Patient safety in work environments: Perceptions of pediatric healthcare providers in Taiwan

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Abstract

Background: Extensive research on the link between the organizational characteristics of the work environment and patient safety in a healthcare organization has been conducted; yet, only a few studies have concentrated on care providers in a pediatric unit.

Objectives: To determine the correlation between different work environment factors impacting patient safety in a pediatric care unit from the perspective of registered nurses working in these units.

Design: Cross-sectional design.

Data sources and methods: The study was conducted with 155 registered nurses from a pediatric unit in a medical center in Taiwan with the Chinese version of the Safety Attitudes Questionnaire (SAQ) 2014–2017.

Results: Teamwork climate, higher job satisfaction, and better working conditions are linked to positive perceptions of patient safety culture. Emotional exhaustion is negatively related to most dimensions of patient safety.

Conclusion: Teamwork climate, job satisfaction, working conditions, and emotional exhaustion were identified as critical factors impacting the patient safety climate.

Implications for nursing or health policy: Investments to improve teamwork climate, job satisfaction, and working conditions and reduce emotional exhaustion may have a positive effect on patient safety in pediatric care units.

Keywords: Pediatric nurses; Teamwork climate; Job satisfaction; Safety attitudes questionnaire

Introduction

In healthcare organizations, patient safety is defined as the prevention of accidental injury caused by errors of work (Institute of Medicine, 2004) and regarded as a top priority (Zheng et al., 2018). The work environment is "the set of characteristics that describes an organization and distinguishes it from other organizations; these characteristics should be relatively long-lasting and influence the conduct of members of the organization," as defined by Forehand and Gilmer (1964). Clearly, the design of the work environment influences patient safety outcomes, such as adverse events associated with the professionals serving in a healthcare organization (Laschinger & Leiter, 2006). Unsafe healthcare such as medical errors includes errors in medical care, nosocomial infections, errors in teamwork, and diagnostic errors (Pham, Aswani, & Rosen, 2012). Most of the errors in medical processes are directly or indirectly related to the care provider; consequently, the care provider plays a crucial role in ensuring patient safety (Groves, Meisenbach, & Scott-Cawiezell, 2011).

Research on the connection between work environment and patient safety in health professionals is extensive. Aspects such as staff retention level, teamwork climate, the degree of exhaustion and emotional stress, working conditions, stress recognition, and the level of job satisfaction have been found to be associated with patient safety and related aspects such as patient mortality, healthcare-associated infection, medical errors, and adverse events (Alves & Guirardello, 2016; Nantsupawat et al., 2017; Olds, Aiken, Cimiotti, & Lake, 2017). Nurses in hospitals with better work environments have been found to strengthen their skills and have a greater awareness of near-miss incidents (Flynn, Liang, Dickson, Xie, & Suh, 2012). Nurses in a deficient working environment, e.g., with improper working hours, are prone to the risk of medical errors or near-miss incidents (Wu et al., 2013). Thus, understanding the perception of nurses in the work environment is important for the healthcare organization to enhance patient safety.

To improve the caring process and enhance the degree of patient safety, it is essential to pay attention to what nurses perceive and need as a care provider (Fagan, Parker, & Jackson, 2016; Allen, 2018). The illustrations are diverse, ranging from hardware and software training to becoming familiar with new technologies such as bar-code identification (Guffey & Hyman, 2017), to improvements in the physical space (Farokhzadian, Nayeri, & Borhani, 2015) and the use of aromatherapy as an instrument to reduce stress (Johnson et al., 2017). Funding support, equipment, and facilities also influence working conditions (Li et al., 2018), along with the interventions of management in the organization of the care process (Saltzman et al., 2017).

The degree of resistance of disease between a child and an adult is distinct (Muttarak & Dimitrova, 2019), and pediatric patients have been found to be infected

more susceptibly than an adult to such an extent that the perceptions of health professionals' safety attitude is essential in the pediatric unit. Although there is a stream of research on neonatal intensive care units (Tawfik et al., 2016; Al-Hamdan, Manojlovich, & Tanima, 2017; Profit et al., 2017), limited studies so far have investigated the effect of work environments on patient safety from the perspective of the care providers in the pediatric unit.

