



Teamwork Conflicts; Medical Errors and Patient Safety as Perceived by Nurses: A Cross-Sectional Study of Selected Hospitals in Hail City; Saudi Arabia

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Authors' contributions

This work was carried out in collaboration among all authors. Authors HFA and BA designed the study. Author FDA performed the statistical analysis. Authors HFA and FDA wrote the protocol and wrote the first draft of the manuscript. Author RDD managed the analyses of the study. Author BKA managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Patient safety is a global problem and one of the key elements of the quality of health care systems. The human factor is a major risk factor leading to medical errors that affect patient safety. To explore the impact of this factor on patient safety in the hospitals located in the Ha'il city in Saudi Arabia; the perceptions of nurses working in governmental hospitals were assessed using a self-structured questionnaire. Descriptive statistics were presented for the studied variables. Significant

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differences between the categories of the respondents' characteristics in relation to risk factors were assessed using the Mann-Whitney test; the Kruskal-Wallis and the Spearman rank correlation test. Only 50% of the factors tested were perceived as moderate risk factors that were negatively affecting patient safety in Ha'il hospitals; namely: 'Poor teamwork among medical staff'; 'Unqualified medical staff' and 'Miscommunication among medical staff'. The substantial differences among demographic characteristics of the study sample in relation to the human resources risk factors causing medical errors was identified at $P < 0.05$. Although the human risk factors were ranked as low to moderate; attention to and concern for all risk factors is needed by policymakers and hospital managers in order to improve patient safety in the healthcare settings in the Ha'il city in KSA.

Keywords: Patient safety; medical errors; human resources factor; teamwork; team conflict; Saudi Arabia.

1. INTRODUCTION

Medical errors remain a global issue facing the healthcare industry. Despite the significant improvement in the provision of healthcare services, the number of significant medical errors reported (MEs) remains increasing. The world health organization (WHO) adopted the definition of MEs as 'An error is a failure to carry out a planned action as intended or the application of an incorrect plan (commission or omission), at either the planning or execution phase' [1]. Studies have shown that MEs are the third most common cause of death in the United States leading to illness and death in hospitals, accounting for up to 6.5% of hospital admissions [2–5]. The responsibility of MEs is primarily relying on the health system, medical staff and patients. In this context, it has been estimated that 70-80% of MEs are attributed to human factors linked to interpersonal interaction [6].

Several studies have emphasized that the factors and conditions associated with the existence of the MEs include individual characteristics (e.g., age, gender, length of experience, type of qualifications) and work environment characteristics (e.g., medical department and safety conditions) [7–15]. In this context, it has been recognized that poor teamwork and weak communication among medical staff as the most common reasons of MEs [16–18].

Studies have demonstrated that effective teamwork (which includes communication, coordination, cooperation, attitude monitoring, and other behaviors) is responsible for a large variation in MEs [19–22]. For example, one study indicated that the risk of medical errors and complications in surgery increases by five times when teamwork behaviors are lower [23]. Therefore, the weakness of teamwork - such as incomplete communication and failure to use available expertise - which increases the risk of

medical error due to its fateful impact on the lives and safety of patients cannot be underestimated [3,24,25].

The study of patient safety within the health care system has been receiving an increasing attention of the scholars across the globe including Saudi Arabia. The Saudi Ministry of Health (MOH) receives 40,000 complaints about incidents involving MEs every year. After further investigations, 20% (8,000 cases) of these complaints have been proven to be actual medical errors [26]. However, the rate of MEs that is reported by the MOH does not reflect the real magnitude of the problem in the Saudi Healthcare System, since a large proportion of medical errors is not documented, especially in rural areas [27]. Al-Ahmadi (2008) has conducted a study on measuring patient safety culture in Riyadh's hospitals and tried to explore the perceptions of staff on patient safety, error reporting and factors that influence the levels of frequency of events reported. The study compared the public and private hospitals and found the key areas that need an improvement in public hospitals are handoffs and transitions, communication openness, staffing, and non-punitive response to error; whereas in private hospitals the areas that need an improvement are staffing and non-punitive response to error. The study also found that the event reporting was influenced by feedback and communication about error, staff position, teamwork across units, non-punitive response to error, supervisor/managers expectations and actions promoting patients safety, and type of hospital. The study suggests that the healthcare organizations should reduce the fear of blame culture and create a climate of open communication and continuous learning [10]. The study on factors affecting nurses' perceptions of patient safety by Mwachofi and colleagues [28] has made an attempt to examine socioeconomic

