A Longitudinal Study of Assessing the Patient Safety Culture from Nurses' Viewpoints Based on the Safety Attitudes Questionnaire in Taiwan

Yii-Ching Lee, Chih-Hsuan Huang, Chih-Yi Hsu, and Hsin-Hung Wu

***Abstract*—This study uses internal survey data based on the Chinese version of safety attitudes questionnaire in 2011-2014 from a regional teaching hospital in Taichung City, Taiwan to assess nurses' perceptions toward the patient safety culture. In order to make a comparison among different years, analysis of variance with $\alpha = 0.05$ is used, and Bonferroni method is chosen to perform post hoc analysis. The results show that teamwork climate has been improved since 2012. Safety climate, job satisfaction, stress recognition, and perception of management have not been improved or declined statistically in 2011-2014. In contrast, the hospital management needs to pay much attention to working condition because the performance perceived by nurses has been decreased and reached the lowest agreement value in 2014 among four years. Obviously, working condition should be improved in a top priority in order to improve the patient safety culture in this case hospital.**

***Index Terms*—Safety attitudes questionnaire, patient safety culture, analysis of variance, Bonferroni, nurse.**

I. Introduction

In order to relentlessly improve patient safety, Shu *et al.* [1] stated that building a patient safety culture is an essential issue in any healthcare systems and hospitals. Patient safety should be started with the enforcement of the system safety of healthcare organizations and an organization's safety culture is a fundamental factor that influences the system safety [2]. Establishing a positive patient safety culture indicates healthcare organizations strive to improve relentlessly [3]. In addition, a positive patient safety culture improves healthcare organizations' patient safety performance and safety outcomes and shows that organizations place the patient safety culture as one of their highest priorities [1], [4], [5]. Aghdash *et al.* [6] further stated that patient safety is a critical element for healthcare organizations that should be measured in a regular basis to improve patient safety.

Bodur and Filiz [7] pointed out that the patient safety culture can be assessed by the perceptions of healthcare organizations' staff on issues such as teamwork, job satisfaction, working condition, and the like. With the assessment results, healthcare organizations obtain a clear view of areas that might require strengthening their patient safety culture, identifying specific challenges related to patient safety, and, ultimately, making comparisons with other healthcare organizations [4]. Safety attitudes questionnaire (SAQ) originally developed by Sexton *et al.* [8] has been widely used to assess the safety culture of healthcare organizations [9]–[13]. Through the SAQ surveys, staffing deficiencies can be identified and the strengths can also be found [14].

Nurses' attitude toward the patient safety culture is essentially important in healthcare organizations because nurses have direct and close relationships with patients. Besides, their attitudes are often framed as results of all other contributory features of the working environment [15], [16]. On the other hand, a longitudinal study to assess the patient safety culture in healthcare organizations might be preferred because the hospital management can trace the performance from time to time. More importantly, the trends show how the patient safety culture performs on a timely basis. Thus, the hospital management can pay much attention to those negative trends and take corrective actions from nurses' viewpoints to improve the patient safety culture [17].

This study uses the internal patient safety culture data from the safety attitudes questionnaire in 2011-2014 of a regional teaching hospital in Taichung City, Taiwan. In addition, the focus is on nurses' perceptions toward the patient safety culture. That is, this study intends to track the nurses' perceptions on the patient safety culture in terms of six dimensions from year to year.

II. Patient Safety Culture

Lee *et al.* [17] summarized that healthcare organizations should regularly assess the perceptions of the staffs' safety attitudes through conducting the surveys to first understand the current patient safety culture and then improve the safety culture. The hospital management can initiate improvement actions to enhance the strengths and improve the deficiencies of the patient safety culture from the survey results. When the patient safety culture is positive, it might indicate that the healthcare organization places patient safety culture in a high

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priority. Shie *et al.* [18] and Ulrich and Kear [19] stated that better attitude toward patient safety results in lower medical errors. In addition, hospitals with a more open culture and reflective attitude toward errors could reduce the number of accidents and failures. In order to assess the patient safety culture, the safety attitudes questionnaire developed by Sexton *et al.* [8] has been widely applied in practice [17].