Literature

In a healthcare organization, a service process is designed and executed based on the patient safety strategy; therefore, the care provider is one of the most important components that determine the performance of patient safety (Mansour, 2015). They are on the frontline to provide services to patients; thus, the care provider's perception of patient safety in a work environment is essential for any healthcare organization to improve their overall patient safety performance. Also, the work environment is concerned as an organizational indicator that is relevant to patient safety (Olds et al., 2017). Thus, various dimensions in the work environment influence the conduct of care providers. Various attributes of the work environment have been considered in the literature, including those related to the physical environment, such as physical elements, challenge, freedom, support, coherence, threats in the work environment, and the effect of status quo (Hon et al., 2013), and those related to the social climate, such as employee participation, knowledge sharing, and procedural justice (Schepers & Van den Berg, 2007).

In any healthcare organization, organizational characteristics in the work environment result in the behavior of the health professionals and the performance of organizations, such as patient mortality, healthcare-associated infection, adverse event, medical error, patient safety, patient safety culture, etc. Thus, for care providers, various attributes of patient safety have been considered in the literature and include job satisfaction, intention to stay, burnout, emotional distress, teamwork, safety climate, teamwork climate, perceptions of management, working conditions, stress recognition, and emotional exhaustion. Nantsupawat et al. (2017) indicated that burnout, job satisfaction, and intention to leave are important indicators to measure patient safety and patient care in Thai healthcare. Further, Olds et al. (2017) indicated that the results indicated that organizational characteristics such as safety climate and work environment in healthcare organizations are relative to patient mortality in the survey of non-federal hospitals, including California, Florida, Pennsylvania, and New Jersey in the United States. Occupational stress weakens the physical health and mental status of employees and has been found to be linked to fatigue, emotional distress, and exhaustion (Mosadeghrad, 2014). The freedom to express any opinion should be given

when professionals detect mistakes in the service process (Profit et al., 2012).

In prior studies, considerable dimensions measuring work environments are discussed (Norman & Sjetne, 2017). Three major directions concerned with the work environment are related to professional relationships, personal characteristics, and availability of resources. For example, collaborative relationships (Gregory et al., 2019), management support (Hayes, Douglas, & Bonner, 2015), professional pride (Vikström & Johansson, 2019), workload (Lee & Kim, 2020), and working conditions (Dunstan & Coyer, 2020) are reviewed in the issue of work environments. Gregory et al. (2019) indicated an effective communication medical team in teamwork is critical for enhancing patient safety. Hayes et al. (2015) conducted an online survey in Australia and New Zealand and found that management support is an important organizational factor to make hemodialysis nurses satisfaction resulting in better performance in the work environment. A qualitative study from Vikström and Johansson (2019) indicated that the contributions that nurses benefit residents from their professional ability are correlated to professional pride in workplaces. Lee and Kim (2020) used the questionnaires to investigate the impact of stress factors on work performance for nurses from South Korea's hospitals. The results indicated that workload statistically significantly affects intention to leave. Inadequate staffing, which is related to nurse-to-patient ratio, is one of the reasons that nurses suffer from a high workload. Dunstan and Coyer (2020) conducted the SAQ in intensive care units in two Australian hospitals. The results indicate that the scores of working conditions are statistically different among professions. In particular, working conditions that nurses possess with the lowest scores are essential for the healthcare organization to improve to benefit patient safety in hospitals.

Children are more susceptible to physical issues than adults in an ill environment (Muttarak & Dimitrova, 2019). Thus, the care process and behavior of the care providers in the frontline are critical for patient safety in pediatric units. Additionally, nurses in pediatric units tend to suffer from occupational stress, as they are not only made to face the problems of their child patients but also the problems of their parents. The existence of burnout among the staff in a healthcare organization has been found to be associated with patient safety culture, which is a fundamental of care quality (Profit et al., 2014). In the safety issue of very low birth weight neonates, the degree of burnout and teamwork of the staff have been found to be associated with healthcare-associated infection rates (Tawfik et al., 2016; Profit et al., 2017). Care providers who suffer from emotional distress are more likely to be involved in adverse events in the Neonatal Intensive Care Unit; crucial factors to mitigate the likelihood and consequences of such events are the assistance from colleagues (Winning et al., 2018). With an improved work environment, job satisfaction for nurses was seen to increase

at the Neonatal Intensive Care Unit in Jordan (Al-Hamdan, 2017). Alves et al. (2016) showed the relationship among emotional exhaustion, safety climate, and job satisfaction from the perspective of nurses in a pediatric unit. In sum, the attributes measuring patient safety in the past research were diverse. Specifically, rare research investigates the health professionals' perception of patient safety in the work environment in a pediatric unit.