and organizational/system factors affecting patient safety and quality perceptions [28]. The data collected from 566 nurses in five hospitals located in Riyadh, Saudi Arabia. According to the study, factors that improve patient safety and the likelihood that nurses use their own facility include: fewer visible errors; ability to communicate suggestions; information technology support and training; and a confidential error reporting system. The study found that the system factors, including functional feedback, suggestions, and error reporting significantly affect patient safety improvements. It also found that the nurses' education to operate their information systems has positive effects. Zakari [29] has conducted a study on attitude of academic ambulatory nurses toward patient safety culture in Saudi Arabia [29]. The study recommended that enhancing the quality of collaboration between personnel and the proactive organizational commitment to safety might promote safety culture in academic care settings. It further recommended that the assessment of workplace safety culture is the first step in identifying barriers that nurses face to provide safe patient care. A study conducted by Almutairi, A. F. (2012), investigates the influence of cultural diversity, in a multicultural nursing workforce, on the quality and safety of patient care and the work environment at King Abdul-Aziz Medical City, Riyadh region. The authors revealed a significant difference between cultural background categories and perception of safety climate. The study argues that multicultural nature of nursing work environment is inherently risky due to the conflicts that arise from the different cultural norms, beliefs, behaviours and languages. Furthermore, there was uncertainty within the multicultural nursing workforce about the clinical and cultural safety of the patient care environment and about the cultural safety of the nursing workforce [30].

A cross sectional study was conducted by El-Jardali et al. [28] on patient safety culture in a large teaching hospital in Riyadh. The regression analysis found the associations between higher patient safety aggregate score and greater age (46 years and above), longer work experience, having a Baccalaureate degree, and being a physician or other health professional. The study also found that patient safety practices are crucial towards improving overall performance and quality of services in healthcare organizations [31].

In the current study, we strive to investigate (i) what are the underlying human resources related factors causing medical errors in the MOH hospitals of Hail region in KSA? and (ii) are there substantial differences among demographic characteristics of the study sample in relation to the human resources risk factors causing medical errors?

2. RESEARCH DESIGN AND METHODOLOGY

This study adopted a descriptive method by applying a cross-sectional survey, using self-administered questionnaires for data collection. Responses were collected from nurses affiliated to 3 major hospitals in Ha'il city that are King Khalid Hospital, Hail General Hospital, and Maternity and Children's Hospital. The permission of these hospital authorities has been obtained to conduct this study. The study was conducted according to the guidelines of the Declaration of Helsinki. A voluntary response sampling method was employed to recruit the participants to complete the questionnaire. The informed consent which identified study details and purpose was presented before the questionnaire was started. No personal information of the participants was requested by the survey. Participants had a choice to complete either the English or Arabic version of the questionnaire. A structured questionnaire method consisting of several sections representing several dimensions (i.e. the system, the patient and the human resources risk factors) distributed into 450 nurses working in the selected hospitals. For the current study, only the dimension of human resources risk factor were considered, while other factors were studied independently in other articles. Two sections from this survey were concerned for the purpose of this study. The first section covered the characteristics and demographics of the participants while the second section investigated nurses' perceptions toward the dimension of human resources risk factors causing MEs. Survey response rate was 54.66% (n=246).