TABLE I: SIX DIMENSIONS AND THIRTY QUESTIONS IN SAFETY ATTITUDES QUESTIONNAIRE

Teamwork Climate	
1	Nurse input is well received in this clinical area.
2	In this clinical area, it is difficult to speak up if I perceive a problem with patient care.
3	Disagreements in this clinical area are resolved appropriately (i.e., not who is right, but what is best for the patient).
4	I have the support I need from other personnel to care for patients.
5	It is easy for personnel here to ask questions when there is something that they do not understand.
6	The physicians and nurses here work together as a well-coordinated team.
Safety Climate	
7	I would feel safe being treated here as a patient.
8	Medical errors are handled appropriately in this clinical area.
9	I know the proper channels to direct questions regarding patient safety in this clinical area.
10	I receive appropriate feedback about my performance.
11	In this clinical area, it is difficult to discuss errors.
12	I am encouraged by my colleagues to report any patient safety concerns I may have.
13	The culture in this clinical area makes it easy to learn from the errors of others.
Job Satisfaction	
14	I like my job.
15	Working here is like being part of a large family.
16	This is a good place to work.
17	I am proud to work in this clinical area.
18	Morale in this clinical area is high.
Stress Recognition	
19	When my workload becomes excessive, my performance is impaired.
20	I am less effective at work when fatigued.
21	I am more likely to make errors in tense or hostile situations.
22	Fatigue impairs my performance during emergency situations (e.g. emergency resuscitation, seizure).
Perception of Management	
23	Management supports my daily efforts.
24	Management doesn't knowingly compromise patient safety.
25	I get adequate, timely information about events that might affect my work.
26	The levels of staffing in this clinical area are sufficient to handle the number of patients.
Working Condition	
27	Problem personnel are dealt with constructively by our unit.
28	This hospital does a good job of training new personnel.
29	All the necessary information for diagnostic and therapeutic decisions is routinely available to me.
30	Trainees in my discipline are adequately supervised.

Sexton *et al.* [8] developed the safety attitudes questionnaire with six dimensions and thirty questions as shown in Table I to assess the patient safety culture from the staff's viewpoints. Six dimensions are teamwork climate, safety climate, job satisfaction, stress recognition, perception of management, and working condition. Teamwork climate is the perceived quality of collaboration between personnel. Safety climate is defined as the perceptions of a strong and proactive organizational commitment to safety. Perception of management is the approval of managerial actions. Job satisfaction is the positivity about the work experience. Stress recognition is measured by how performance is affected by stressors. Finally, working condition is defined as the perceived quality of the work environment and logistical support such as staffing and equipment [8], [10], [11]. There are six, seven, five, four, four, and four questions in the respective dimensions.

Shie *et al.* [18] stated that the SAQ plays a critical role to assess the safety culture for healthcare organizations. Safety attitudes questionnaire with good validity and reliability was designed to assess staff's opinions about patient safety issues, medical errors, and event reports [20]. In 2008, the Taiwan Joint Commission on Hospital Accreditation developed the Chinese version of patient safety culture by using forward and backward translation of safety attitudes questionnaire (Short Form 2006) to evaluate the quality of the translation. In addition, the questionnaire was pilot-tested and discussed by an expert panel for intelligibility and applicability of the items [2], [21]. Therefore, the Chinese version of SAQ has good validity and reliability.

In each healthcare organization, staff typically includes physicians, nurses, technicians, pharmacists, medical administrators, respiratory therapists, and others. Lee *et al.* [22] pointed out that physicians and nurses are the core staffs in each healthcare organization. Besides, nurses might be the most important human resources because nurses directly contact patients and their healthcare provides a profound insight into patient safety problems and potential solutions to the problem [16]. Further, nurses' attitudes toward patient safety are essential because their attitudes are often framed as a result of all other contributory features of the working environment [15]. Therefore, it is of interest to observe nurses' attitudes toward the patient safety culture.

Nurses are required to answer thirty questions based on a five-point Likert scale which ranges from strongly agree to strongly disagree. There are two reversed questions in the Chinese version of SAQ, including Items 2 and 11. That is, each respondent's answer needs to be adjusted. For instance, if the original answer of strongly agree in either Item 2 or Item 11, the adjustment is to use the numerical value of one instead of the numerical value of five due to the poor performance of patient safety.

