



Research article

The influence of physician-nurse collaboration on patient safety culture

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ABSTRACT

Background: Many factors in health care organizations affect patients' safety, such as; multi-professional teamwork and collaboration. Physician-Nurse collaboration is the most crucial inter-professional collaboration in the health care system. Because these professionals are the closest to the patient and make most decisions related to patients' conditions, Physician-Nurse collaboration affects patients' health condition consequences, length of stay in health care facilities, patients' mortality, and the existence of medical errors.

Aim of the study: This study explores the relationship between physician-nurse collaboration and patient safety culture and compares patient safety culture levels between Jordanian hospitals from different sectors. In addition, examine differences in patient safety culture levels according to the position of health care providers (i.e., nurse managers, RN, and physicians).

Methods: A descriptive, cross-sectional design using a self-administered questionnaire was used for the current study. Data were collected between February and May of 2019. Four different hospital settings in Jordan (University, not-for-profit, private and governmental hospitals) were selected. In addition, we recruited a convenience sample representing registered nurses, nurse managers, and physicians at the selected hospitals.

Measurements: Three self-administered questionnaires were used to collect data for the current study: Demographic Data, Collaboration and Satisfaction About Care Decisions (CSACD), and Hospital Survey on Patient Safety Culture version 1.0 (HSOPS).

Data analysis: Data were screened for errors in data entry, outliers, or missing values. Data were normally distributed without extreme outliers. This study used descriptive statistics, the Pearson product-moment correlation, one-way ANOVA, and the Chi-square tests were used in this study. The level of significance (alpha value) is set at 0.05.

Results: showed that physician-nurse collaboration had a significant positive relationship with all patient safety culture levels ($P < 0.01$). In addition, the Pearson's product-moment correlation coefficient results indicated that all patient safety culture scores and subscales were positively and significantly correlated with physician-nurse collaboration ($P < 0.01$). Furthermore, the results of one-way ANOVA showed a statistically significant difference in the overall perception of patient safety culture according to the position of participants ($P < 0.01$). Moreover, Participants in Not-for-Profit Hospitals were more likely to report an 'excellent/very good' patient safety grade ($P < 0.001$) than in other hospitals.

Conclusion: Physician-nurse collaboration positively impacts overall patient safety culture grades. Health care organization in Jordan has the potential to increase levels of patient safety cultures; however, to achieve this aim, there should be a stronger focus on building effective inter-professional collaboration and building a blame-free culture among healthcare providers, and these organizations should receive the needed support from health care leaders in the country. To help strengthen the health care system, raise patient safety culture levels, and improve quality.

1. Introduction

Patients' safety is the primary concern in health care organizations, primarily when multiple international accreditation organizations have

now caused patient safety-culture assessment within their principles so that hospitals should assess and evaluate safety issues. In addition, they are permitting healthcare organizations to improve the unimpeded view of the weak areas that need improvement to strengthen patient safety

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culture (Deilkås and Hofoss, 2008; Smits et al., 2009). According to the World Health Organization, Patients Safety is “the prevention of errors and the adverse effects to the patient associated with health care” (WHO, 2018).

Health care providers are the key to success for hospitals. Their efforts and work affect the quality of health care presented to clients. The essential professions among health care providers are physicians and nurses. Although these two professions have direct contact with the patient, the decisions they make and the skills they practice affect patients' outcomes, and the collaboration between physicians and nurses affects patients' safety and outcomes (Holden et al., 2013).

There are considerable agreements in the literature that collaboration, especially in decision-making between physicians and nurses, reduces medical errors, creates excellent patient outcomes, and enhances patient safety.

The Institute of Medicine (I.O.M.) reported that Error has been human for over a decade. It commended a patient safety culture for raising safety over care procedures (Donaldson et al., 1999). Also, it commended inter-professional teamwork and included nurses' functions to enhance patients' safety (Donaldson et al., 2000; Corrigan, 2005). After this recommendation from (I.O.M.), evidence has been expanded on the essentials of adopting a patient safety culture to lessen medical errors and improve patient safety (Ali et al., 2018).

