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ORIGINAL PAPER

ASSOCIATION BETWEEN NURSES' BURNOUT, HOSPITAL PATIENT SAFETY CLIMATE AND QUALITY OF NURSING CARE

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Abstract

Aim: To evaluate the associations between nurse burnout, the hospital patient safety climate, the patient safety grade, and adverse events. *Design:* Cross-sectional. *Methods:* 117 nurses completed the Copenhagen Burnout Inventory and the Hospital Survey on patient safety culture. Pearson correlation and linear regression analysis was conducted to assess associations between variables. *Results:* Higher level of burnout significantly met with lower grade of patient safety, overall perception of patient safety, higher frequency of adverse events recorded, and medication errors. The overall perception of safety was positively related to teamwork within hospital units and non-punitive responses to error. The frequency of recorded events was significantly negatively associated with hospital management support and supervisors' activities, and positively with feedback. Medication errors correlated positively with organizational learning and continuous safety improvement and negatively with staffing. Significant relationships have been identified between management support, non-punitive responses to error, teamwork within hospital units, and selected adverse events. *Conclusion:* Enhancement of the patient safety climate and nurses' mental health are important patient safety improvements in healthcare organisations.

Keywords: adverse events, burnout syndrome, hospital patient safety climate, nursing profession, quality of nursing care.

Introduction

Burnout syndrome is a psychological syndrome that emerges as a long-lasting response to chronic stress in the workplace (Maslach & Leiter, 2016). This syndrome is associated with many adverse consequences, not only personal (anxiety, depression, suicidal tendencies, substance abuse, insomnia) (Salvagioni et al., 2017), but also negative work consequences (reduced work performance, absenteeism, job turnover) (Bakker et al., 2014; Salvagioni et al., 2017) and in the profession of nursing it leads to deteriorating healthcare quality (increased number of adverse events and errors, incomplete care, deteriorating patient safety) (Alves & Guirardello, 2016; Hall et al., 2016; Liu et al., 2018; Vifladt et al., 2016).

Patient safety is a key indicator of quality healthcare. It is defined as preventing errors and harm to the patient, as well as reducing the risk of side effects, learning from errors, and building a safety culture in the healthcare system that includes organizations, professionals, and patients (Mitchell, 2008).

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Creating patient safety culture is one of the strategies for building patient safety in healthcare facilities. The concept of safety culture and safety climate is not clearly defined by scholars. These terms are defined or used interchangeably in many publications. (Guldenmund, 2000; Halligan & Zecevic, 2011; Nielsen, 2014). Based on a review of theories and research studies, Guldenmund (2000) differentiates between these two concepts. He described safety culture as part of an overall organizational culture that develops over a long period of time and is relatively stable over time. According to Guldenmund's theoretical framework, three levels of organizational safety culture can be studied. The core aspects of safety culture are the internal norms and values of individuals (which may or may not relate to safety) that guide the behaviour of group members and the entire organization. They are mostly implicit, subconscious, relatively non-specific, and difficult to measure. The next level, involved in shaping the culture of patient safety in the organization, consists of attitudes and beliefs that are relatively explicit and conscious, and this level includes objects (hardware, software, people, and behaviour). An example of this level is the perception of safety climate or behaviour (e.g., unfinished / missed care, records of adverse events, etc.). These

factors are already measurable indicators of a safety culture. At the third level, the culture of safety is created by clearly visible and measurable external factors (e.g., inspections, warnings, manuals, regulations, rules, standards, use of safety, and protective equipment) (Guldenmund, 2000). Based on the work of the following authors (Guldenmund, 2000; Nielsen, 2014), safety climate can be defined as the beliefs and attitudes of employees to the formal and informal policies, practices, and activities of the organization in relation to security. Safety climate is considered easier to handle, so it can be seen as a gateway to working with the organization's safety culture. At the same time, it can be considered as an alternative indicator of performance in the field of safety culture (Guldenmund, 2000; Nielsen, 2014).