The SAQ is one of the most common methods to assess patient safety culture which is vital for the healthcare organization to understand the health professionals' perception of patient safety in the work environment. The SAQ developed by Sexton et al. (2006) in the United States has been used worldwide to assess the patient safety culture in healthcare organizations and characterized good psychometric properties and great internal consistency (Chi, Wu, Huang, & Lee, 2017). Patient safety culture is defined as a "subset of organizational culture, which relates specifically to the values and beliefs concerning patient safety within healthcare organizations" (Feng, Bobay, & Weiss, 2008). It is constructed by various dimensions and results in different behaviors of patient safety (Sexton et al., 2006). Understanding the importance of work environment factors in the SAQ helps decision-makers improve patient safety in healthcare organizations (Lee, Weng, Stanworth, Hsieh, & Wu, 2015). In recent studies, patient safety in several healthcare-related workplaces such as intensive care units (Dunstan & Coyer, 2020), ambulatory practices (Miller et al., 2019), inpatient mental health services (Dickens, Salamonson, Ramjan, Steel, & Everett, 2019), the entire hospital (Lee, Tzeng, & Chiang, 2019a; Lee, Huang, Wu, Hsueh, & Wu, 2019b; Pavan et al., 2019; O'Leary et al., 2019), home nursing (Bondevik, Hofoss, Husebø, & Deilkås, 2019) is assessed by the SAQ.

In Taiwan, based on the SAQ (short form 2006), the Joint Commission of Taiwan developed the Chinese version of the SAQ to assess the patient safety culture in healthcare organizations on a yearly basis (Chi et al., 2017; Lee, Shieh, Huang, Wang, & Wu, 2017a; Lee, Huang, Hsu, & Wu, 2016). In 2008, the first Chinese version of the SAQ was launched, with 6 dimensions and 30 questions, based on the short form of the SAQ developed by the Joint Commission of Taiwan (Chi et al., 2017; Lee et al., 2017a). In 2014, three hospital-level aspects of safety culture from the Agency for Healthcare Research and Quality, which were originally included in the previous version, were removed. Two dimensions, emotional exhaustion and work-life balance, were added (Chi et al., 2017). Thus, the current Chinese version of the SAQ in the survey has 8 dimensions and 46 questions. In fact, since 2008, the Chinese version of the SAQ has been regarded as the official questionnaire to assess the patient safety culture in Taiwan because both the survey results and the original data set need to be submitted electronically to the Joint Commission of Taiwan through the website under the current

medical system in Taiwan (Lee et al., 2017b). Thus, this study investigates a survey by using the Chinese version of the SAQ in one of the best medical centers to evaluate health professionals' perception of patient safety in a pediatric unit.

In sum, prior studies address various issues such as professional relationship (Gregory et al., 2019; Hayes et al., 2015), personal characteristics (Vikström & Johansson, 2019; Lee & Kim, 2020), and availability of resources (Dunstan & Coyer, 2020) showing that good work environments directly or indirectly benefit quality of care. In a study of Shaheen, El-Hneiti, Albqoor, & Ahmad (2019), the factors of work environments, including work stress, work-related exhaustion, participation management, and skills development, do not significantly impact the quality of care for nurses who provide care for adults. However, prior research rarely investigates the relationships between the work environment and patient safety from the perceptions of pediatric nurses based on the SAQ.

