ORIGINAL RESEARCH

The Association of Work Environments and Nurse-Nurse Collaboration: A Multicenter Cross-Sectional Study

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Article Info	Abstract
	Background: Along with the recent healthcare reform, intraprofessional collaboration in nursing is considered an essential factor for managing the challenges related to diverse roles and tasks of nurses in providing high quality care. There is lack of knowledge on how the nursing work environment could influence nurse-nurse collaboration. **Purpose:** The study aimed to assess the relationship between nursing work environment and nurses' intraprofessional collaboration. **Methods:** A total of 300 nurses working in four teaching hospitals participated in this multicenter cross-sectional study. Data were collected using the Nurse-Nurse Collaboration Scale (NNCS) and the Practice Environment Scale of the Nursing Work Index (PES–NWI). The Pearson correlation test was used to analyze the data. **Results:** The results showed that the mean score of the PES–NWI was 2.65 ± 0.32 out of 4. The highest and lowest scores belonged to the subscales of the nursing foundations for quality of care (2.86 ± 0.31) and staffing and resource adequacy (2.24 ± 0.49), respectively. The mean total score of nurse-nurse collaboration was 2.94 ± 0.21 out of a score of 4. The results showed a significant positive relationship between nursing work environment and nurses' intraprofessional collaboration ($r=0.49$, $p<0.05$). **Conclusion:** The nursing practice environment has a positive and significant relationship with nurse-nurse collaboration. Therefore, improving nurses' practice environment and providing healthy workplaces could improve the intraprofessional nurse's collaboration. Moreover, nurse managers should improve nurses' skills in some areas of collaboration such as conflict management.

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1. Introduction

Nurses are the largest number of health care professionals and have more contacts with patients than other health care providers (Zamanzadeh et al., 2018). To improve the quality of services to patients and their families within the health care settings, nurses should work collaboratively. Although there are different definitions for the concept of collaboration, one of the most comprehensive definitions is the one stating that collaboration is a dynamic, interactive and reciprocal process among team members to achieve common goals based on mutual respect, trust, responsibility, effort, and helps (O'Leary et al., 2011; Pakpour et al., 2019). Nurse-nurse collaboration needs sharing of information, values, and patients' care plans among nurses and making efforts for a common goal of improving patient outcomes and care quality (Lemetti et al., 2017; Ma et al., 2018).

An increasing number of patients with multiple and complex illnesses, advancement of technology and sophisticated equipment, and sharing information among professional members highlight the importance of nurse-nurse collaboration in health care systems (Di Prospero & Bhimji-Hewitt, 2011). Establishing effective communication is considered an important dimension of collaboration, so nurses should strengthen their communication skills and social interactions alongside their clinical skills to work collaboratively within workplace environment (Durmuş & Yıldırım, 2016).

The literature review shows that effective nurse-nurse collaboration could have positive outcomes for patients, organizations, and nurses (Piasecka et al., 2015; Prentice et al., 2020). In this regard, healthcare systems support the intraprofessional collaboration of nurses and collaboration of nurses with other health care professionals (interprofessional collaboration). These collaborations and team work could increase patients' safety, reduce nurses' burnout, and finally improve the quality of patient care (Pakpour et al., 2019; Lemetti et al., 2021). It has been found that building an environment that encourages nurses' collaboration can significantly influence nurses' performance (Al-Hamdan et al., 2021). Conversely, if a nurse does not collaborate with other nurses, it can lead to negative consequences such as medical errors, missed nursing care, increased job absenteeism, reduced job satisfaction, and increased nurses' turnover in the nursing profession (Aiken et al., 2012). Previous research has reported that poor interactions between nurses ultimately cause tension and stress among nurses. On the other hand, lack of collaboration and teamwork has been associated with compromised patient safety and patient care and reduced productivity, patient dissatisfaction, and medication errors (Stewart, 2018). Therefore, collaboration and teamwork in the nursing profession are recognized as essential elements of nursing practice and is a crucial factor to maintain effective and high-quality care (Gabriel et al., 2013).

Factors affecting collaboration are discussed at both individual and organizational levels. The factors such as individuals' desire for collaboration, willingness to achieve a common goal, showing mutual respect and trust for each other, and effective communication skills are considered individual factors (Rydenfält et al., 2012). Receiving support and feedback from colleagues and managers and the organizational culture of teamwork is considered the important organizational factor of teamwork in the practice setting (Tsai, 2011).