Promoting patient safety is one of the most important goals and challenges for healthcare systems worldwide (Liu et al., 2018). In the context of patient safety improvement, the central strategy has become to build safety systems aimed at open reporting of adverse events, maximizing education of patient safety, and creating patient safety culture (Aiken et al., 2012, 2013; Kirwan et al., 2013; Mitchell et al., 2016; Pokorná et al., 2016; World Health Organization & World Alliance for Patient Safety, 2008). The system of reporting adverse events in Slovakia was introduced in accordance with the Recommendation 2009/C 151/01 on patient safety (Council of the European Union, 2009). The medical facility should have two systems. One voluntary reporting system, in which employees record, report, and analyse their own errors and mistakes, and the other one, a mandatory reporting system in which serious adverse events related to the provision of healthcare are reported. Ensuring safe care is the responsibility of all employees working in the field of healthcare. According to a report of the Agency for Healthcare Research and Quality in the U.S. (2019), nurses play an important role in monitoring patients, detecting deteriorations early, detecting possible errors and side effects, performing myriad tasks, and ensuring and maintaining continuous care so that patients are provided with high-quality, safe care. Nurses report adverse events and errors most frequently and therefore play an important role in increasing patient safety, improving the quality of healthcare, and ensuring patient satisfaction (Agency for Healthcare Research and Quality, 2019; Aiken et al., 2012; Kirwan et al., 2013). Current studies (Cho et al., 2015, 2016; Griffiths et al., 2019; Liao et al., 2016; Liu et al., 2018) point to a close association between patient safety and the organizational factors of the nurses' work environment, in particular the quality of the working environment, the hospital safety climate, adequate staffing (number, education of nurses) or the length of working time (Bae & Fabry, 2014). Poorer patient safety is also associated with some procedural aspects of nursing care, such as unfinished / missed nursing care (Gurková et al., 2020; Liu et al., 2018). Negative associations have also been identified between patient safety and adverse outcomes in nurses – their professional burnout, and lower job satisfaction and well-being (Alves & Guirardello, 2016; Hall et al., 2016; Liu et al., 2018; Vifladt et al., 2016). The healthcare system in Slovakia, as in other countries, struggles with a lack of registered nurses, due to job dissatisfaction, increased migration (Gurková et al., 2013, 2020), and burnout (Pilárik & Tobákošová, 2013; Slezáková et al., 2015).

Monitoring the patient safety grade and patient safety climate from nurses' perspectives, as well as other factors (job satisfaction, burnout syndrome), has been shown to be vital for improving patient safety (Gurková et al., 2020; Kirwan et al., 2013). In the conditions of the Slovak Republic, we recorded two studies that dealt with patient safety and their determining factors, namely the hospital patient safety climate (Gurková et al., 2020; Sováriová Soósová et al., 2017) and unfinished / missed care (Gurková et al., 2020). However, we have not seen studies that look at the relationships between patient safety, adverse events, burnout of nurses, and the hospital safety climate.

Aim

Due to a more comprehensive understanding of patient safety mechanisms, we decided to assess the associations between patient safety, adverse events, the hospital patient safety climate, and nurse burnout syndrome.

Methods

Design

The study had a cross-sectional descriptive character.

Sample

The study was carried out from December 2017 until June 2018. The main inclusion criteria for the study were: age over 18 years, current work in the position of nurse, and a willingness to cooperate. Employees in the position of nurse assistant were not included in the study group (in Slovakia, since 2018 this position has been renamed as a "practical nurse"). A set of questionnaires was issued to 180 nurses in hospital facilities and to nurses – students of postgraduate specialized studies at the Faculty of Medicine of the Pavol Jozef Šafárik University

in Košice. In the analysis, 117 questionnaires were included (response rate 65%).

The suitability of the sample size was tested by post hoc Power analysis in G*Power 3.1 (Faul et al., 2009). Post hoc Power analysis for linear regression analysis (fixed model, R^2 increasing) performed at conventional mean effect size $f^2 = 0.16$, alpha level = 0.05, for 117 respondents and for the total number of tested predictors 11, reached a power value of 81%, which is an acceptable level for clinical research (i.e., the sample size is acceptable) (Faul et al., 2009; Ptáček & Raboch, 2010).

Data collection

A set of questionnaires aimed at assessing patient safety, adverse events, hospital patient safety climate, burnout syndrome, and selected socio-demographic and professional characteristics was issued to nurses.