2.1 Validity and Reliability

The study assessed both face and content validity according to Hoskins (1985) [32]. The value of Cronbach's alpha of the scale was considered reliable as it is greater than 0.80.

2.2 Data Analyses

Input data were analyzed using the SPSS Statistics 22.0 (IBM SPSS Statistics, New York, NY, USA). Descriptive statistics (means, standard deviations (SD), and frequencies) were presented for the studied variables. The level of statistical significance was set at $p < 0.05$. The human resources risk factors were ranked according to the mean of the whole scale by applying Friedman test [33]. To understand the variation in perception of the risk factors in the study population, further analyses were undertaken. In particular, the Mann-Whitney and Kruskal-Wallis tests were carried out. The Mann-Whitney test was used to seek significant differences between two categories of the respondents' characteristics in relation to risk factors. These included: respondents' gender and nationality. The Kruskal-Wallis test was used to test the significant differences among respondents' perceptions of risk factors according to their medical specialty. In addition, the Spearman rank correlation test was used to test for correlations between demographic ordinal variables (i.e. age, professional level and duration of medical practice) and risk factors

3. RESULTS

3.1 Validity and Reliability

Cronbach's alpha was used to measure the reliability of the risk factors scale. The scale of the current study was considered reliable since alpha was greater than 0.80 for the risk factors scale (0.845). Tables 1 and 2 shows the reliability analysis of the risk factors and the scale respectively.

3.2 Demographic Characteristics

The demographic characteristics of respondents were assessed using descriptive statistics analysis. Six demographic variables were

included namely; age, gender, nationality, medical department, work experience and professional level (Table 3). Our data showed that more than half of the respondents were within the age group 20-29 and citizens (58.1% and 57.3% respectively). The data also showed that most (98.4%) of the respondents were female nurses. Moreover, the analysis revealed that most of the respondents belong to obstetrics and gynaecology department (43.5%). The data also showed that almost half of the respondents (49.2%) had less than five years of work experience. Finally, it has been shown that over half of the study sample (54.9%) is nursing technicians.

3.3 Risk Factors for Patient Safety

The respondents' perceptions for existence of human risk factors in the MOH hospitals are outlined in Table 4. Additionally, the risk factors were also ranked in descending order according to the mean rank score.

3.4 Differences among Characteristics of the Study Sample in Relation to the System Risk Factors

3.4.1 Age

The Spearman rank correlation test was used to test the correlations between respondents' age and the human behavior risk factors for patient safety. As shown in Table 5, the significance level of $P < 0.05$ indicated that there were significant positive associations between the "age" variable and the risk factors 'poor teamwork among medical staff' and "misdiagnosis by physicians", suggesting that these factors were perceived to exist by older nurses more than their younger counterparts.

Table 1. Reliability analysis of the risk factor scale

Risk Factor	Cronbach's alpha if item deleted
Poor teamwork among medical staff	.846
Weak commitment in following safety protocols (e.g. hand hygiene) among medical staff	.845
Negligence of medical staff	.845
Misdiagnosis by physicians	.847
Unqualified medical staff	.842
Miscommunication among medical staff	.844
Cronbach's Alpha	.845

Table 2. Reliability statistics - Scale

Cronbach's Alpha	N of Items
.845	6

Table 3. Age, gender, and nationality of respondents

Age	Frequency	Percent
less than 20	6	2.4
20 to 29 years old	143	58.1
30 to 39 years old	61	24.8
40 and above	36	14.6
Gender		
Male	4	1.6
Female	242	98.4
Nationality		
Saudi	141	57.3
Non-Saudi	105	42.7
Department		
OB/GNY	107	43.5
Internal Medicine	14	5.7
Emergency Room	17	6.9
Paediatrics	49	19.9
Surgery	16	6.5
Other	43	17.5
Work experience		
Less than 5 years	121	49.2
5 to 9 years	74	30.1
10 to 14 years	32	13.0
15 years and more	19	7.7
Professional level		
Nursing technician	135	54.9
Registered nurse	105	42.7
Others	6	2.4
Total	246	100.0