One of the factors that may affect nurse-nurse collaboration is the nursing practice environment (Gabriel et al., 2013). Nurses' clinical practice environment is a collection of information, resource allocation, the possibility of support establishment, an opportunity to learn, development and strengthening staffs' skills that enable nurses to work with a greater sense of collaboration and satisfaction (Sanjar et al., 2012). Improving the nursing practice environment is considered a practical strategy for recruiting and maintaining skilled nurses in clinical settings (Rivaz et al., 2020). According to the literature review, a favorable professional practice environment has been associated with less missed care, lower nurse burnout and job dissatisfaction, and high quality of care (Zeleníková et al., 2020). More recently, Mohammadzadeh et al. (2021) found that a positive nursing work environment increases nurses' career success.

The characteristics of each nursing practice environment are different from other contexts. Some practice environments improve morale and productivity, increase collaboration and job satisfaction, and improve nurses' self-esteem, leading to improved quality of care. Conversely, poor work environments could lead to dissatisfaction, frustration, and isolation among staff and can lead to an increase in emotional disorders such as depression, anxiety, and physical problems among health care providers (Choi et al., 2013).

The literature review shows that an unhealthy practice environment leads to an increase in medical errors, a decrease in the quality of care, conflict, and tension among health care providers leading to quality care deficits (Zeleníková et al., 2020). A systematic review showed that poor nursing workplace relationships affect nurses' psychological health, intensify their intent to leave, and decrease job performance and productivity (Wei et al., 2018). According to the literature review, there are many studies about the interprofessional collaboration between nurses and physicians (Galletta et al., 2016; Zhang et al., 2016), and less attention has been paid to intraprofessional collaboration of nurses (Dougherty & Larson, 2010; Liao et al., 2015). Meanwhile, recent studies emphasize the importance of nurses' intraprofessional collaboration for improving the quality of care and patients' safety and increasing nurses' job satisfaction (Chiarella et al., 2020; Al-Hamdan et al., 2021; Ylitörmänen et al., 2019). Although there are some studies in the field of nurses' collaboration, most of them have studied the outcomes of nurses' collaboration on patients. Another study has examined the effect on nurses' collaboration on nurses' outcomes such as job satisfaction and burnout (Ylitörmänen et al., 2019). Therefore, there is a paucity of literature on how the nursing work environment could influence nurse-nurse collaboration. Accordingly, this study aimed to assess the relationship between nursing work environment and intraprofessional collaboration among nurses.

2. Methods

2.1 Research design

This was a multicenter descriptive cross-sectional study that assessed the data from a population at one specific point in time. We followed the relevant guidelines (STROBE statement) for cross-sectional studies.

2.2 Setting and samples

This study was conducted in four teaching hospitals affiliated with Tabriz University of Medical Sciences, Iran. The sampling table proposed by Krejcie and Morgan (1970) was used to calculate sample size. The total nurse population of the hospitals was 1,060. Therefore, the sample size was calculated as 300 nurses by considering the formula with a confidence interval of 95%. A total of 300 nurses working in different fields of clinical settings were selected based on a stratified random sampling method. Based on the numbers of nurses in each hospital, the sample numbers were chosen from each hospital proportionally. The inclusion criteria were nurses having at least a bachelor's degree in nursing and direct working with patients in clinical settings. Nurses who were not engaged in direct nursing care were excluded from the study.

2.3 Measurement and data collection

Data were collected from March to May 2019. The relevant information on the objective of the study was provided to all participants; they were also asked to complete the questionnaires of the study. The questionnaires were distributed to the nurses by a main researcher. Data collection was performed by two main instruments. The Nurse-Nurse Collaboration Scale (NNCS) was used to measure nurse-nurse collaboration. This questionnaire was designed by Dougherty and Larson (2010) and has 35 questions. It includes five domains of conflict management (seven questions), communication (eight questions), shared process (eight questions), coordination (five questions), and professionalism (seven questions). The answers to each question are based on a four-point Likert scale of Strongly Disagree (1), Disagree (2), Agree (3), and Strongly Agree (4). On this scale, seven questions are scored in reverse. The range of score in each subscale and total scales varied from 1 to 4. A higher score indicates a higher level of nurse-nurse collaboration. The psychometric evaluation of this scale has been examined in a previous study reporting a Cronbach's alpha of 0.89 (Dougherty & Larson, 2010). The content validity was used for assuring of the Persian version of the Nurse-Nurse Collaboration Scale. For this purpose, after translating and back-translating the scale from English to Persian, the scale was given to ten nursing professors and they provided comments on the content of this tool. There was a high agreement on the scale and they commented on revising two items which was unclear in Persian language. The item content validity index (I-CVI) ranged from 0.80 to 1 and scale content validity index (S-CVI) ranged from 0.87 to 0.96, which indicated high content validity. The Cronbach's alpha coefficient of the Persian version of NNCS was 0.81.