The Hospital Survey on Patient Safety Culture (HSPSC) (Gurková et al., 2020; Rockville et al., 2018; Sorra & Dyer, 2010) consists of 42 items that are grouped into 12 domains evaluating the patient's safety climate. The study includes two other items. One evaluates the patient's safety grade (which we recoded from 1 [failing] to 5 [excellent]) and the other one – the number of reported adverse events in the last 12 months (1 [no reported events] up to 6 [21 or more reported events]). HSPSC allows to evaluate these domains:

- concerning the achieved results:
  - overall perception of patient safety (4 items) evaluates the use of safety procedures and systems of the organization as a whole,
  - the frequency of adverse event recording (3 items) focuses on the reporting of three types of adverse events according to their safety risk in relation to patient harm on a scale from never to always,
- on the hospital level:
  - hospital management support for patient safety (3 items), which assesses the extent to which patient safety is a priority of hospital management, as well as the management's approach to creating a work environment that supports patient safety,
  - teamwork across units (4 items) evaluates the degree of cooperation and coordination of work between departments in an effort to ensure the best possible patient care,
  - handoffs and transmissions (4 items) evaluates whether important patient information is transmitted between hospital units and at the beginning and end of work shifts,
- on unit level (ward unit):
  - teamwork within units (4 items) evaluates the cooperation and coordination of the work of the members of the treatment unit team, and their mutual support and respect,
  - supervisor / manager's expectations and actions promoting patient safety (4 items) monitors whether the manager is considering employee proposals to improve patient safety, does not overlook patient safety issues, positively evaluates employees for adherence to safe procedures,
  - organizational learning – continuous improvement (3 items) focuses on whether adverse events have led to the introduction of positive changes, whether the effectiveness of changes is evaluated,
  - feedback and communication (3 items) evaluates whether the staff is informed about the occurrence of adverse events, whether they are provided with feedback on the implemented changes, and whether the possibilities of error prevention are discussed,
  - communication openness (3 items) assesses the possibility of open expression for the staff on areas that may have a negative impact on the patient, and the possibility of free and open communication with the superior on the topic,
  - staffing (4 items) assesses the perception of adequate staffing and working time in relation to patient safety,
  - non-punitive responses to error (3 items) assesses the perception of the use of repressive measures (inference of personal responsibility, keeping errors in the personal file).

Items of these domains are scored on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree), and respectively 1 (never) up to 5 (always). Scores in individual domains can be calculated as the average percentage of positive responses (4 [agree], 5 [strongly agree]) of individual items within the domain or as the average of the sum of respondents' responses to individual items forming a given domain. It ranges from 1 to 5, and a higher score represents a higher safety culture. In this study, the overall reliability of the instrument expressed by a Cronbach's alpha value of 0.62 was questionable, lower than the recommended value of 0.70.

The extent of burnout syndrome was assessed by the Copenhagen Burnout Inventory (CBI) (Kristensen et al., 2005). The questionnaire evaluates personal burnout, work-related burnout, and client-related burnout (patients). The items are scored on a Likert scale from 100 (always / very high grade) to 0 (never / almost never / very low grade). The last item in the work-related burnout domain must be recoded.

The scores of individual domains are obtained by averaging the sum of their items. The higher the score, the higher the burnout rate. According to the CBI score, the burnout is divided into the following quartiles: up to 25 (very low or low burnout), from 25 to 50 (low to medium burnout), from 50 to 75 (medium to high burnout), 75 and more (high to very high burnout). The CBI is a valid and reliable tool for burnout assessment. In this study, the overall reliability of the instrument was satisfactory, with Cronbach's alpha taking 0.81.

Indicators of unsafe care, and thus reduced quality of care, are various adverse events (e.g., pressure ulcers, falls, infections, and medication errors), increased morbidity and mortality of patients (Cho et al., 2015; Griffiths et al., 2019). In this study, we evaluated the incidence of seven adverse events: pressure ulcers, uninjured falls, injured falls, peripheral venous catheter infections / inflammations, central venous catheter infections, permanent urinary catheter infections, and medication errors. We assessed the number of selected adverse events reported over the last 12 months in categories ranging from 1 (none) to 6 (21 and above).

