AI Big data analysis and application: Patient Safety Culture of Nursing Staff in an Operation Room

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Abstract

The objectives of this study were to investigate patient safety attitudes among operation room (OR) nursing staff by using the Safety Attitudes Questionnaire (SAQ) and to compare their safety attitudes with the entire hospital nurses'. This study investigated the factors affecting patient safety attitudes by the multivariate regression models. There was a significant association between resilience and safety climate after adjusting for age, gender, and career experience using the multiple-regression model. Perception of management was also significantly associated with job satisfaction. The survey data provide baseline information on OR nurses. The results can be used to follow-up on the effectiveness of quality improvement campaigns, caring Strategy, and patient safety education in the future. Establish a caring notification system. Achieve effective management.

Keywords: operating room, nursing staff, patient safety culture, safety attitudes scale

1. Introduction

"To Err Is Human," which is IOM's report, has aroused international attention to patient safety issues. The risk of medical errors in the operating room is higher than that of other medical units. However, the occurrence of medical errors is related to organizational culture, personal beliefs, attitudes, and values. Patient safety culture is considered to be the key to patient safety. Besides, safety culture surveys can assist in understanding patient safety issues, assessing personnel safety attitudes, and creating a safe medical environment that supports patients. Many patient safety studies have shown that improvements in safety attitudes and safety culture are significantly related to the reduction of medical errors. The purpose of this study is to understand the safety culture of nursing staff in the operating room and the factors that may affect the safety culture, to further compare with the data of the whole hospital, and to explore the difference between the safety of patients in the operating room and the whole hospital[1,2,3,6,8].

2. Materials and Methods

2.1. *Research tools: SAQ (Safety Attitudes Questionnaire)*

The Chinese version of the SAQ questionnaire has 40 questions in five dimensions-"teamwork climate," "safety climate," "job satisfaction," "perception of management, and "working conditions," distinguished according to Likert scale into strongly disagree, somewhat disagree, neutral, somewhat agree, and strongly agree. The content also includes basic demographic changes.

2.2. *Research objects*

The research objects are the nurses at a medical center and it takes about 5 minutes to fill out the online questionnaire.

2.3. *Data analysis*

The scores of each dimension are calculated as the average scores of the questions in the dimension, showing the scores of the safety attitudes of nurses of different genders, ages, and working years in the operating room. By nonparametric statistics, differences in scores of various dimensions of safety attitudes of nurses in operating rooms of different genders, ages, and years of

work are verified. By multiple regression, the influence of the SAQ dimension scores of the nurses in the operating room is explored. In order to compare the SAQ score difference between the operating room and the whole hospital nurses, the chi-square test is adopted to check whether the distribution of demographic characteristics is consistent to ensure the comparability of the nurses in the operating room with those of the whole hospital, so as to further explore whether different genders, ages, working years, and supervisor backgrounds of the nurses in the operating room and the whole hospital nurses affect the difference in scores.

3. Results

A total of 1613 nurses in the hospital answered, and the recovery rate was 69.6%; 102 nurses in the operating room answered, and the questionnaire response rate was 63.5%, with the internal consistency of the questionnaire 0.65 to 0.89. There is no significant difference between the operating room and the whole hospital in terms of supervisory positions, age, and working years of nurses (p> 0.05) (Table 3).

The scores of nurses in the operating room on each dimension are "teamwork climate" (71.6 ± 11.3), "safety climate" (69.3 ± 9.5), "job satisfaction" (67.5 ± 11.0), "working conditions" (67.8 ± 10.3), and "perception of management" (65.5 ± 10.2). There is no difference in the scores of nurses in operating rooms of different age groups. Operating room nurses with a working experience of 2 two to ten years have scores lower than those of more than ten years and less than two years, reaching significant difference on working conditions (61.2 vs. 75.1 vs. 73.3, p <0.01), shown in Table 1.