To the best of our knowledge, the only studies investigating the perception of pediatric nurses on work environment factors are those of Alves and Guirardello (2016) and Alves et al. (2016), who showed the relationship between emotional exhaustion, safety climate, and job satisfaction in pediatric units in Brazil. Our study was carried out in the pediatric unit of a medical center in Taiwan. Patient safety issues are gaining increased attention in many Taiwanese hospitals (Ministry of Health and Welfare, 2019); yet, to the best of our knowledge, this is the first study that is focusing on the link between organizational factors and patient safety for a pediatric unit. Our study differs from the work of Alves and Guirardello (2016), as we investigated the perceptions of pediatric nurses from a more comprehensive view based on the SAQ, focusing on the predictive effects of the following six dimensions: 1) emotional exhaustion, 2) job satisfaction, 3) teamwork climate, 4) stress recognition, 5) perceptions of management, and 6) working conditions.

Study aim

This study aims to investigate the perceptions of registered nurses about patient safety in pediatric work environments.

Methods

Study design and sample

The selected case hospital is ranked as one of the best medical centers in Taiwan and contains more than 35 divisions with 1500 employees in total, providing 700 hospital beds and clinical education and training to health professionals. The pediatric nurses were annually requested to participate in the survey by using the latest Chinese version of the SAQ (SAQ, see Table 1) in the 2014–2017 period. Thus, an effective

number of questionnaires for pediatric nurses were obtained using the internal survey data conducted in this medical center. This study has been approved by the institutional review board. The clinical trial approval certificate (ethic statement) was approved by Cheng Ching General Hospital in Taichung City, Taiwan.

All the respondents were considered individually as one sample. In the work environment, each nurse has to take care of various patients with different psychometric properties when executing missions. Thus, the same nurse has been considered as an independent individual instead of the same individual when responding to the questionnaire each year. There is a constant interval to distribute the questionnaires every year; the questionnaires are taken as one sample.

Measure

Based on the Sexton et al.'s (2006) SAQ, the Joint Commission of Taiwan has incorporated the Maslach Burnout Inventory-Human Services Survey (MBI-HSS) to completely assess the attitudes of hospital staff toward a better patient safety culture. The emotional exhaustion dimension from the MBI-HSS and work-life balance were integrated into the questionnaire. Thus, the Chinese version of the SAQ questionnaire contains 46 questions, grouped into 8 dimensions: teamwork climate (questions 1 to 6), safety climate (questions 7 to 13), job satisfaction (questions 14 to 18), stress recognition (measured through reverse-scored questions 19, 21, 25, and 26); perceptions of management (questions 27 to 30), working conditions (questions 31 to 34), emotional exhaustion (measured through reverse-scored questions 20, 22, 23, 24, 35, 36, 37, 38, and 39), and work-life balance (questions 40 to 46).

The Chinese version of the SAQ has been confirmed to be reliable and valid by the results of Huang, Wu, & Lee (2018a) and Wu, Lee, & Huang (2019) in order to better understand the perceptions of physicians and nurses toward patient safety culture. The Cronbach's alphas for the dimensions of the SAQ ranged around 0.760 to 0.941. Each question in each dimension was assessed using a five-point Likert scale (1 = Strongly Disagree and 5 = Strongly Agree). Work-life balance was excluded since it is a four-point frequency scale different from an interval scale. Sexton et al. (2018) and Sexton et al. (2017) demonstrate work-life balance has a weak correlation to safety climate. Based on the aforementioned studies, work-life balance was removed from the analysis.

Insert Table 1 here

Data Analysis

This following section outlines the assessment of statistical analysis used to evaluate the dimensions of patient safety. The descriptive statistics were initially calculated to provide the demographic information of pediatric nurses and the scores for each of patient safety dimensions. Next, we used the Pearson's correlation coefficient in SPSS 22.0 to examine the strength of the linear relationship between any two continuous variables of seven patient safety dimensions. Specifically, the correlation relationships between safety climate and the other six patient safety dimensions (i.e., teamwork climate, job satisfaction, stress recognition, perceptions of management, working conditions, and emotional exhaustion) were investigated (Cohen, Cohen, West, & Aiken, 2013).