One of the essential principles to building a patient safety culture is to provide blame-free culture in health care organizations. Fear of blame is a recognized barrier in patient safety culture. Reporting errors enables the organizations to identify system failures and allow them to improve the system to avoid such losses in the future, and that will provide a principle for the health care providers they should report the errors that improve patient safety within the organization without fearing of blame and shame because of the mistake that happened. However, this mistake could become an opportunity for improvement, one of the patient safety culture standards (Cooper et al., 2017).

Extensive circumstantial factors seem to influence patient safety. For example, Holden et al. (2013) recognized seven factors: teams, patients, tasks, environmental, technology, organizations, and institutional factors. In addition, Morello et al. (2013) recognized other factors that enhance patient safety, which arises the promotion of safety by management, the development of structures for teamwork in and across hospital departments, open communication, effective transmission of a communication, a culture of no blame, an adequate level of staffing, learning continuity, safety awareness, and hospital-wide systems and processes to enhance safety. Among these factors among health care organizations that affect patients' safety are multi-professional teamwork and collaboration (Wami et al., 2016).

Teamwork between health care providers is essential in providing patient care. Teamwork is defined according to Human Resources in Health: “two or more people who interact interdependently with a common purpose, working toward measurable goals that benefit from leadership that maintain stability, while encouraging honest discussion and problem-solving” (H.R.H., 2018). In addition, multi-functional team members link a series of functional proficiency to the tasks, even for a one-time mission or imperishable functioning work (Meredith et al., 2017).

Multi-functional teamwork includes a succession of substantial activities and handovers; even though inputs by team members in each stage could be useless, somehow, highly allied team processes are considered a really “inter-professional” (Katzenbach and Smith, 2015). Collaboration might arise from teamwork in a varied and composite framework. Collaboration can be defined as reverence and helpfulness among team members (O'connor et al., 2016). Collaboration can be inter-professional and inter-professional. The Institute Of Medicine defines inter-professional collaboration as work involving health and social care professionals who come together regularly to solve problems, provide services, and enhance health outcomes. Some studies considered the same concept. A cross-sectional survey of patients was conducted in

China to investigate the baseline status of patients' awareness, knowledge, and attitude toward patient safety to determine the factors influencing patient involvement. The result was that most of the patients who participated in the study articulated a readiness to contribute to patient safety; however, their knowledge of patient safety was minimal (Zhang et al., 2020).

Although many research studies physician-nurse collaboration issues, other researchers studied the patient safety culture among healthcare providers. Limited research could investigate the influence of physician-nurse collaboration on patient safety culture. In Jordan, there are few studies about the physician-nurse relationship at Jordanian hospitals, the level of collaboration in decision making, and how this relationship is reflected in patient safety culture within the health care organizations. The current study aimed to:

1. To explore the relationship between physician-nurse collaboration and patient safety culture at Jordanian Hospitals.
2. To compare patient safety culture levels between Jordanian hospitals from different sectors.
3. To examine differences in patient safety culture levels according to the position of health care providers (i.e., nurse managers, RN, and physicians).

2. Methodology

2.1. Design

A cross-sectional descriptive design was used in this study between February and May 2019.

2.2. Sample and setting

In this study, four nationally and internationally accredited hospitals were selected. The target population included registered nurses, physicians, and nursing managers. The targeted population decisions directly impact the patients' health conditions at Jordanian hospitals.

The recruited sample was: registered nurses $n = 292$, physicians (resident doctors) $n = 201$, and nursing managers (unit managers) who have direct contact with the patients $n = 32$. However, the accessible populations were all registered nurses and general physicians, whether in residency programs or transition programs working in their current location for six months and more. They also involve nursing unit managers who have worked in their current position for over one year in the study's hospitals.

A stratified sampling technique was used for this study during the data collection. We conducted each stratum according to the number of employees (nurses and general physicians) in each hospital included in the study.

Based on Cohen's tables, the required sample size is 472 registered nurses, nursing managers, and general physicians (Cohen, 1992). The sample was calculated using a medium effect size, alpha 0.01, and power of 0.8 (Cohen, 1992). However, to avoid the no-response effect, 20% was added (Polit and Beck, 2013), so the sample size became 567 participants, including registered nurses, nursing managers, and general physicians.