Within the socio-demographic and professional characteristics, we evaluated age, gender, education, length of experience in the nursing profession, length of experience in the hospital, length of experience in the current department, shifts, number weekly working hours, hospital units, and the types of hospitals.

Data analysis

The results were processed in the statistical program IBM SPSS, version 20.0, and in the MS Excel. Descriptive analysis – absolute (n) and percentage (%), arithmetic mean (M), and standard deviation (± SD) values – was used to describe sample, adverse events, patient safety, hospital safety climate, and patient safety. All HSPSC domains, patient safety, number of reported events, and adverse events were distributed symmetrically (skewness values were below ±1), except for CBI values (skewness = -1.42) and the frequency of recorded central venous catheter infections (2.44). Only variables with a data loss of 5% or less were included in the inferential statistics, which is considered a non-significant loss (Dong & Peng, 2013). We used Pearson correlation (r, as most variables were symmetrically distributed) and linear regression analysis to test associations between variables. Burnout and HSPSC domains were tested by linear regression as predictors of the patient safety grade, overall safety perception, frequency of adverse events reported, and selected adverse events. Collinearity between predictors was excluded and values of variance inflation factor (VIF) were less than 2.5 for all included predictors (Johnston et al., 2018). The overall reliability of the instruments was assessed by Cronbach's alpha. The level of $p \leq 0.05$ indicated statistically significant relationships between variables.

Results

The study sample consisted of 117 nurses with an average age of 37.77 years. Most of the nurses were female and more than half of the nurses had completed university education. The average length of nurse experience was 15 years, and most nurses worked in 12-hour-shifts, from 40 to 59 hours per week. The overall characteristics of the sample are given in Table 1.

Table 1 Sample characteristics

Variable	Values
Age mean (± SD)	37.77 (8.84)
Sex n (%)	
male	2 (1.7)
female	115 (98.3)
Education n (%)	
secondary medical school	18 (15.4)
higher secondary medical school	25 (21.4)
university – baccalaureate degree	54 (46.2)
university – master and higher degree	20 (17.1)
Length of experience in nursing profession mean (± SD)	15.08 (9.6)
Length of experience in hospital mean (± SD)	11.79 (9.00)
Length of experience on actual hospital unit mean (± SD)	10.36 (8.80)
Shifts n (%)	
only morning shift	17 (14.5)
12-hours shifts	95 (81.2)
8-hours shifts	5 (4.3)
Weekly working hours n (%)	
less than 20 hours	2 (1.7)
20–39 hours	22 (18.8)
40–59 hours	93 (79.5)
60 and more	–
Hospital units n (%)	
medical	42 (35.9)
surgical	36 (30.8)
intensive care	39 (33.3)
Type of hospital according to owner	
private	82 (70.1)
public	35 (29.9)
Type of hospital according to specialisation	
general	88 (75.2)
teaching / university	15 (12.8)
specialised	14 (12.0)

SD – standard deviation

In this study, we recorded a mean burnout syndrome score (rated by CBI) of 56.86 (± 12.62) (minimum score 15.87, maximum 83.13), indicating a medium to high burnout rate. Average values of patient safety grade and hospital safety climate are shown in Table 2. Values of the number of reported adverse events are shown in Table 3. The worst hospital climate safety score was recorded in the domain of staffing, non-punitive responses, and teamwork across units.

Table 2 Patient safety and hospital patient safety climate

Hospital patient safety climate (HSPSC[a])	% positive	mean (SD)
Outcome variables		
patient safety grade (higher score = higher grade)	–	3.22 (0.63)
overall patient safety perception	48.3	3.28 (0.61)
frequency events reported	37.8	3.12 (0.67)
Hospital level		
management support for patient safety	42.1	3.15 (0.67)
teamwork across units	32.7	2.97 (0.52)
handoffs and transition	37.2	3.00 (0.57)
Unit level		
teamwork within units	54.7	3.46 (0.61)
supervisor / manager's expectations, actions promoting patient safety	42.5	3.17 (0.61)
organisational learning – continuous improvement	52.1	3.39 (0.60)
feedback and communication about error	46.4	3.31 (0.61)
communication openness	34.7	3.01 (0.61)
staffing	31.0	2.84 (0.52)
non-punitive response to error	31.1	2.96 (0.56)