After validating the direct and strength of patient safety dimensions, linear regression with forward selection was used to identify the essential dimension(s) that affect safety climate from the perspective of pediatric nurses. Linear regression with forward selection starts with an empty set and adds an attribute one at a time continually. At each step, only the variable which gives the highest correlation with the dependent variable is added into the selection (Chi, Huang, Lee, & Wu, 2019). That is, variables that have greater theoretical importance are entered first. It is worth mentioning that an interaction effect of independent variables is unable to be included in the forward selection approach, but the decision-maker allows to clarify which variable has a greater impact directly on the dependent variable (Karagiannopoulos, Anyfantis, Kotsiantis, & Pintelas, 2007; Cheng, Lee, Huang, & Wu, 2020).

The criteria of adding variable(s) into a linear regression model is implemented: a variable in the probability of F less than 0.05 is considered to enter the linear regression model until none of the variables statistically significantly improves the model. To this end, six dimensions, including teamwork climate, job satisfaction, stress recognition, perceptions of management, working conditions, and emotional exhaustion, are the independent variables, whereas the safety climate is the dependent variable in the Chinese version of the SAQ.

The work experience in an organization and age were used as contextual variables to test for possible nonresponse bias. Results indicated no significant difference at a 0.05 significance level for the two contextual variables. Therefore, non-responsive bias was not a significant concern in this study.

Results

Descriptive statistics of the respondents' demographic characteristics are provided in Table 2. The sample profile demonstrated that most respondents were female (99.4%), age ranged from 31 to 40 years (38.1%), and education of the bachelor (89.7%). Around three-fourths of respondents with relevant working experiences were

employed more than five years in the hospital.

Insert Table 2 here

Among the 8 dimensions surveyed in the questionnaire (see Table 1), we considered the safety climate (SC) as the dependent variable and studied the predictive effect of the following 6 independent variables: 1) emotional exhaustion (EE), 2) job satisfaction (JS), 3) teamwork climate (TC), 4) stress recognition (SR), 5) perceptions of management (PM), and 6) working conditions (WC). We did not include the impact of work-life balance, as this was measured on a frequency scale. The scores for each of the six dimensions were calculated by summing the scores of the items measuring that particular dimension.

Insert Table 3 here

As shown in Table 3, the results of the statistical analysis demonstrated that safety climate (average value is 26.59) has the highest average value, whereas stress recognition (average value is 14.38) has the lowest average value. The Cronbach's α values of all seven dimensions were found to be greater than 0.60, which demonstrates acceptable internal consistency. Overall, the dimensions of patient safety represented satisfactory outcomes except for the lowest mean percentage of emotional exhaustion (54%). In particular, the results indicated that the emotional exhaustion has a higher standard deviation than the other patient safety dimensions. Analysis of variance is further employed to test if nurses have different perceptions in emotional exhaustion. Table 4 illustrated that nurses aged 21-30 and 31-40 have a significantly lower degree of emotional exhaustion than those aged 51-60 statistically. Thus, the degree of emotional exhaustion may vary from age to age.

Insert Table 4 here

Table 5 shows the Pearson's correlation coefficients between the dimensions. The results demonstrated the perceptions of management were significantly correlated with working conditions and job satisfaction: the more management support the nurses felt, the higher the perception of working conditions and job satisfaction would be. Safety climate was found to be significantly correlated to teamwork climate. In addition, emotional exhaustion was found to be significantly negatively correlated with most dimensions of patient safety culture. When employees have a higher degree of emotional exhaustion, they tend to feel less satisfaction in job satisfaction, teamwork

climate, perceptions of management, and working conditions.

Insert Table 5 here

The result for regression analysis is shown in Table 6. The approach with forward selection confirmed that teamwork climate, job satisfaction, and working conditions can predict safety climate; the other dimensions were found to have coefficients that did not differ significantly from 0.05. Teamwork climate (β = 0.505) has the most positive effect on safety climate, followed by job satisfaction (β = 0.208) and working conditions with β = 0.204. The more the nurses are satisfied with job and working conditions, the better the safety climate is perceived to be.

Insert Table 6 here

Discussion

This study aims to assess factors that have significantly affected patient safety in a work environment from the perspective of registered nurses working in the pediatric care unit of a medical center in Taiwan. The discussions of findings are given below.

