapists. One of the highlighted results of respiratory therapists was the positive response to the job satisfaction domain in this study. There is a lack of evidence in the literature to confirm the association between respiratory therapists and job satisfaction. Given the key role that respiratory therapists play in ICUs in some countries, further research to explore this hypothesis is warranted.

Respondents tended to rate communication and collaboration higher with Charge Nurses than with any other personnel. A possible explanation could be that Charge Nurses have a pivotal role in ICUs as they act as open communication channels between bedside nurses and other team members. Physicians rated their collaboration and communication with nurses higher than nurses did among themselves. Aydon et al. (2014) obtained similar results to this study, which indicated that physicians tended to rate collaboration and communication with nurses as high. Respondents identified key areas for improvement in patient safety in ICUs including staffing levels, communication and teamwork skills and administration supports. Similar to previous findings where participants identified provision of training, education, resources and guidelines and

improved communication with ICU managers as issues relating to patient safety (Alayed et al. 2014, Huang et al. 2010).

Limitations

This study had some limitations. Firstly, convenience sampling was used. This type of sampling strategy is a self-selection one. Respondents who self-select may not be appropriate to the research study potentially leading to bias and negatively impacting the study outcomes (Schneider & Fisher 2013). The second limitation was that the results are not generalisable to other healthcare facilities due to the sample of only two ICUs in Saudi Arabia. A further limitation is the responses from respiratory therapists, many of whom were previously registered nurses. Finally, the results are based on self-reported questionnaires. Self-reporting may contribute to bias as respondents may answer the questionnaire according to their social needs (social response bias), rather than give honest responses (Polit & Beck 2010).

Conclusion

This study provided a snapshot of participants' attitudes towards patient safety, revealing significant challenges for safety culture in two ICUs in Saudi Arabia. Findings were that healthcare professionals had a negative attitude towards patient safety according to six safety domains. Key issues identified were job satisfaction, stress recognition, collaboration and communication, staffing levels, training and education and resources and guidelines. Further research into this complex issue is crucial including interviewing staff to further explore these study results.

Implication for nursing management

Internationally, patient safety in ICU will remain a high priority into the future. Nurse managers need an awareness of the multiple, complex factors that can potentially impact on patient safety. The findings of this study have added to the limited literature available regarding Saudi Arabian

ICU health professional's perspectives of patient safety issues. This study may contribute to managers, policy makers and researchers, to examine patient safety issues and developing strategies to address the identified issues, in all ICUs.

One recommendation would be to critically review international practices and models for patient care ratios in ICUs. Managers need to implement a reliable model that is reflective of the workload associated with caring various patients in the ICU. This could also have wider implications for managers as it could contribute to workforce planning, recruitment and education requirements for ICU staff. Ultimately impacting on patient safety through improving job satisfaction, retention and decreasing stress amongst staff (Adomat 2004).

Another implication the need to focus on the significant role management and leadership play in patient safety within their ED. Improving the presence of managers and hospital administration in ICUs is highly recommended. This has the ability to improve trust and respect, and gives the opportunity for managers to listen to feedback from staff. There needs to be a focus on identifying leaders within the ICU, who are able to support staff. Once identified it is recommended that leaders attend educational programs, tailored to ICUs, to improve teamwork, leadership and communication, potentially positively impacting on patient safety (Clancy & Tornberg 2007).

A further implication is shift allocation. Quality, safe patient care needs to be the priority when allocating staff during a shift. Staff should be allocated according to their competency assessment, qualifications and past experiences, not according to their nationality or preferences (Chaboyer et al. 2013). Managers need to have the skills to deal with the challenges that this would create in ICUs with multicultural workforces. Managers need to have well developed effective communication and conflict resolution skills to manage this situation.

Further research into this global health priority is required to contribute to improving patient safety in healthcare. Also, nurse managers and researchers are encouraged to use the SAQ-ICU with other methods such as interview to identify the behaviour of participants towards patient safety.