2.3. Ethical considerations

Before conducting this study, approval for Jordan University of Science and Technology through the Deanship of Scientific Research and the Ethics of Human Research Committee at the Ministry of Health (M.O.H.). Also, permission to collect data from the four hospitals was granted from the hospitals' administration offices. Respondents' consent was taken before the survey, and all respondents have been informed that all information will be used for academic purposes only. Besides, the purpose

and assurance of confidentiality of data collection were given to the respondents at the beginning of the study.

2.4. Data collection measures

We collected data using a self-administered questionnaire. Original authors sought and approved to use of the instrument. The questionnaire comprises three sections. Section (1) is the socio-demographic form which includes information about gender, age, marital status, level of education, shift-for registered nurses-, unit, nursing experience/physician experience, current position, and type of hospital. Section (2) is the Collaboration and Satisfaction About Care Decisions (CSACD) (Baggs, 1993): to estimate the quality of interface in making care decisions -and satisfaction-with the decision-making method in the health care site. Alpha reliability of collaboration questions is 0.95. Construct validity of the collaboration questions was supported by finding expected correlational patterns and factor analysis revealing a single factor that explained 75% of the variance in collaboration. And finally, Section (3) Hospital Survey On Patient Safety Culture HSOPS version 1.0. The internal reliability of the subscale scores was 0.46–0.88 (Sorra et al., 2016): this tool highlighted patient safety, errors, and events reporting. Table 1 shows the means and standard deviations for the used scales and their subscales.

2.5. Data analysis

Data were analyzed using the Statistical Package for the Social Sciences 25 (SPSS 25). Data were checked and screened for errors in data entry, outliers, or missing values. The scores of physician-nurse collaboration and patient safety culture were approximately normally distributed without extreme outliers. This judgment about normality was made based on the histograms, skewness, and kurtosis values.

Descriptive statistics were used to describe the socio-demographic characteristics of the study participants. In addition, descriptive statistics were used to identify the percent of positive responses for each item and the average positive responses for the Hospital Survey on Patient Safety Culture according to the guidelines provided by the author manual. After the negatively worded items were reverse coded, the two highest response categories (e.g., strongly agree/Agree) were combined to represent a positive response. Finally, the domain scores were calculated using the item-level percent positive scores.

The Pearson product-moment correlation was used to identify the relationship between the overall mean scores of physician-nurse collaboration (a continuous variable) and the overall mean scores of patient safety culture (a continuous variable) among the study participants. The differences in the levels of patient safety culture (a continuous variable)

Table 1. Means and standard deviations of the study scales.

SCALE	Mean	Std. Deviation
Collaboration and Satisfaction About Care Decisions (CSACD)	9.66	2.690
Hospital Survey on Patient Safety Culture (HSOPSC) Subscales	Mean	Std. Deviation
Communication Openness	71.94	23.127
Feedback and communication about errors	81.75	31.930
Frequency of event reporting	82.04	33.475
Handoffs and Transition	78.02	6.243
Management support for patient safety	80.73	21.636
No punitive Response to errors	55.74	7.682
Organizational Learning–Continuous education	93.01	27.809
The overall perception of Patient Safety	103.04	20.409
Staffing	79.18	14.848
Supervisor/manager expectations & actions promoting patient safety	98.40	23.820
HSOPSC Total score	1024.28	161.588

according to the type of hospital and the position of the study participants (categorical variables with more than two categories) were identified using the one-Way ANOVA. The homogeneity of variance assumption of the one-Way ANOVA was not violated, as evidenced by the non-significant results of Levene’s test. Chi-square tests were conducted to identify differences in patient safety grade and the number of events (categorical variables) according to the type of hospital and the position of the study participants (categorical variables). Chi-square tests were reported after assuring that at least 80% of the cells have an expected count = of 5 or more, which is an assumption for this test.

3. Results

Table 2 represents the Demographic characteristics and other variables. A total of 559 participants completed the current study. More than half of the participants (n = 292, 52.2%) were females, while most were younger than 30 years old (n = 402, 71.9%). In addition, 488 participants (87.3 %) have a bachelor’s degree. Regarding the positions of the participants, 326 (58.3%) were registered nurses (RN), 32 (5.7%) were nurse managers, and 201 (36%) were physicians.