First, the Pearson's correlation coefficient results demonstrated that emotional exhaustion is negatively related to safety climate. Similarly, the level of emotional exhaustion is negatively correlated with job satisfaction, teamwork climate, perceptions of management, and working conditions, respectively. Studies conducted in pediatric care units have commonly illustrated high levels of emotional exhaustion among nurses (Profit et al., 2014; Alves & Guirardello, 2016; dos Santos Alves, da Silva, & de Brito Guirardello, 2017). Indeed, the workload for nurses is high: with an average nurse-patient ratio reaching 1:9.8 in the case hospital in 2019, Taiwan performed much worse than the international ratio of 1:6 (Ministry of Health and Welfare, 2019). Existing studies have already emphasized the burnout risks among nurses in Taiwan, which leads to adverse consequences such as medical errors, increased personnel turnover, absenteeism, shortage of staff, and failure to meet patient needs (Huang, Wu, Lee, Wu, & Lin, 2018b). As these negative outcomes threaten the safety of patients, we suggest tracking the level of emotional exhaustion, for instance, by implementing Employee Assistance Programs (EAP) that regularly monitor potential factors affecting nurses' productivity (such as working pressure, interpersonal relations, and work deployment). Moreover, stable recruitment programs and standard handoff systems should be implemented to decrease the high nurse-patient ratio and mitigate the occurrence of medical errors and mistakes during shifts.

Second, teamwork climate was shown to have the most positive impact on safety

climate in the current study. Our result confirms the findings of Abu-El-Noor et al. (2017) and Gabrani, Hoxha, Simaku, & Gabrani (2015), who showed as the teamwork of hospital staff (e.g. physicians and nurses) strengthens, the safety climate increases. Indeed, a strong teamwork climate in hospitals contributes to the promotion of an environment that enables the delivery of safe care and therefore, ensures the enhancement of patient safety. This positive relationship has been mainly attributed to better communication, coordination, collaboration between nurses and physicians within the units, and participation at bedside rounds (Abu-El-Noor et al., 2017; Jiménez, Swartz, & McCorkle, 2018). Thus, hospital managers should encourage and incentivize cooperation between nurses and physicians, promote awareness of the importance of patient safety regularly, and support open dialogue and regular communication about patient safety issues in the units.

Third, our results revealed that working conditions influence the perception of patient safety. This is consistent with the study in Huang et al. (2018a). In general, nurses face a variety of challenges during work time, such as high time pressure, multi-tasking, and staffing shortages. Nurses in a pediatric unit need to pay more attention to children's patients rather than to adult patients in other units. In a work environment, a high workload implies nurses possess fewer resources in the workplace (Fagerström, Kinnunen, & Saarela, 2018). Resources such as training programs for nurses can help avoid outcomes such as burnout and the perceived quality of care (Paguio & Doris, 2019). General respect for the health and wellbeing of nurses is a key part of the working conditions (Gershon et al., 2007). The present study confirms that human resource management improves the patient safety climate, for instance by employing sufficient staff, by implementing a more rational salary system with performance-based bonuses, and by providing training programs for new personnel. The latter is particularly important, as inconsistent procedures may impact patient safety and wellbeing; e.g., premedication practices under endotracheal intubation in Hatch et al. (2016) and Foglia et al. (2015).

Last but not least, the results show that safety climate is positively impacted by job satisfaction. Nurses with more work experience may represent higher consciousness about patient safety (Alves & Guirardello, 2016; dos Santos Alves et al., 2017; Roney & Acri, 2018). As suggested by the literature, job satisfaction can be strengthened, for instance, by implementing effective performance appraisal mechanisms, facilitating transparent communications between the nurses and patients, improving communications in adverse events (Wagner et al., 2018; Jiménez, Swartz, & McCorkle, 2018), and enhancing the sense of belonging and participation (which can strengthen nurses' sense of belonging to the units and/or hospitals). Moreover, the transformational leadership style of the administrators and/or supervisors on the

pediatric unit may play a role in determining how satisfied the nurses are with their job. Nurses' empowerment may be influenced by the perception that the hospital cares about its nurses' wellbeing and that their work is valued. Empowering nurses may increase job satisfaction and intensify patient safety quality (Boamah, Laschinger, Wong, & Clarke, 2018; Roney & Acri, 2018).