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Conflict of interest

There were no financial or personal matters of conflict.

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Table 1: Demographic Information (n=144)

	n	%
Age (years)		
<25	12	8.3
25-29	83	57.6
30-34	24	16.7
>35	21	14.6
Gender	n	%
Male	26	18.1
Female	118	81.9
Ethnicity	n	%
Black	1	0.7
White	3	2.1
Asian	106	73.6
African	4	2.8
Middle Eastern	29	20.1
Missing	1	0.7
Job Category	n	%
Charge Nurse	6	4.2
Head Nurse/Unit Manager	4	2.8
Registered Nurse	96	66.7
Medical Resident	16	11.1
Intensivist	7	4.9
Respiratory Therapist	15	10.4
Experience	median	IQR
Years of Employment (years)	3.0	1.75,7
Critical care experience (years)	2.0	1, 4
Job Status	n	%
Full Time	144	100
Usual Shift	n	%
Days	21	14.6
Evenings	2	1.4
Nights	118	81.9
Other	118	81.9
Missing	1	0.7
Admissions	median	IQR
Average monthly patient admissions by physician (n=23) to unit	60	40,70
Previously Completed Survey	n	%
Yes	3	2.1
No	140	97.2
Don't know	1	0.7

Table 2: Total scores of the six SAQ-ICU domains

SAFETY CLIMATE		Total Sample (n= 144)	Hospital A (n= 94)	Hospital B (n= 50)	% +ve responses (>75)	P Value
		Mean (SD)	Mean (SD)	Mean (SD)		
4	I would feel safe being treated here as a patient.	63.72 (24.53)	64.63 (24.15)	62.00 (25.37)	51.4	0.54
5	Medical errors are handled appropriately in this ICU.	68.06 (24.99)	67.55 (25.09)	69.00 (25.03)	57.6	0.74
11	I receive appropriate feedback about my performance.	44.62 (29.88)	40.16 (30.94)	53.00 (26.07)	27.1	0.014
22	I am encouraged by my colleagues to report any patient safety concerns I may have.	67.71 (22.88)	68.35 (22.05)	66.50 (24.54)	66.7	0.65
30	I know the proper channels to direct questions regarding patient safety in this ICU.	70.14 (27.78)	74.20 (23.89)	62.50 (32.83)	66.7	0.016
12	In this ICU, it is difficult to discuss errors.	53.13 (27.56)	55.05 (28.30)	49.50 (26.00)	38.2	0.25
23	The culture in this ICU makes it easy to learn from the errors of others.	57.29 (27.71)	58.78 (30.83)	54.50 (20.63)	41.7	0.38
TOTAL		60.66 (12.67)	61.25 (13.20)	59.57 (11.67)	49.9	0.45
TEAMWORK CLIMATE						
37	It is easy for personnel in this ICU to ask questions when there is something that they do not understand.	73.43 (20.95)	76.34 (18.19)	68.00 (24.76)	77.1	0.02
36	I have the support I need from other personnel to care for patients.	68.06 (24.81)	70.48 (21.68)	63.50 (29.54)	63.9	0.11
3	Nurse input is well received in this ICU.	70.80 (22.40)	69.35 (20.57)	73.50 (25.46)	63.9	0.29
26	In this ICU, it is difficult to speak up if I perceive a problem with patient care.	53.32 (28.39)	55.38 (28.52)	49.50 (28.34)	41.7	0.24
32	Disagreements in this ICU are resolved appropriately (i.e., not who is right but what is best for the patient).	61.71 (27.55)	66.40 (25.40)	53.00 (29.73)	56.3	0.005
40	The physicians and nurses here work together as a well-coordinated team.	62.15 (28.20)	61.70 (29.03)	63.00 (26.84)	53.5	0.79
TOTAL		64.91 (13.00)	66.55 (06.78)	61.75 (13.41)	59.4	0.03