III. RESEARCH METHOD

The data sets in 2011-2014 are from a regional teaching hospital in Taichung City, Taiwan. The purpose of this study is to observe nurses' attitudes toward the patient safety culture in terms of dimensions based on the Chinese version of SAQ conducted by this case hospital annually. This study collects the internal survey data in 2011, 2012, 2013, and 2014 such that a longitudinal study can be conducted to trace the trends of dimensions of the patient safety culture from year to year. The effective numbers of the internal questionnaires for nurses are 346, 451, 415, and 390 for the years of 2011, 2012, 2013, and 2014, respectively. The specific demographic

information from 2011 to 2014 is summarized in Tables II-Table V. In order to make a comparison among different years, analysis of variance is used with $\alpha = 0.05$. In addition, Bonferroni method is chosen to perform post hoc analysis because Bonferroni method outperforms Scheffe method in reducing the Type I error [23].

TABLE II: DEMOGRAPHIC INFORMATION OF THIS REGIONAL TEACHING HOSPITAL IN 2011

Demographic Information	Category	Frequency (%)
Gender	Male	64 (18.4)
	Female	284 (81.6)
Age	Less than 20	2 (0.6)
	21-30	125 (35.9)
	31-40	153 (44.0)
	41-50	54 (15.5)
	51-60	14 (4.0)
	61 or over	0 (0)
Supervisor/Manager	Yes	40 (11.5)
	No	308 (88.5)
Job Status	Full time	327 (94.0)
	Part time	20 (5.7)
	Agency	1 (0.3)
	Contract	0 (0)
Experience in Organization	Less than 6 months	26 (7.4)
	6 to 11 months	34 (9.8)
	1 to 2 years	48 (13.8)
	3 to 4 years	59 (17.0)
	5 to 10 years	81 (23.3)
	11 to 20 years	94 (27.0)
	21 years or more	6 (1.7)
Experience in Position	Less than 6 months	34 (9.8)
	6 to 11 months	35 (10.0)
	1 to 2 years	61 (17.5)
	3 to 4 years	67 (19.3)
	5 to 10 years	78 (22.4)
	11 to 20 years	70 (20.1)
	21 years or more	3 (0.9)
Education	Junior high school and below	4 (1.2)
	Senior high school	14 (4.0)
	College/University	308 (88.5)
	Graduate school	22 (6.3)
Direct Patient Contact	No	34 (9.8)
	Rare	45 (12.9)
	Very often	269 (77.3)

TABLE III: DEMOGRAPHIC INFORMATION OF THIS REGIONAL TEACHING HOSPITAL IN 2012

Demographic Information	Category	Frequency (%)
Gender	Male	9 (2.0)
	Female	444 (98.0)
Age	Less than 20	7 (1.5)
	21-30	210 (46.4)
	31-40	195 (43.0)
	41-50	40 (8.8)
	51-60	1 (0.2)
	61 or over	0 (0)
Supervisor/Manager	Yes	35 (7.7)
	No	418 (92.3)
Job Status	Full time	425 (93.8)
	Part time	28 (6.2)
	Agency	0 (0)
	Contract	0 (0)
Experience in Organization	Less than 6 months	37 (8.1)
	6 to 11 months	15 (3.3)
	1 to 2 years	94 (20.8)
	3 to 4 years	76 (16.8)
	5 to 10 years	119 (26.3)
	11 to 20 years	104 (23.0)
	21 years or more	8 (1.7)
Experience in Position	Less than 6 months	46 (10.2)
	6 to 11 months	17 (3.7)
	1 to 2 years	104 (23.0)
	3 to 4 years	90 (19.9)
	5 to 10 years	122 (26.9)
	11 to 20 years	70 (15.5)
	21 years or more	4 (0.8)
Education	Junior high school and below	0 (0)
	Senior high school	5 (1.1)
	College/University	437 (96.5)
	Graduate school	11 (2.4)
Direct Patient Contact	No	10 (2.2)
	Rare	21 (4.6)
	Very often	422 (93.2)