Table 3 presents the percent of positive responses for the Patient safety culture items for each item. In the current study, the mean positive response for each item ranged from 19.03 (Non-punitive response to Error) to 67.25 (Teamwork within units). Positive responses were calculated using the two highest response categories (e.g., strongly agree/Agree) combined to represent a positive response.

Furthermore, Physician-nurse collaboration and patients’ safety culture were explored. Table 4 shows the relationship between physician-nurse collaboration and patients’ safety culture. The Pearson’s product-moment correlation coefficient was used to examine the relationship between physician-nurse collaboration and patient safety culture among the study participants (Table 4). The results indicated that all patient safety culture total scores and subscales were positively and significantly correlated with physician-nurse collaboration (P < 0.01).

Moreover, Table 5 shows the differences between patients’ safety levels according to their professional status. Overall, the results of one-

Table 2. Sample characteristics (N = 559).

Variable	Frequency	Percent	
Gender	Male	267	47.8
	Female	292	52.2
Age	less than 30	402	71.9
	31–40	128	22.9
	41–50	26	4.7
	51–60	3	0.5
Marital Status	Single	279	49.9
	Married	273	48.8
	Widow	3	0.5
	Divorced	4	0.7
level of education	Diploma Degree (3 years)	18	3.2
	Bachelor’s Degree	488	87.3
	Master’s Degree	53	9.5
Position	Registered Nurse (RN)	326	58.3
	Nurse Manager	32	5.7
	Physician	201	36.0
Place of Work	Governmental Hospital	152	27.2
	University Teaching Hospital	131	23.4
	Private Sector	74	13.2
	Not-for-Profit Hospital	202	36.1
Shift work	A-B-C	186	33.3
	Day/Night	149	26.7
	On-call 24 h s	192	34.3
	A shift	32	5.7

Table 3. Percent average positive response for an item-level.

Items	% positive	Mean (S.D.)
Teamwork within units	67.25	3.68 (.73)
Supervisor/manager expectations and actions promoting patient safety	53.7	3.43 (.75)
Organizational learning–continuous improvement	66.8	3.7 (.70)
Management support for patient safety	56.2	3.44 (.76)
Feedback and communication about error	38.3	3.50 (.82)
Frequency of events reported	53.73	3.49 (.85)
Overall perceptions of patient safety	54.08	3.06 (1.12)
Communication openness	46.33	3.32 (.72)
Teamwork across units	50.48	3.32 (.73)
Staffing	25.56	2.83 (.67)
Handoffs and transitions	44.20	3.21 (.91)
Non-punitive response to error	19.03	2.55 (.79)

Table 4. The relationship between physician-nurse collaboration and patients' safety culture.

Teamwork Within Units	r	.542**
	P-value	.000
Supervisor/Manager Expectations & Actions Promoting Patient Safety	r	.370**
	P-value	.000
Organizational Learning–Continuous Improvement	r	.507**
	P-value	.000
Management Support for Patient Safety	r	.465**
	P-value	.000
Overall Perceptions of Patient Safety:	r	.401**
	P-value	.000
Feedback and Communication About Errors	r	.523**
	P-value	.000
Communication Openness	r	.406**
	P-value	.000
Frequency of Events Reported:	r	.310**
	P-value	.000
Teamwork Across Units	r	.431**
	P-value	.000
Staffing	r	.135**
	P-value	.001
Handoffs and Transitions	r	.198**
	P-value	.000
Non-punitive Response to Errors	r	.192**
	P-value	.000
Overall culture safety	r	.585**
	P-value	.000

way ANOVA showed a statistically significant difference in the overall perception of patient safety culture according to the position of participants. In addition, the post-hoc (Scheffe test) revealed the Nurse Manager's perception of the patient.

Safety culture was higher ($P = 0.03$) than the other registered nurses and the physicians ($P < .01$). In addition, registered nurses' perceptions of patient safety culture were higher than physicians' ($P < .01$). (Table 5).

Table 6 shows the Differences in patient safety grade and Number of Events Reported according to position and hospitals. According to the position, the chi-square analysis revealed no significant difference in reporting an 'excellent/very good' patient safety grade. However, physicians report at least one event in the last year than registered nurses and nurse managers ($P = 0.04$) (Table 6).