[a]HSPSC – Hospital Survey on Patient Safety Culture; SD – standard deviation

Table 3 Adverse events reported by nurses for the last 12 months

Adverse events	Number of reported events HSPSC[a] n (%)	Pressure ulcers n (%)	Falls n (%)	Falls with injury n (%)	Peripheral venous catheter infections n (%)	Central venous catheter infections n (%)	Urinary catheter infections n (%)	Medication errors n (%)
Any	28 (23.9)	23 (19.7)	36 (30.8)	55 (47.0)	20 (17.1)	87 (74.4)	45 (38.5)	44 (37.6)
1–2	28 (23.9)	37 (31.6)	39 (33.3)	34 (29.1)	44 (37.6)	18 (15.4)	42 (35.9)	31 (26.5)
3–5	33 (28.2)	24 (20.5)	35 (29.9)	24 (20.5)	35 (29.9)	4 (3.4)	18 (15.4)	27 (23.1)
6–10	21 (17.9)	20 (17.1)	2 (1.7)	1 (0.9)	11 (9.4)	3 (2.6)	6 (5.1)	11 (9.4)
11–20	3 (2.6)	6 (5.1)	2 (1.7)	–	1 (0.9)	–	1 (0.9)	–
21 and more	–	2 (1.7)	–	–	1 (0.9)	–	–	1 (0.9)

[a]HSPSC – Hospital Survey on Patient Safety Culture adverse events reported by nurses for the last 12 months

Table 4 shows the associations between the variables. The burnout of nurses increased with the weekly working hours and with the negative perception of the hospital safety climate. The degree of patient safety and the overall perception of patient safety were positively correlated with most HSPSC domains, but negatively correlated with the rate of nurse burnout and the weekly working hours. The number of recorded adverse events was positively correlated with the length of experience, the nurses' burnout, and the number of weekly working hours, with feedback on patient safety. However, negative associations were identified in relation to management support at the unit and hospital level. The number of medication-related errors increased with the number of weekly working hours, the burnout rate, and the worse perception of safety climate in selected HSPSC domains. The results of the linear regression analysis are shown in Table 5. The patient safety grade was significantly negatively associated with nurse burnout, not with the HSPSC domains (the F change test was not significant). The overall perception of patient safety was significantly negatively associated with nurse burnout and positively with the HSPSC domains – teamwork across units and non-punitive responses. The frequency of adverse events reported was associated with a higher burnout,

Table 4 Correlation analysis between patient safety, adverse events, burnout, safety climate, and selected sample characteristics

Variables	Burnout	Patient safety grade	Overall patient safety	Number of adverse events HSPSC[a]	Frequency of adverse events reported	Medica-tion errors	Pressure ulcers	Falls without injury	Falls with injury	Peripheral venous catheter infections	Central venous catheter infections	Urinary catheter infections
Age	0.040	-0.013	-0.165	0.093	0.063	0.032	0.062	0.085	0.065	-0.200*	-0.231*	-0.130
Length of experience	0.094	-0.082	-0.155	0.073	0.014	-0.012	0.032	0.050	0.031	-0.237*	-0.190*	-0.114
Hospital length experience	0.011	-0.047	-0.215*	0.150	0.156	-0.003	0.146	0.027	0.149	-0.131	-0.161	-0.044
Unit length experience	0.110	-0.178	-0.289**	0.263**	0.162	0.089	0.127	0.064	0.155	-0.108	-0.201*	-0.035
Weekly working hours	0.394***	-0.283**	-0.178	0.346***	0.143	0.309***	0.101	0.168	0.134	0.150	-0.222*	-0.035
Burnout	-	-0.412***	-0.303***	0.280**	0.160	0.416***	0.168	0.060	0.018	0.076	-0.025	0.113
Management support	-0.200*	0.300***	0.342***	-0.321***	-0.143	0.022	-0.028	-0.151	-0.298	0.060	0.124	-0.181
Teamwork across units	-0,337***	0.267***	0.355***	0.023	-0.129	-0.229*	-0.069	0.003	0.039	-0.179	-0.098	0.016
Handoffs and transition	-0.571***	0.454***	0.401***	-0.218*	-0.165	-0.333***	-0.072	-0.209*	0.011	-0,023	0.011	-0.190*
Teamwork within units	-0.238**	0.150	0.185*	-0.116	-0.087	-0.049	-0.143	0.156	-0.163	0.075	0.043	-0.074
Supervisor / manager's expectations, patient safety promoting	-0.430***	0.291**	0.306***	-0.368***	0.091	-0.239*	-0.055	-0.069	-0.075	0.129	-0.073	-0.103
Organisational learning – continuous improvement	-0.093	0.126	0.263**	-0.017	-0.206*	0.320***	0.059	-0.165	-0.125	-0.018	0.149	-0.000
Feedback	0.023	0.043	0.010	0.217*	0.056	-0.015	0.155	0.129	0.225*	0.238*	-0.027	0.014
Communication openness	-0.118	0.044	0.191*	0.060	-0.163	0.042	0.053	-0.033	0.075	0.007	-0.006	0.010
Staffing	-0.279**	0.198*	0.174	-0.070	-0.148	-0.277**	-0.109	0.046	0.145	0.027	0.017	-0.087
Non-punitive response to error	-0.280**	-0.028	0.220*	-0.073	0.155	-0.084	0.010	0.018	-0.224*	-0.286**	-0.081	-0.150