Table 4. Frequency distribution and ranking of the risk factors for medical errors

Risk factor	Does not exist		Somewhat exists		Exists		Total		Mean	Rank
	n%	n%	n%	n%	n%	n%	n%			
Poor teamwork among medical staff	62	25.2	128	52.0	56	22.8	246	100	10.53	1st
Weak commitment in following safety protocols (e.g. hand hygiene) among medical staff	85	34.6	107	43.5	54	22.0	246	100	9.59	6th
Negligence of medical staff	73	29.7	126	51.2	47	19.1	46	100	9.61	5th
Misdiagnosis by physicians	66	26.8	139	56.5	41	16.7	246	100	9.72	4th
Unqualified medical staff	56	22.8	140	56.9	50	20.3	246	100	10.44	2nd
Miscommunication among medical staff	52	21.2	149	60.6	45	18.3	246	100	10.29	3rd

3.4.2 Gender and nationality

Gender: The Mann-Whitney test was performed to assess the differences based on the gender of nurses in relation to the human factors tested. There was no significant difference between

male nurses and female nurses in relation to the all human risk factors (Table 6).

Nationality: Table 7 shows there were statistically significant positive differences between citizens and residents nurses in relation to the human

behavior risk factors (i.e. poor teamwork among medical staff) in favor of residents' nurses.

3.4.3 Medical department

Kruskal-Wallis analysis showed that there were significant differences among nurses working in different medical departments in relation to three human factors: 'negligence of medical staff' as well as 'unqualified medical staff' with the highest mean in nurses' perceptions working in the emergency department and 'misdiagnosis by physicians' with the highest mean in nurses' perceptions working in internal medicine department (Table 8).

3.4.4 Work experience

The results of the Spearman rank correlation test showed that there were no significant associations between the variable "work experience" and any of the human factors (Table 9).

3.4.5 Professional level

Results of the Spearman rank correlation analysis showed that there is a statistically significant positive association between the professional level of nurses and all human factors except one human factor which is 'misdiagnosis by physicians', as shown in the Table 10.

Table 5. Correlation between nurses' age and human factors

Risk Factor	Correlation Coefficient	P-value
Poor teamwork among medical staff	.144	.024
Weak commitment in following safety protocols (e.g. hand hygiene) among medical staff	.117	.067
Negligence of medical staff	-.013	.844
Misdiagnosis by physicians	.141	.027
Unqualified medical staff	-.091	.157
Miscommunication among medical staff	.000	.999

Table 6. Differences in perceptions of nurses in relation to human factors by gender

Risk factor	Gender	Mean rank	P-value
Poor teamwork among medical staff	Male	102.00	.504
	Female	123.86	
Weak commitment in following safety protocols (e.g. hand hygiene) among medical staff	Male	135.13	.723
	Female	123.31	
Negligence of medical staff	Male	108.38	.639
	Female	123.75	
Misdiagnosis by physicians	Male	155.38	.311
	Female	122.97	
Unqualified medical staff	Male	149.50	.409
	Female	123.07	
Miscommunication among medical staff	Male	75.88	.122
	Female	124.29	

Table 7. Differences in perceptions of nurses in relation to human factors by nationality

Risk factor	Gender	Mean Rank	P-value
Poor teamwork among medical staff	Saudi	113.76	.006
	Non-Saudi	136.59	
Weak commitment in following safety protocols (e.g. hand hygiene) among medical staff	Saudi	117.54	.102
	Non-Saudi	131.50	
Negligence of medical staff	Saudi	118.58	.168
	Non-Saudi	130.11	
Misdiagnosis by physicians	Saudi	119.53	.255
	Non-Saudi	128.83	
Unqualified medical staff	Saudi	120.30	.360
	Non-Saudi	127.80	
Miscommunication among medical staff	Saudi	119.18	.206
	Non-Saudi	129.30	