Table 5. The differences in patients' safety levels according to position.

	N	Mean	Std. Deviation	F	P-value
Registered Nurse (RN)	326	3.3750	.46830	9.207	.000
Nurse Manager	32	3.6025	.65990		
Physician	201	3.2530	.44419		
Total	559	3.3442	.47960		

Participants in Not-for-Profit Hospitals were more likely to report an 'excellent/very good' patient safety grade ($P < 0.001$) than in other hospitals, while there was no difference in the number of events reported according to the type of hospital (Table 7).

4. Discussion

Levels of patient safety culture built-in Jordanian hospitals were determined by comparing the results to other studies, it is noticed that the percentages of the composites are very low, and under the positive responses rate of the survey, according to the user guide of the HSOPSC, the positive responses are above 70%. IF scores are below 70%, these areas require improvement.

The highest score was teamwork within units, which took 67.25%. This result could be explained because the study was only among four hospitals in Jordan, and the study sample was a small sample size compared to other studies. Also, it could be explained that Jordan is a developed country where the health sector requires more effort to develop and improve compared to health sectors in the Gulf area and American hospitals, which are more developed countries and have more resources and possibilities to develop health sectors there.

4.1. What is the relationship between physician-nurse collaboration and patient safety culture?

Interpreting the physician-nurse collaboration levels and patient safety culture levels showed that physician-nurse collaboration levels positively affect patient safety culture levels, which means that collaboration comes up with a positive work environment, better patient outcomes, decreased medical errors, and positive teamwork impact (Hanafi, 2018; Ali et al., 2018).

The Significant relation between physician-nurse collaboration, overall patient safety culture, and overall perception of patient safety culture showed a positive impact of physician-nurse collaboration on overall patient safety culture. That means when multi-professionals focus on patients' needs and outcomes, their awareness of patient safety culture is highly perceived.

The results showed differences in relations between collaboration and different composites, and the highest positive relation was between collaboration and teamwork within units; also, the results showed a significant relationship between collaboration and teamwork across units. These composites measure the level of teamwork and confirm that collaboration is one of the essential components of good teamwork. That means good collaborative processes between team members lead to good teamwork. However, the results of relation between collaboration and teamwork across units were less than the relation between collaboration and teamwork within units because the communication between teams across units is less than the communication of teams within units. Also, they may not share the same perspectives and goals related to cultural differences, the nature of work, and patients' demands in different units.

Also, another result showed a highly positive relationship between collaboration and feedback and communication about errors and communication openness composites. The lack of effective communication in shared decision-making can lead to inter-professional collaboration failure (Légaré et al., 2013).

Thus, good collaboration is linked to effective communication. When team members communicate effectively, they can share their ideas and

Table 6. The differences in patient safety grade and Number of Events Reported according to position.

Position	Patient Safety Grade		P-value	Number of Events Reported:		P-value
	Poor/failing/acceptable	Excellent/very good		No events	At least one event	
Registered Nurse (RN)	80 24.5%	246 75.5%	.40	10 3.1%	316 96.9%	.04
Nurse Manager	10 31.3%	22 68.8%		3 9.4%	29 90.6%	
Physician	59 29.4%	142 70.6%		3 1.5%	198 98.5%	

Table 7. Differences in patient safety grade and Number of Events Reported according to position and hospitals.

Hospital	Patient Safety Grade		P-value	Number of Events Reported:		P-value
	Poor/failing/acceptable	Excellent/very good		No events	At least one event	
Governmental Hospital	83 54.6%	69 45.4%	P < .001	6 3.9%	146 96.1%	.273
University Teaching Hospital	32 24.4%	99 75.6%		3 2.3%	128 97.7%	
Private Sector	23 31.1%	51 68.9%		4 5.4%	70 94.6%	
Not-for-Profit Hospital	11 5.4%	191 94.6%		3 1.5%	199 98.5%	

perception, which enhances the level of understanding among them and strengthens the inter-professional relationship and discuss the decisions they made for the patients to avoid medical errors and improve the treatment process. They will focus on patient health status rather than their own goals.