The Practice Environment Scale of the Nursing Work Index (PES–NWI) was used to measure the nurses' practice environment. This scale was designed by Lake in 2002. It has 31 questions and includes five domains: the participation of nurses in hospital affairs (nine questions), the nursing foundations for quality of care (10 questions), the nurse manager ability, leadership and support of nurses (five questions), staffing and resource adequacy (four questions), and collegial relations between physician and nurse (three questions). The answer to each question is based on 4 options Likert scale including 1 (Strongly Disagree), 2 (Disagree), 3 (Agree), and 4 (Strongly Agree). The mean scores of items are calculated for each subscale. A higher score indicates a better practice environment. The validity and reliability of this tool have been assessed by Parker et al. (2010) and the Cronbach's alpha of more than 0.71 has been reported for each subscale. Moreover, in a study by Lake (2002), the Cronbach's alpha for each domain ranged from 0.85 to 0.95, indicating high reliability. The psychometrics evaluation of the Persian version of the PES–NWI tool has been performed by Elmi et al. (2013) with a Cronbach's alpha coefficient of 0.98. In our study, the Cronbach's alpha coefficient of the Persian version of NNCS was 0.91. Moreover, the demographic data, including age, gender, marital status, education, working time, work experience, and work units were collected by a demographic questionnaire.

2.4 Data analysis

Data analysis was done using SPSS (ver. 21) software using Pearson correlation coefficient. The normality assumption of data was checked by Kolmogorov-Smirnov test. The analysis showed that the data were normally distributed. The descriptive data were presented by the mean and standard deviation. A p-value <0.05 was considered as statistically significant.

2.5 Ethical considerations

The approval of the current study was obtained from the Ethical Board of Tabriz University of Medical Sciences (Ethical code: IR.TBZMED.REC.1397.850). Participation in the study was absolutely voluntary. The study's objectives were explained to the nurses and they entered the study after obtaining written informed consent from all the participants.

3. Results
3.1 Characteristics of the respondents

A total of 300 clinical nurses (with a mean age of 32.06±7.07 years) participated in the study. The majority of them (82%) were female. In terms of marital status, 71% of the samples were married. The majority of samples (97.7%) had a bachelor's degree. In the present study, 93% of the nurses participating in the study were working in rotating shifts (Table 1).

Table 1. Characteristics of the nurses (n=300)

Characteristics	Mean±SD	f	%
Age (years)	32.06±7.07		
Gender			
Female		246	82
Male		54	18
Marital status			
Single		86	28.7
Married		213	71
Divorced		1	0.3
Degree			
Baccalaureate		293	97.7
Master in nursing		7	2.3
Work experience in nursing (years)	8.53±6.84		
Work experience in the current unit (years)	4.82±4.22		
Main working time			
Fixed shift		21	7
Rotation shift		279	93
Work unit			
Emergency		35	11.7
Medical		66	22
Surgical		71	23.7
Critical care		128	42.7

3.2 The mean score of nurse-nurse collaboration

Based on the results, the mean total score of nurse-nurse collaboration was 2.94±0.21 out of 4. The results of our study showed that the highest scores of collaboration were related to professionalism (3.09±0.31), coordination (3.04±0.29), communication (2.96±0.32), shared process (2.82±0.34), and conflict management (2.82±0.26), respectively (Table 2).

3.3 The mean score of the Practice Environment Scale

The results showed that the mean score of the Practice Environment Scale of the Nursing Work Index was 2.65±0.32 out of 4. The highest score obtained in the subscale of the nursing foundations for quality of care subscale (2.86±0.31) and the lowest score belonged to the staffing and resource adequacy subscale (2.24±0.49) (Table 3).