Table 8. Differences in perceptions of nurses from different medical departments in relation to human factors

Risk Factor	Medical department	Mean rank	P-value
Poor teamwork among medical staff	OB/GYN	124.05	.055
	Internal Medicine	152.79	
	Emergency Room	109.38	
	Pediatric	116.07	
	Surgery	90.69	
	Others	138.85	
Weak commitment in following safety protocols (e.g. hand hygiene) among medical staff	OB/GYN	124.29	.149
	Internal Medicine	148.29	
	Emergency Room	153.38	
	Pediatric	118.20	
	Surgery	101.06	
	Others	116.02	
Negligence of medical staff	OB/GYN	123.40	.007
	Internal Medicine	134.64	
	Emergency Room	159.65	
	Pediatric	118.57	
	Surgery	73.50	
	Others	130.06	
Misdiagnosis by physicians	OB/GYN	131.51	.041
	Internal Medicine	147.96	
	Emergency Room	145.12	
	Pediatric	107.02	
	Surgery	106.47	
	Others	112.16	
Unqualified medical staff	OB/GYN	125.94	.003
	Internal Medicine	140.07	
	Emergency Room	165.44	
	Pediatric	113.89	
	Surgery	77.31	
	Others	123.59	
Miscommunication among medical staff	OB/GYN	123.66	.052
	Internal Medicine	140.86	
	Emergency Room	155.32	
	Pediatric	118.15	
	Surgery	88.66	
	Others	123.93	

Table 9. Correlation between nurses' work experience and human factors

Risk factor	Correlation coefficient	P-value
Poor teamwork among medical staff	.093	.144
Weak commitment in following safety protocols (e.g. hand hygiene) among medical staff	.096	.134
Negligence of medical staff	-.044	.493
Misdiagnosis by physicians	075	.242
Unqualified medical staff	-.085	.184
Miscommunication among medical staff	-.001	.990

4. DISCUSSION

The study highlights the impact of human risk factors on patient safety in MOH hospitals located in the Hail region. The study showed that patient safety correlated to human risk factors is perceived by the respondents to be violated by a combination of factors. It was

found that half of the human-level risk factors were perceived as the top human risk factors. However, these factors including 'Poor teamwork among medical staff', 'Unqualified medical staff' and 'Miscommunication among medical staff' were perceived to exist in the MOH hospitals at the moderate level "somewhat exists".

Table 10. Correlation between nurses' professional level and the human factors

Risk factor	Correlation coefficient	P-value
Poor teamwork among medical staff	.397	.000
Weak commitment in following safety protocols (e.g. hand hygiene) among medical staff	.231	.000
Negligence of medical staff	.316	.000
Misdiagnosis by physicians	.110	.084
Unqualified medical staff	.294	.000
Miscommunication among medical staff	.211	.001

The study also assessed the substantial differences among characteristics of the study sample in relation to the tested risk factors of patient safety. First, 'Poor teamwork among medical staff', which was perceived as the top risk factor, showed a statistically significant positive correlation with age, nationality (in favor of non-Saudi nurses), and the professional level of nurses. This may result from a better understanding of the complicated work processes involving various professionals and departments and the ways they work in teams over time. Another possible explanation is that the accumulated experience and job rank of these veteran nurses made them understand the importance of teamwork. Additionally, the diverse experiences of Saudi residents' nurses in foreign countries may make them understand the importance of teamwork. Indeed, Caring for patients is a team activity. Effective patient care relies on individual staff, in a ward or department, working together effectively. The team may comprise excellent individual nurses or doctors who are knowledgeable and skillful in a clinical sense, but for this to benefit patients, there also needs to be a good collaboration with each other. When errors happen, it is not usually due to a lack of technical knowledge about a disease or drug, but to poor communication or teamwork [34,35]. Thus, hospitals' executives should incorporate teamwork training programs, with a priority for younger medical staff, as part of their in-service education efforts for effective team building and functioning in Ha'il hospitals.