Table 1. SAQ dimension scores of the nursing staff in the operating room

	Teamwork Climate	*p* value	Safety Climate	*p* value	Job Satisfaction	*p* value	Perception of Management	*p* value	Working Conditions	*p* value
Nurses	71.6 (11.3)		69.3 (9.5)		67.5 (11.0)		65.5 (10.2)		67.8(10.4)	
Gender		1.00		0.25		0.06		0.13		0.03
Male	81.6 (7.5)		77.0(15.1)		78.5 (2.2)		75.0 (8.7)		81.5 (7.2)	
Female	66.0 (9.2)		68.1 (9.0)		66.7 (11.2)		65.0 (10.3)		66.3 (9.5)	
Supervisor Position		0.23		0.91		0.96		0.12		0.22
Yes	80.1 (-)		68.5 (-)		68.1 (-)		85.0 (-)		80.1 (-)	
No	67.2 (10.0)		69.4 (9.1)		67.8 (11.4)		65.3 (10.0)		67.1 (10.3)	
Age (years old)		0.18		0.81		0.91		0.64		0.49
< 31	67.6 (9.4)		68.5 (10.3)		68.1 (11.5)		65.0 (8.9)		67.5 (9.6)	
31~40	65.8 (14.9)		70.9 (10.65)		65.5(13.6)		68.0 (16.0)		65.9 (14.4)	
> 40	75.1 (7.1)		67.1 (2.1)		68.5(0)		72.5 (17.7)		75.5 (7.3)	
Working Experience (years)		0.19		0.33		0.21		0.11		<0.01
< 2	73.3 (10.1)		70.9 (10.3)		72.6 (9.2)		69.1 (10.5)		73.6 (10.2)	
2~10	61.2 (7.2)		66.1 (9.7)		65.1 (11.0)		61.5 (9.6)		61.5 (7.1)	
> 10	75.1 (9.0)		72.8 (7.5)		68.1 (9.8)		73.2 (11.0)		75.2 (9.3)	

Among the factors that affect the scores of nurses in the operating room, gender, supervisor position, age and working experience have no significant differences in the scores of nurses in the operating room. The scores of "teamwork climate" and "safety climate" of nurses in the operating room are affected by each other's dimensions. The scores of "job satisfaction" and "perception of management" also influence each other due to different job satisfaction or management perception degrees, as shown in Table 2.

The scores of nurses in the operating room in all dimensions are significantly lower than those of in the whole hospital. According to different gender, whether to hold a supervisory position, age, and working experience, the difference in scores between operating room nurses and whole hospital nurses is compared. Females, non-supervisors, and operating room nurses with 2-10-year working experience have significantly lower scores in

each dimension (p <0.05), as shown in Table 3. Multiple regression is used to analyze the influence of variables on the dimension score. Work unit is one of the factors that affect the dimension score. The scores of the nurses in the operating room in "teamwork climate" (= 75.3, SE = 1.1, R2 = 0.05), "safety climate" (= 74.2, SE =

1.2, R2 = 0.05), "perception of management" (= 70.2, SE = 1.5, R2 = 0.03), and "working conditions" (= 72.5, SE = 1.5, R2 = 0.02) are significantly lower than those in the whole hospital. As the age group decreases, the scores of the nurses in the operating room also decrease.

Table 2. Regression analysis of the influence on patient safety culture in the operating room

	Teamwork Climate			Safety Climate			Job Satisfaction			Perception of Management			Working Conditions		
Intercept	β(SE)	p value	R^2	β(SE)	p value	R^2	β(SE)	p value	R^2	β(SE)	p value	R^2	β(SE)	p value	R^2
	1.8 (12.8)	0.88	0.49	14.9 (12.7)	0.27	0.50	-3.7 (12.5)	0.78	0.63	7.7 (12.2)	0.54	0.64	26.3 (10.6)	0.02	0.62
SAQ Dimensions															
Teamwork Climate	—			0.5 (0.2)	0.01		0.2 (0.2)	0.23		0.1 (0.2)	0.55		< 0.1 (0.2)	0.95	
Safety Climate	0.8 (0.2)	< 0.01		—			0.2 (0.2)	0.36		-0.1 (0.2)	0.72		0.1 (0.2)	0.53	
Job Satisfaction	-0.1 (0.2)	0.68		0.2 (0.2)	0.36		—			0.5 (0.2)	0.03		0.2 (0.2)	0.43	
Perception of Management	0.5 (0.3)	0.09		-0.1 (0.2)	0.71		0.5 (0.2)	0.03		—			0.3 (0.2)	0.16	
Working Conditions	< 0.1 (0.3)	0.98		0.2 (0.2)	0.53		0.2 (0.2)	0.42		0.3 (0.2)	0.16		—		

Table 3. Comparison of SAQ scores of the staff between the operating room and the hospital