Implications for Nursing and Health Policy

When nurses are satisfied with their work environment, negative perceptions of their work are reduced (Liu, Aungsuroch, & Yunibhand, 2016) and consequently, patient safety is enhanced in healthcare. Interventions for improving nurses' perception of emotional exhaustion, job satisfaction, working conditions, and teamwork climate are needed to provide a better work environment and, thus, effectively promote patient safety.

Designing mechanisms that facilitate transparent communications between personnel and patients can avoid adverse events and thus strengthen job satisfaction in patient safety climate. A regular reward should also be awarded to nurses to recognize their outstanding performance so that they feel appreciated at work and to enhance their job satisfaction. Creating a sufficient workplace might be a good way to increase work pleasure and performance.

Hospital managers have the responsibility to encourage and incentivize interactions between personnel through appropriate activities improving the teamwork climate. The establishment of Quality Control Circle (QCC) or Huddle Observational Tool (HOT) can motivate the enthusiasm of nursing staff to participate in gaining professional knowledge and member-interactive activities, which in turn strengthens cooperative teamwork and communication skills. Providing a variety of communication channels such as seminars, staff suggestion boxes, and consultations to communicate with nurses can promote mutual understanding between nursing members and units in the hospital, which is favorable to patient safety work and can create a harmonious atmosphere of cross-unit teamwork.

Support and encouragement for nurses from hospital managers are important for providing better working conditions. Implementations could include adjusting the nursing salary structure appropriately as well as creating a self-development platform. Similarly, training programs through hospital seminars based on specific professional and the knowledge of patient safety can have a positive effect on working conditions. Additionally, designing interventions that allow for the transformational leadership style as well as empowerment on varying classifications of nursing personnel may be a more effective strategy for promoting nurses' attitudes and behaviors toward patient safety.

Policies and strategies including maintaining an adequate nurse-patient ratio are important for nurses to avoid exhaustion and to ensure nurses have plenty of energy and enthusiasm to deliver professional care to patients. Ensuring the status of nurses' physical and mental exhaustion by closely monitoring their productiveness is essentially important. The development of a systemic mentorship is critical in exchanging professional knowledge, skills, and valuable experience among nurses, thus reducing the overall stress and exhaustion built up in the units.

Limitations

Our research has limitations. The respondents were registered nurses from the pediatric care unit at a medical center. Thus, the results may not generalize to other institutions such as regional and/or district hospitals. Extending the study to other healthcare organizations could improve the scope of the study. Future studies on patient safety could also examine the perspective of other staff types, such as technicians, pharmacists, etc.

Conclusions

The results suggest that investments that facilitate teamwork climate, job satisfaction, and working conditions can contribute substantially to improvements in the safety climate. Moreover, the negative effect of emotional exhaustion on the safety climate was identified in the current study. Related activities that allowed employees to increase the degree of responsibility for their jobs were found to be helpful and should be promoted by the organization (Alves & Guirardello, 2016). To better promote patient safety culture in pediatric units, implementations related to the work environment variables, such as teamwork climate, job satisfaction, stress recognition, perceptions of management, working conditions, and emotional exhaustion, analyzed in this study should be given a high priority in nursing interventions.

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Table 1: The Safety Attitudes Questionnaire

Teamwork climate (TC)	(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(r)
	(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 (SC)	(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(r)
	(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 (JS)	(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 (SR)	(19) When my workload becomes excessive, my performance is impaired(r)
	(21) I am less effective at work when tired(r)
	(25) I am more likely to make errors in tense or hostile situations (e.g. emergency resuscitation, seizure) (r)
	(26) Fatigue impairs my performance during emergency situations(r)
Perceptions of management (PM)	(27) Managers supports my daily efforts
	(28) Managers do not knowingly compromise patient safety
	(29) I get adequate, timely information about events that might affect my work
	(30) The levels of staffing in this clinical area are sufficient to handle the number of patients
Working conditions (WC)	(31) Problem personnel are dealt with constructively
	(32) This hospital does a good job at training new personnel
	(33) All the necessary information for diagnostic and therapeutic decisions is routinely available to me
	(34) Trainees in my discipline are adequately supervised