Table 2. The level of nurse-nurse collaboration (n=300)

Domain	Mean±SD	Min-Max
Conflict management	2.82±0.26	2.14-3.57
Communication	2.96±0.32	1.63-4
Shared processes	2.82±0.34	1.75-4
Coordination	3.04±0.29	1.40-4
Professionalism	3.09±0.31	2-4
Total score	2.94±0.21	2-4

Table 3. Nurses view on nursing work index (n=300)

Domain (score range 1-4)	Mean±SD	Min-Max
Participation of nurses in hospital affairs	2.62±0.39	1-4
Nursing foundations for quality of care	2.86±0.31	1.70-4
The nurse manager ability, leadership, and support of nurses	2.46±0.43	1-4
Staffing and resource adequacy	2.42±0.49	1.25-4
Collegial nurse–physician relations	2.84±0.51	1.33-4
Total score	2.65±0.32	1.42-3.94

3.4 The relationship between nurses working index and nurse-nurse collaboration

Based on the results of this study, the mean total score of the PES-NWI scale had a positive and significant relationship with the mean total score of the nurse-nurse collaboration scale ($r=0.49$, $p<0.05$). Also, the results showed a positive relationship between each subscale of PES–NWI and the total score of nurse-nurse collaboration ($p<0.05$) (Table 4).

Table 4. The correlation between the mean score of the Nursing Practice Environment Scale and Nurse-Nurse Collaboration (n=300)

	Nurse participatioin hospital affairs	Nursing foundations for quality of care	Nurse manager ability, leadership, and support of nurses	Staffing and resource adequacy	Collegial nurse–physician relations	Total nursing work index
Conflict management	r=0.126 p=0.029*	r=0.169 p=0.003*	r=0.106 p=0.068	r=-0.006 p=0.916	r=0.054 p=0.355	r=0.127 p=0.028*
Communication	r=0.232 p=0.000*	r=0.165 p=0.004*	r=0.305 p=0.000*	r=0.112 p=0.053	r=0.261 p=0.000*	r=0.260 p=0.000*
Shared processes	r=0.282 p=0.000*	r=0.217 p=0.000*	r=0.375 p=0.000*	r=0.355 p=0.000*	r=0.162 p=0.005*	r=0.343 p=0.000*
Coordination	r=0.349 p=0.000*	r=0.318 p=0.000*	r=0.355 p=0.000*	r=0.358 p=0.000*	r=0.309 p=0.000*	r=0.415 p=0.000*
Professionalism	r=0.413 p=0.000*	r=0.382 p=0.000*	r=0.463 p=0.000*	r=0.487 p=0.000*	r=0.393 p=0.000*	r=0.522 p=0.000*
Total nurse-nurse collaboration	r=0.412 p=0.000*	r=0.360 p=0.000*	r=0.483 p=0.000*	r=0.389 p=0.000*	r=0.346 p=0.000*	r=0.491 p=0.000*

* Correlation is significant ($p<0.05$) using the Pearson correlation coefficient.

4. Discussion

This study assessed the association of nurses' intraprofessional collaboration and nurses' practice environment. Higher scores indicated higher nurse-nurse collaboration. The mean total score of nurses' collaboration was 2.94±0.21 out of a score of 4. In a study conducted by Lee and Hwang (2019) in Korea, the mean score of nurse-nurse collaboration was reported as 2.99±0.23, which is similar to this study. In another study done in Turkey by Durmus et al. (2018), nurses showed higher intraprofessional collaboration (3.09±0.39) compared to nurses in our study. This finding is not consistent with our results. It seems that this difference could be related to the context of the study in which some organizational and personal factors are different in the context of our hospitals compared with those studied in Turkey. As argued by Lemetti et al. (2021), nurses from different organizations could have different opinions on nurses' collaboration.

The results indicated that in terms of nurses' collaboration, the highest score was attributed to the field of professionalism and the lowest score was related to the field of conflict management. A study by Hassona and El-Aziz (2017) in Egypt which assessed the relationship between intensive care nurses' collaboration and missed nursing practice showed a higher mean score in the field of communication and a lower score in the field of coordination. These findings are not consistent with the results of our study. Ylitormanen et al. (2019) argue that collaboration as a dynamic and complex process could be influenced by some organizational and professional factors. Therefore, the difference in nurses' perceptions of collaboration in different countries can be attributed to the diversity of organizational factors and professional values in each country or context.

Regarding the nursing working environment, the mean score of the PES–NWI scale was 2.65±0.32 out of 4. The highest score belonged to the subscale of nursing foundations for quality of care and the lowest score belonged to the subscale of the staffing and resource adequacy (2.24±0.49). In a study conducted in Greece by Prezerakos et al. (2015), the results showed that the mean score of the Nurses' Practice Environment Scale (2.48±0.34) was lower than the results obtained from our study. In another study conducted in the USA, Flynn et al. (2010) assessed the effects of nurses' practice environment on the quality of care. The results showed that the mean score of nurses' practice environment was higher than our study. Moreover, Choi et al. (2013) investigated the association between the nursing practice environment and nurses' job satisfaction. The results showed that the mean score in all subscales, except the area of nurses' participation in hospital affairs, was higher than the results of our study. Therefore, it seems that the nursing practice environment differs according to the various context-based organizational factors such as organizational culture, management, leadership, and resources.