	Teamwork Climate		Safety Climate		Job Satisfaction		Perception of Management		Working Conditions	
	OR/All	p value	OR/All	p value	OR/All	p value	OR/All	p value	OR/All	p value
Gender										
Male	81.8(7.6) / 70.0 (11.5)	0.18	77.0 (15.0) / 78.2 (3.2)	0.89	78.7 (2.3) / 81.1 (5.0)	0.50	75.0 (8.7) / 75.1 (12.9)	1.00	81.7 (7.6) / 70.1 (11.5)	0.18
Female	66.3 (9.4) / 73.3 (13.2)	< 0.01	68.2 (9.0) / 76.2 (11.7)	<0.01	66.5 (11.3) / 73.2 (17.3)	< 0.01	65.0 (10.3) / 71.4 (14.8)	<0.01	66.1 (9.3) / 73.2 (13.3)	<0.01
Supervisor Position										
Yes	80.1 (-) / 80.5 (10.6)	0.96	68.8 (-) / 85.7 (10.2)	0.14	68.0 (-) / 86.4 (15.6)	0.27	85.1 (-) / 82.3 (11.9)	0.83	80.0 (-) / 80.7 (10.6)	0.96
No	67.6 (10.2) / 72.9 (13.5)	0.02	69.1 (9.8) / 75.9 (11.5)	<0.01	67.6 (11.5) / 72.7 (17.1)	0.03	65.3 (10.0) / 71.5 (14.7)	<0.01	67.3 (10.0) / 72.8 (13.5)	0.02
Age (years old)										
< 31	67.5 (9.5) / 72.3 (13.1)	0.08	68.5 (10.2) / 74.7 (11.7)	0.02	68.4 (11.6) / 70.7 (17.4)	0.28	65.1 (8.9) / 70.2 (14.1)	0.02	67.4 (9.4) / 72.2 (13.0)	0.08
31~40	65.7 (14.8) / 73.5 (13.1)	0.21	70.9 (10.6) / 77.6 (11.3)	0.22	65.4 (13.3) / 74.4 (16.5)	0.24	68.1 (16.0) / 71.5 (15.9)	0.63	65.6 (14.9) / 73.8 (13.3)	0.21
> 40	75.1 (7.1) / 77.0 (14.8)	0.83	67.1 (2.0) / 80.7 (12.6)	0.15	68.1 (0) / 81.2 (15.0)	< 0.01	72.75 (17.7) / 77.4 (13.9)	0.63	75.1 (7.2) / 77.3 (14.7)	0.83
Working Experience (years)										
< 2	73.4 (10.3) / 72.3 (13.6)	0.77	70.9 (10.3) / 74.6 (10.7)	0.29	72.8 (9.2) / 70.0 (17.6)	0.41	69.1 (10.5) / 70.3 (13.6)	0.78	73.5 (10.5) / 72.2 (13.7)	0.77
2~10	61.6 (7.1) / 73.4 (12.6)	< 0.01	66.3 (9.7) / 76.2 (12.5)	< 0.01	65.1 (11.0) / 73.5 (16.6)	0.04	61.8 (9.7) / 71.7 (15.01)	< 0.01	61.5 (7.1) / 73.4 (12.5)	<0.01
> 10	75.1 (9.2) / 74.5 (14.0)	0.94	72.9 (7.6) / 78.7 (11.9)	0.33	68.0 (9.8) / 77.6 (16.9)	0.27	73.6 (11.2) / 73.3 (15.0)	0.93	75.0 (9.2) / 74.4 (14.2)	0.94

4. Discussion

Due to the special working environment, the risk of medical errors in the operating room is higher than that in other medical units. The American College of Emergency Physicians (ACEP) pointed out that the risks of medical errors in the operating room include crowded medical environment, communication barriers for patients or their families, shortage of medical manpower, failure in prediction of workload factors, poor patient health, failure in the establishment of a long-term medical relationship with patients as the outpatient routine, and the condition that physicians need to make rapid medical treatment decisions in emergencies[5].

Research results show that operating room nurses have the highest scores in the "teamwork climate" dimension. The operating room is the epitome of the hospital and summarizes all medical services. Due to the uncertain and unpredictable characteristics of operating room medical care, a good teamwork is needed. In this research, "teamwork climate" and "safety climate" are the dimensions of mutual influence. "Job satisfaction" and "perception of management" are also significantly related in this study, showing that the satisfaction of nurses has a considerable relationship with the management mode of the unit supervisor. Junior and senior operating room nurses scored higher in all dimensions and it is speculated that it may be related to the high turnover rate of nursing manpower in the operating room. The operating room is a high-pressure, high-risk, and fast-paced medical environment. Different medical service features of the operating room will automatically select the appropriate nurses. Experienced nurses themselves have more awareness of patient safety, and it is not easy for junior nurses to relax in dealing with urgent and serious situations[3,6].

In this study, the scores of patient safety attitudes of operating room nurses are lower than those of the whole hospital. It is necessary to cooperate with other measurement tools to analyze the correlation with the medical event to clarify whether the safety of the patient is truly affected. The research results are only suitable for individual hospitals to understand the perceptions of unit nurses' patient safety attitudes, which cannot be fully extended to all hospitals. Medical institutions can refer to this research method and analysis tools for further in-depth discussion. It is recommended that the scores of the patient safety culture scale can be used in the future to compare and discuss patients' prognostic results, the occurrence of medical error, and changes in behavior of medical staff for more comprehensive information[7].

In this study, SAQ is used to investigate patient safety culture, which can not only understand patient safety attitudes of nurses in the operating room but assist in tracking the connection between the safety attitude of operating room personnel and patient safety with quality management methods and medical information system interventions in the future so as to improve the safety culture of the operating room[4].

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Authors Introduction

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