In the second rank, 'Unqualified medical staff' was also a moderate risk factor for patient's safety, as perceived by nurses from different medical departments, with the highest by the emergency room's nurses. These findings are consistent with other studies which found that this obstacle is more likely to occur in intensive care units, operating rooms and emergency services [7]. Moreover, our data also showed a statistically significant positive correlation

between the perception of different professional levels of nurses and the risk factor 'Unqualified medical staff'. Such a finding could be because nurses with higher professional levels are more aware of mistakes made by less qualified medical staff in particular short-experienced medical staff. Moreover, they might take some courses in patient safety or might have many years of experience.

Thirdly, 'Miscommunication among medical staff' was also perceived as a moderate risk factor of patient safety by the participants and showed a significant positive association with the professional level of nurses. Indeed, many studies showed that lack of communication among medical staff will create situations where medical errors can occur [18,36,37]. These errors have the potential to cause severe injury or unexpected patient death. In this context, it has been estimated that 80 % of serious safety events occur due to miscommunications among professionals [37].

Medical error is estimated to be the third most common cause of death [38]. Teamwork failures and miscommunication among medical staff account for up to 80% of serious medical errors. The top risk human factors that were perceived by nurses in this study synergically impact patient safety [24,25,39]. These risk factors are extremely connected each to others. Teamwork definitely requires good communication among a variety of specialties (e.g., nursing, physician specialties, physical therapy, social work) and using the available expertise and well-qualified medical staff to care for patients. Consequently, there is a critical need for health care professionals, particularly those in leadership roles, to consider strategies for improving team-based, effective communication among medical staff and supporting the medical staff with continuous training courses to ensure highly qualified employment which subsequently will enhance quality patient care.

On the other hand, the participants perceived 'Misdiagnosis by physicians', 'negligence of medical staff' and 'Weak commitment in following safety protocols (e.g. hand hygiene) among medical staff' as not existing risk factors (mean <9.96).

Although these risk factors were ranked lower compared with others, attention to and concern for all risk factors is needed by policy makers and hospital managers in order to improve patient safety in the healthcare settings. The findings of the study may have implications for improving healthcare delivery in the MOH hospitals. The study contributes to the knowledge of patient safety in Saudi Arabia and it offers some insights into the relationship between improving patient safety and factors that might hinder such improvement. Patient safety is an integral part of healthcare delivery, and achieving an acceptable standard of patient safety requires that all levels of a healthcare organization develop a common patient safety system, including both a positive culture of safety and the organizational support for the processes.

However, the study does have some limitations. The current study was limited to the MOH hospitals in one geographical area (i.e. Hail region) due to time constraints and the limited resources of project; hence the proposition that the study results are generalizable across the MOH needs to be investigated through further research. It is also important to note that safety is not just the domain of nurses. In the present study, inclusion of more than one group would have required a much larger sample with, consequently, the need for more time and more resources which were beyond the scope of the project. The future studies may look at the perceptions of other healthcare workers in other regions of the Saudi Arabia.

5. CONCLUSION

We investigated the underlying human resources factors causing medical errors in the MOH hospitals of Hail region in KSA and the substantial differences among demographic characteristics of the study sample in relation to the human resources risk factors causing medical errors. 'Poor teamwork among medical staff', 'Unqualified medical staff' and 'Miscommunication among medical staff' were perceived as moderate risk factors, while others were weak risk factors. Thus, our results indicated a moderate teamwork conflict among

medical staff, particularly nurses, in Ha'il hospitals. However, younger, Saudi and technicians' nurses had weak perceptions toward the significant of these factors in medical errors and patient safety. Therefore, training programs, with a priority for these groups, should be continuously conducted for building effective and functioning team in Ha'il hospitals.

CONSENT

The informed consent which identified study details and purpose was presented before the questionnaire was started.

ETHICAL APPROVAL

It is not applicable.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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