Another significant relation lies between collaboration and organizational learning-continuous improvement, quality improvement programs that focus on improving services. Through continuous education, as the literature showed a high impact of inter-professional collaboration in improving patients' outcomes, reducing medical errors, and reducing overall costs, the organization considers collaboration in its continuous educational programs to improve the quality of care by improving inter-professional collaboration and teamwork environment (Hanafi, 2018; O'connor, 2017; Rouse, 2014).

Related to this literature, we can see the bond between collaboration and continuous improvement in health organizations. The ability of different professionals to collaborate improves the quality of care, which is the core of quality improvement in the organization.

Managers and supervisors always look to improve patient safety in their working areas. They set action plans to promote patient safety and reduce medical errors. Clinical narrative supervision from managers for physicians and nurses with continuous feedback about practices, good educational programs, and culture of patient-focused care could build an environment of high patient safety standards and a harm-free setting in the health organization (Tomlinson, 2015).

This study showed a significant relationship between managerial expectations and promoting patient safety and Management support for patient safety and collaboration.

When managers focus on building a good relationship between inter-professional and teach the newcomers the importance of teamwork, that would increase collaboration between inter-professionals and impact the

patient safety culture levels. On the other hand, physician-nurse collaboration affects patient safety by reducing medical errors and enhancing patient outcomes that will increase managers' expectations related to patient safety issues, increasing managers' support for their staff.

4.2. The differences in patient safety grade and number of events reported according to position

The study results showed that nurses are likely to report fewer events compared to physicians. The results of this study are similar to some previous studies in the literature. For example, in a study in Kuwait about baseline assessment of patient safety culture: also, in this study, the result showed that nurses are likely to report fewer events. The authors justified this because of the fear of punishment and punitive culture toward errors and humiliation (Ali, 2018).

In this study, the results showed a low percentage of non-punitive responses to errors and frequency of reported errors which support the result of having less rate of the event reported, so nurses still have a blame culture of errors, and they are afraid of punishment, and keep making mistakes in their files.

The overall patient safety grades which are related to the position are convergent.

4.3. The differences in patient safety grade and number of events reported according to hospitals

The results showed that not-for-profit hospital is more likely to report excellent and very good than other hospitals. Maybe because this hospital has more accreditation than the others, the hospital's policies may focus on patient safety procedures and culture more than the rest. Accreditation programs impact patient safety grades in health organizations (Al-Awa et al., 2010).

The study result showed no differences in the number of events reported among hospitals.

4.4. Implications

Results of this study provide essential perceptions of the changes organizations might go through to enhance patient safety culture levels by improving effective inter-professional collaboration.

This study may encourage organizations' administrators, policy-makers, and leaders to use inter-professional collaboration as a factor in increasing patient safety culture levels.

4.5. Study limitations

Since the research results depend on participants' perceptions, this could be a limitation because the degree to which the assumptions were reliable depended on the validity of staff conclusions. The organizational culture could be a limitation because participants might give their organization a good impression.

4.6. Recommendations

A cross-sectional design was utilized in this study, in which data was collected at a single point in time. Future research is to study the influence of physician-nurse collaboration on patient safety culture using longitudinal study designs to observe changes in the level of patients' safety cultures and level of collaboration over time.

Also, experimental studies are needed for future studies to measure the impact of interventional procedures, such as educational programs about collaboration or training courses to teach participants how to collaborate effectively on the level of interprofessional collaboration between physicians and nurses.

5. Conclusion

Patient safety is a significant concern in health organizations that reduce medical errors, provide a culture of safety within the staff, enhance patient outcomes, and reduce costs. However, a literature review showed that patient safety culture still needs improvements in some areas in health organizations worldwide, including Jordan.

The results showed a positive impact of physician-nurse collaboration on patient safety culture, as Jordanian health care professionals reported.

The study results showed differences in patient safety culture perceptions among professionals from Jordan's healthcare sectors. The study also conducted a baseline assessment for patient safety culture in different Jordanian health sectors; in addition, the study supported the impact of inter-professional collaboration on patient safety culture.

Declarations

Author contribution statement

Basil amarnah, MPH, PMH-CNS, PHD; Fatima Al Nobani: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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