Emotional exhaustion (EE)	(20) I feel like I'm at the end of my rope(r)
	(22) I feel burned out from my work(r)
	(23) I feel frustrated by my job(r)
	(24) I feel I'm working too hard on my job(r)
	(35) I feel emotionally exhausted from my work(r)
	(36) I feel used up at the end of the workday(r)
	(37) I feel tired when I get up in the morning and have to face another day on the job(r)
	(38) Working with people all day is really a strain for me(r)
	(39) Working with people directly puts too much stress on me(r)
Work-life balance (WLB) (4 point frequency scale)	(40) Missed meals
	(41) A hasty meal
	(42) All-day work without any rest
	(43) Individual or family plan changes due to work factors
	(44) Poor sleep
	(45) Less than five-hours of sleep at night
	(46) Working overtime

Note: (r): reverse scored questions

Table 2: Demographic characteristics of pediatric nurses

DEMOGRAPHIC VARIABLE		Frequency	Percentage
Gender	Male	1	0.6
	Female	154	99.4
Age	21-30 years old	55	35.5
	31-40 years old	59	38.1
	41-50 years old	34	21.9
	51-60 years old	7	4.5
Supervisor/Manager	Yes	10	6.5
	No	145	93.5
Respondents reporting adverse events in the past 12 months	No	115	74.2
	1-5	38	24.5
	6-10	2	1.3
Education	Senior High School	1	0.6
	College/University	139	89.7
	Master's Degree	15	9.7
Working experience in organization	Less than 1 year	8	5.2
	1 to 2 years	9	5.8
	3 to 4 years	20	12.9
	5 to 10 years	34	21.9
	11-20 years	65	41.9
	21 years and above	19	12.3
Working experience in position	Less than 1 year	9	5.8
	1 to 2 years	10	6.5
	3 to 4 years	18	11.6
	5 to 10 years	35	22.6
	11-20 years	69	44.5
	21 years and above	14	9

Table 3: Characteristics of patient safety variables (n=155)

Variables/Dimensions	Max.	Mean (% score)	SD	α
Safety climate	35.00	26.59 (76%)	3.734	0.760
Emotional exhaustion	44.00	23.88 (54%)	7.338	0.926
Job satisfaction	25.00	20.01 (80%)	3.754	0.940
Teamwork climate	27.00	22.34 (83%)	3.120	0.680
Stress recognition	20.00	14.38 (72%)	3.784	0.925
Perceptions of management	20.00	15.75 (79%)	2.966	0.860
Working conditions	20.00	15.90 (80%)	2.935	0.917

Table 4 ANOVA Results for Nurse's Age in Seven Dimensions

Dimension	F	Sig.	Bonferroni
Safety climate	1.579	.197	
Emotional exhaustion	5.001	.002	21-30 > 51-60; 31-40 > 51-60
Job Satisfaction	1.941	.125	
Teamwork climate	2.678	.049	51-60>31-40
Stress Recognition	1.390	.248	
Perceptions of Management	2.056	.108	
Working Conditions	3.459	.018	51-60>21-30; 51-60>31-40

Table 5: Pearson's ρ of patient safety variables

Variables	Pearson's ρ						
	SC	EE	JS	TC	SR	PM	WC
SC	1.000						
EE	-.301**	1.000					
JS	.724**	-.424**	1.000				
TC	.761**	-.315**	.717**	1.000			
SR	.321**	.078	.320**	.287**	1.000		
PM	.711**	-.423**	.804**	.749**	.269**	1.000	
WC	.714**	-.350**	.759**	.694**	.302**	.855**	1.000

Note: ** p-value < 0.01; SC: safety climate; EE: emotional exhaustion; JS: job satisfaction; TC: teamwork climate; SR: stress recognition; PM: perceptions of management; WC: working conditions

Table 6. Multiple linear regression – safety climate (response variable), emotional exhaustion and job satisfaction (explanatory variables)

Response variables	Explanatory variables	Coefficient	95% CI		Sig.	R^2
			LL	UL		
Model* Safety climate	Teamwork climate	0.505	0.443	0.767	0.007	0.688
	Working conditions	0.204	0.084	0.435	<0.001	
	Job satisfaction	0.208	0.057	0.357	0.004	

*Explanatory variables: emotional exhaustion, job satisfaction, teamwork climate, stress recognition, perceptions of management, working conditions.