TABLE IV: DEMOGRAPHIC INFORMATION OF THIS REGIONAL TEACHING HOSPITAL IN 2013

Demographic Information	Category	Frequency (%)
Gender	Male	17 (4.1)
	Female	400 (95.9)
Age	Less than 20	9 (2.2)
	21-30	185 (44.4)
	31-40	168 (40.3)
	41-50	52 (12.5)
	51-60	3 (0.6)
	61 or over	0 (0)
Supervisor/Manager	Yes	29 (7.0)
	No	388 (93.0)
Job Status	Full time	374 (89.7)
	Part time	24 (5.8)
	Agency	5 (1.1)
	Contract	14 (3.4)
Experience in Organization	Less than 6 months	42 (10.1)
	6 to 11 months	16 (3.8)
	1 to 2 years	77 (18.5)
	3 to 4 years	76 (18.2)
	5 to 10 years	100 (24.0)
	11 to 20 years	95 (22.8)
	21 years or more	11 (2.6)
Experience in Position	Less than 6 months	49 (11.8)
	6 to 11 months	23 (5.5)
	1 to 2 years	91 (21.8)
	3 to 4 years	78 (18.7)
	5 to 10 years	119 (28.5)
	11 to 20 years	52 (12.5)
	21 years or more	5 (1.2)
Education	Junior high school and below	1 (0.2)
	Senior high school	3 (0.7)
	College/University	401 (96.2)
	Graduate school	12 (2.9)
Direct Patient Contact	No	8 (1.9)
	Rare	27 (6.5)
	Very often	382 (91.6)

TABLE V: DEMOGRAPHIC INFORMATION OF THIS REGIONAL TEACHING HOSPITAL IN 2014

Demographic Information	Category	Frequency (%)
Gender	Male	12 (3.1)
	Female	378 (96.9)
Age	Less than 20	9 (2.3)
	21-30	167 (42.8)
	31-40	149 (38.2)
	41-50	56 (14.4)
	51-60	9 (2.3)
	61 or over	0 (0)
Supervisor/Manager	Yes	32 (8.2)
	No	358 (91.8)
Job Status	Full time	343 (88.0)
	Part time	20 (5.1)
	Agency	7 (1.8)
	Contract	20 (5.1)

Experience in Organization	Less than 6 months	45 (11.5)
	6 to 11 months	16 (4.1)
	1 to 2 years	67 (17.2)
	3 to 4 years	63 (16.2)
	5 to 10 years	91 (23.3)
	11 to 20 years	97 (24.9)
	21 years or more	11 (2.8)
Experience in Position	Less than 6 months	59 (15.1)
	6 to 11 months	18 (4.6)
	1 to 2 years	70 (17.9)
	3 to 4 years	67 (17.2)
	5 to 10 years	102 (26.2)
	11 to 20 years	71 (18.2)
	21 years or more	3 (0.8)
Education	Junior high school and below	0 (0)
	Senior high school	4 (1.0)
	College/University	371 (95.2)
	Graduate school	15 (3.8)
Direct Patient Contact	No	7 (1.8)
	Rare	25 (6.4)
	Very often	358 (91.8)

IV. Research Results

To calculate the average value for each dimension, the scores from the questions in each dimension are summed up and then the average value is computed based on the effective number of nurses. Table VI shows the average scores of six dimensions from 2011 to 2014. From descriptive statistics, teamwork climate, job satisfaction, perception of management, and working condition have their highest values in 2011 but their lowest values in 2012, 2012, 2012, and 2014, respectively. In contrast, safety climate and stress recognition have their highest values in 2014 but their lowest values in 2012.

TABLE VI: Scores of Dimensions from 2011 to 2014

Dimension (Number of Questions)	Year 2011	Year 2012	Year 2013	Year 2014
Teamwork Climate (6)	22.30	20.47	20.77	22.02
Safety Climate (7)	24.00	23.98	24.33	24.72
Job Satisfaction (5)	18.11	17.36	17.54	17.45
Stress Recognition (4)	14.50	14.46	14.70	14.95
Perception of Management (4)	14.03	13.40	13.59	13.46
Working Condition (4)	14.25	13.73	13.71	13.61