According to the results in this study, the lower scores were found in the subscale of resource adequacy and staffing and the leadership and nurse managers' support of nurses. Nantsupawat et al. (2017) argue that a poor practice environment such as lack of support from nursing managers and inadequate equipment could lead to nurses' burnout and poor quality nursing care. In a recent study, Lapeña et al. (2017) highlighted the importance of leadership in improving the nurses' work environment.

This study showed that the mean total score of the Practice Environment Scale of the Nursing Work Index has a positive and significant relationship with the mean total score of the nurse-nurse collaboration scale. Moreover, there was a significant positive relationship between each subscale of PES–NWI and the total score of nurse-nurse collaboration. It means that improvement in the nursing work index could increase the nurses' collaboration. Previous research has reported that working within better work environments could increase nurses' job satisfaction and decreases their intention to leave and burnout (Nantsupawat et al., 2017). More recently, Moisoglou et al. (2020) found a negative association of healthy work environment with nurses' personal, work-related and patient-related burnout.

To our knowledge, no studies focusing on the association of nurses' collaboration and nursing practice environment were found. In a qualitative study, Sevilla-Zeigen (2016) showed how a healthy work environment could influence the patients' safety and nurses' quality of care. The participants highlighted the significance of effective relationship, teamwork, and collaboration in improving the healthy workplace in the health care settings. As argued by Lemetti et al. (2021) effective collaboration between nurses require support from the organizations and managers with a greater respect on mutually arranged guidelines, objectives, and policies. In a recent study by Mohammadzadeh et al. (2021), it was found that providing a healthy working environment could affect the nurses' outcomes such as their career success. In this regards, some studies highlight

the importance of organizational factors and working environment in providing high quality nursing care (Valizadeh et al., 2018; Ahmadpour et al., 2020; Zamanzadeh et al., 2017). In addition, Sapar and Oducado (2021) believe that the shortage of nurses is a global issue that influences the quality of nursing care. Moore and Prentice (2013) maintain that supporting the collaborative practice by nurse managements and providing innovative opportunities for nurse-nurse collaboration could improve nurses' collaboration in the health care settings. Lemetti et al. (2020) also believe that nurses should develop and demonstrate their competence, knowledge, expertise, trust, respect, and fairness as equals with their collaborating partner, demonstrating a collaborative team work.

5. Implications and limitations

The result of this study could have some implications in the clinical settings. Nurse managers and leaders should encourage nurses to work collaboratively. Nurse managers should improve nurses' skills in some areas of collaboration such as conflict management. Moreover, they should provide a healthy working environment and remove the barriers which may impact nurses' collaboration. Improving the practice environment of nurses and providing a healthy workplace could improve the intraprofessional nurses' collaboration.

A limitation of this study is the selection of all participants from the teaching hospitals. Future studies should increase the geographical range of the research and consider diverse types of hospitals (e.g., teaching vs. non-teaching, private vs. public hospitals). Furthermore, we collected data from the perspective of nurses and it is recommended that future studies be carried out on nurse managers, patients, and families. Despite the limitations, this research provides knowledge of nurses' perception of intraprofessional collaboration in the clinical settings and the relation of working index with nurse-nurse collaboration.

6. Conclusion

This study aimed to assess the relationship between nursing work environment and nurses' collaboration in clinical settings. The results showed that the nurses' collaboration is at an acceptable level in general, but some areas including conflict management require more attention from the nursing staff. Moreover, the mean score of the nursing working environment showed a lower score in areas such as resource adequacy and staffing and the leadership and nurse managers' support of nurses. Therefore, nurse managers should support nurses and better staffing in the clinical settings. According to the result, the nursing practice environment showed a significant correlation with nurses' collaboration. Hence, improving the practice environment of nurses and providing a healthy workplace could improve the intraprofessional nurse's collaboration. It is suggested that hospital managers and policy makers should develop appropriate strategies and take the necessary measures to improve the practice environment of nurses to increase their collaboration for providing high quality care.

Author's contribution

MG, RG, HH, JD participated in study conception and design. RG collected the data. MG, HH, JD, and RG also participated in data analysis and drafting of the article were done by MG, RG, HH, JD. All authors critically revised the manuscript.

Conflict of interest

None

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