STRESS RECOGNITION						
27	When my workload becomes excessive, my performance is impaired.	71.53 (28.14)	77.13 (26.35)	61.00 (28.64)	69.4	0.001
34	I am more likely to make errors in tense or hostile situations.	57.29 (34.59)	65.69 (32.79)	41.50 (32.58)	45.8	0.000
49	Fatigue impairs my performance during emergency situations (e.g. emergency resuscitation, seizure).	50.35 (32.92)	55.59 (30.93)	40.50 (34.59)	50.0	0.008
33	I am less effective at work when fatigued.	63.89 (32.09)	68.88 (29.71)	54.50 (34.51)	58.3	0.01
TOTAL		60.76 (24.17)	66.82 (23.72)	49.38 (20.83)	55.9	0.000
PERCEPTIONS OF MANAGEMENT						
18	Hospital management does not knowingly compromise the safety of patients.	55.42 (28.48)	52.39 (26.71)	61.22 (31.07)	39.6	0.08
10	Hospital administration supports my daily efforts.	35.94 (29.67)	34.31 (31.96)	39.00 (24.83)	20.8	0.37
28	I am provided with adequate, timely information about events in the hospital that might affect my work.	60.66 (24.73)	58.87 (22.01)	64.00 (29.08)	47.9	0.24
19	The levels of staffing in this ICU are sufficient to handle the number of patients.	35.99 (33.85)	32.88 (34.95)	41.84 (31.20)	27.1	0.14
TOTAL		47.14 (19.00)	44.68 (19.10)	51.75 (18.12)	33.9	0.03
WORKING CONDITION						
7	All the necessary information for diagnostic and therapeutic decision is <u>routinely available to me</u> .	66.67 (23.09)	66.49 (21.55)	67.00 (25.97)	66.7	0.90
24	This hospital deals constructively with problem personnel.	56.08 (26.65)	59.57 (24.89)	49.50 (28.79)	43.1	0.03
45	Trainees in my discipline are adequately supervised.	56.42 (29.23)	56.65 (29.82)	56.00 (28.37)	48.6	0.90
6	This hospital does a good job for training new personnel.	55.03 (32.60)	49.47 (33.19)	65.50 (28.97)	47.2	0.005
TOTAL		58.55 (18.62)	58.05 (18.37)	59.50 (19.24)	51.4	0.66

JOB SATISFACTION						
2	I like my job.	86.98 (21.92)	86.44 (22.80)	88.00 (20.35)	84.7	0.69
15	This hospital is a good place to work.	60.07 (29.61)	65.69 (25.92)	49.50 (33.31)	53.5	0.002
31	I am proud to work at this hospital.	73.44 (27.45)	78.99 (23.27)	63.00 (31.64)	73.6	0.001
8	Working in this hospital is like being part of a large family.	57.99 (29.81)	55.59 (29.59)	62.50 (29.99)	48.6	0.19
44	Morale in this ICU is high.	73.43 (24.32)	80.38 (19.80)	60.50 (26.77)	68.1	0.000
TOTAL		70.36 (14.94)	73.38 ± 13.50	64.70 ± 15.99	66.7	0.001