To test if the agreement for each dimension is different from 2011 to 2014, analysis of variance with $\alpha = 0.05$ is used. Table VII shows that teamwork climate, perception of management, and working condition have p values less than 0.05, indicating the significant differences between groups (years) exist. Table VIII shows the post hoc analysis of teamwork climate. The agreement of teamwork climate in 2011 and 2014 is significantly better than that in 2012 and 2013. From the descriptive statistics, teamwork climate in 2011 and 2014 has the highest and second highest agreement values. From Table IX, perception of management in 2011 has the highest agreement value among four years from the descriptive statistics, but the agreement value in 2011 is higher than that in 2012 statistically. Table X depicts that the agreement value of working condition in 2011 is the highest from the descriptive statistics and is significantly better than that in 2014.

TABLE VII: Anova Table for Six Dimensions in 2011-2014

Dimension	F	Sig.
Teamwork Climate	21.291	.000*
Safety Climate	2.457	.061
Job Satisfaction	2.500	.058
Stress Recognition	1.461	.224
Perception of Management	3.274	.020*
Working Condition	3.326	.019*

TABLE VIII: Multiple Comparison in Teamwork Climate

(I) Year	(J) Year	Mean Difference (I – J)	Sig.
2011	2012	1.832	.000*
	2013	1.535	.000*
	2014	0.284	1.000
2012	2011	-1.832	.000*
	2013	-0.297	1.000
	2014	-1.548	.000*
2013	2011	-1.535	.000*
	2012	0.297	1.000
	2014	-1.251	.000*
2014	2011	-0.284	1.000
	2012	1.548	.000*
	2013	1.251	.000*

TABLE IX: Multiple Comparison in Perception of Management

(I) Year	(J) Year	Mean Difference (I – J)	Sig.
2011	2012	0.634	.020*
	2013	0.439	.278
	2014	0.565	.070
2012	2011	-0.634	.020*
	2013	-0.195	1.000
	2014	-0.069	1.000
2013	2011	-0.439	.278
	2012	0.195	1.000
	2014	0.126	1.000
2014	2011	-0.565	.070
	2012	0.069	1.000
	2013	-0.126	1.000

TABLE IX: Multiple Comparison in Working Condition

(I) Year	(J) Year	Mean Difference (I – J)	Sig.
2011	2012	0.521	.086
	2013	0.532	.084
	2014	0.634	.024*
2012	2011	-0.521	.086
	2013	0.012	1.000
	2014	0.113	1.000
2013	2011	-0.532	.084
	2012	-0.012	1.000
	2014	0.102	1.000
2014	2011	-0.634	.024*
	2012	-0.113	1.000
	2013	-0.102	1.000

Based on the above analyses, there are no significant differences in safety climate, job satisfaction, and stress recognition in 2011-2014. On the contrary, teamwork climate in 2011 and 2014 outperforms that in 2012 and 2013 statistically. That is, teamwork climate has been improved since 2012. Perception of management in 2011 has the highest agreement value but is not significantly better than that in 2013 and 2014. Moreover, working condition in 2011 has the highest agreement value and is statistically better than that in 2014. That is, working condition is getting worse from both descriptive statistics and post hoc analysis. Obviously, the hospital management needs to pay much attention to working condition because the working environment for nurses is deteriorating as time goes by.

V. Conclusion

This study uses internal survey data of the Chinese version of safety attitudes questionnaire in 2011-2014 from a regional teaching hospital in Taichung City, Taiwan to assess nurses' perceptions toward the patient safety culture. The results show that there are no significant differences in safety climate, job satisfaction, and stress recognition from 2011 to 2014. Perception of management in 2011 is better than that in 2012 statistically but is not significantly better than that in 2013 and 2014. Moreover, teamwork climate has been improved steadily since 2012. However, working condition seems to be getting worse since working condition in 2011 is statistically better than that in 2014. In fact, working condition in 2014 has the lowest agreement value from the descriptive statistics. Therefore, the hospital management needs to improve the working environment for nurses to prevent the worsened working condition in a top priority. Safety climate, job satisfaction, stress recognition, and perception of management are required for improvement in the later stage for the hospital management.

Institutional Review Board Approval

The clinical trial approval certificate (ethic statement) was approved by Cheng Ching General Hospital in Taichung City, Taiwan with protocol number of HP150029.

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