Table 3: Comparison of the SAQ-ICU domains

	n	Score, mean(SD)						
		Safety climate	Teamwork	Stress	Perception of	Working	Job satisfaction	Overall
		climate	recognition	Management	condition			
Bedside Nurses	96	60.2 (13)	64.8 (11.9)	62.4 (24.5)	44.3 (19.4)	57.9 (19.5)	68.1 (15)	60.6 (07.1)
Leaders	10	65 (14.5)	68.3 (16.3)	46.8 (29.9)	58.1 (14.1)	65.6 (19.6)	73 (19.7)	65.3 (08.6)
P		0.22	0.40	0.07	0.015*	0.24	0.35	0.052
Nurses	96	60.2 (13)	64.8 (11.9)	62.4 (24.5)	44.3 (19.4)	57.9 (19.5)	68.1 (15)	59.6 (09)
Physicians	23	60.2 (13.6)	64.6 (17.8)	66.5 (20.3)	48.6 (19.6)	58.7 (16)	72.7 (10.7)	61.9 (09.1)
P		0.99	0.94	0.46	0.34	0.86	0.18	0.28
Respiratory Therapists	15	61.1 (6.9)	63.3 (8.3)	50.4 (17.5)	55.4 (12.9)	57.5 (16.4)	79 (13.7)	61.1 (5.3)
Physicians	23	60.2 (13.6)	64.6 (17.8)	66.5 (20.3)	48.6 (19.6)	58.7 (16)	72.7 (10.7)	61.9 (9.1)
P		0.81	0.79	0.016*	0.25	0.83	0.12	0.77
Male	26	60.5 (12.7)	66.7 (13.7)	66.3 (20.4)	49.5 (19.9)	58.1 (15.7)	71.7 (9.5)	62.1 (8.4)
Female	118	60.6 (12.7)	64.4 (12.8)	59.5 (24.8)	46.6 (18.8)	58.6 (19.2)	70 (15.9)	60 (8.8)
P		0.97	0.42	0.19	0.48	0.91	0.61	0.25

* Significant at Level 0.05

Table 4: Overall participant rating of the quality of collaboration and communication with colleagues

Quality of collaboration and communication with	Mean (SD)
Charge Nurse	3.8 (0.9)
Critical Care Resident	3.6 (1.1)
Nurse Manager/Head Nurse	3.5 (1)
Critical Care Registered Nurse	3.5 (1.3)
Respiratory Therapist	3.3 (1)
Critical Care Intensivist	3.3 (1.4)
Physician (Medical)	3.3 (1)
Physician (Surgical)	3.2 (0.9)
Pharmacist	2.7 (1)
Fellow (Surgical)	2.6 (3.9)
Fellow (Medical)	2.3 (1.6)
Critical Care LVN/LPN	1.1 (1.7)
Nursing Aide	1 (1.6)
Secretary	0.8 (1.5)
Overall Mean	2.7 (0.8)

Table 5 Healthcare professionals' recommendations to improve ICU patient safety

Recommendation (Categories)	% (n =19)	Verbatim responses
Staffing level	10 (53%)	<p>“Adequate staff is needed”</p> <p>“Nurse patient ratio 1:1”</p> <p>“Improve the ration rate to 1:1”</p> <p>“Nurse to patient ration must be improved”</p> <p>“Additional staff in ICU for ventilated patient should be 1:1”</p>
Communication and teamwork skills	6 (32%)	<p>“More and better communication with society”</p> <p>“Improve communication with managers”</p> <p>“ Good communication among caregivers”</p> <p>“Proper endorsement”</p> <p>“ Teamwork is needed”</p> <p>“Teamwork”</p> <p>“Reporting medical incidents for improvement”</p>
Training and Education	9 (47%)	<p>“Proper training to new staff”</p> <p>“New staff should have at least three months orientation program-departmental”</p> <p>“Need more training”</p> <p>“Identify patient correctly”</p> <p>“Improve hand hygiene compliance”</p> <p>“Fair staff evaluation”</p>
Resources and Guidelines	6 (32%)	<p>“Follow medical guidelines”</p> <p>“Adequate supplies(surgical)”</p> <p>“Improve the incidence reporting system”</p> <p>“Provide barrier protection to stop infection”</p>

		“Provide more equipment for patient safety purposes”
		“Document patient preferences for life sustaining treatment”
Administration support	7 (37%)	“More roles from the administration” “Administration support” “Change or improve the admin” “Give off days on time, even the unit is so busy” “Equal treatment to non-Saudi and Saudi is a must” “Salary should increase properly. We should be financially compensated”