*[a]HSPSC – Hospital Survey on Patient Safety Culture adverse events reported by nurses for the last 12 months; *p ≤ 0.05; **p < 0.01; ***p < 0.001*

Table 5 Linear regression analysis on patient safety and adverse events

Variables	Patient safety grade	Overall patient safety percep-tion	Number of adverse events reported HSPSC[a]	Frequency of adverse events reported HSPSC[a]	Medication errors	Pressure ulcers	Falls without injury	Falls with injury	Peripheral venous catheter infections	Central venous catheter infections	Urinary catheter infections
1st model											
burnout	-0.412***	-0.303***	0.280**	0.16	0.416***	0.168	0.060	0.018	0.076	-0.025	0.113
F test	23.32***	11.67***	9.47**	2.93	23.47***	3.18	0.41	0.04	0.63	0.07	1.41
adjusted R^2	0.163	0.084	0.070	0.017	0.166	0.019	-0.005	-0.009	-0.003	-0.008	0.004
2nd model											
burnout	-0.230	0.090	0.123	0.167	0.223***	0.127	0.025	-0.048	-0.009	-0.180	-0.043
management support	0.123	0.142	-0.223*	-0.14	0.149	0.060	-0.189	-0.326**	-0.005	0.180	-0.154
teamwork across units	0.063	0.231*	0.106	0.001	-0.123	-0.054	0.101	-0.015	-0.244*	-0.172	0.089
handoffs and transition	0.217	0.175	-0.025	-0.057	-0.172	0.030	-0.232	0.077	-0.011	-0.022	-0.187
teamwork within units	-0.004	0.036	-0.04	0.005	-0.015	-0.185	0.260*	-0.118	0.063	-0.043	0.089
supervisor / manager's expectations, patient safety promotion	0.066	0.172	-0.292**	0.274*	-0.149	-0.047	0.053	-0.021	0.146	-0.186	-0.011
organisational learning – continuous improvement	0.035	0.128	0.01	0.174	0.383**	0.070	-0.178	-0.079	-0.001	0.163	0.058
feedback	-0.013	-0.110	0.262**	0.111	-0.030	0.199	0.117	0.227*	0.190	-0.024	-0.005
communication openness	-0.042	0.070	0.082	-0.169	0.065	0.019	-0.023	0.088	-0.006	0.006	0.036
staffing	0.041	0.095	-0.037	-0.06	-0.192*	-0.063	0.056	0.168	0.040	-0.025	-0.048
non-punitive response to error	-0.093	0.199*	0.021	0.052	-0.055	0.090	0.045	-0.194*	-0.279**	-0.144	-0.163
F change	1.57	3.92***	2.98**	1.58	3.88***	0.73	1.96*	3.45***	2.32*	1.00	0.83
F test	3.65***	4.89***	3.73***	1.71	6.21***	0.94	1.82	3.14***	2.17*	0.92	0.88
adjusted R^2	0.202	0.270	0.211	0.06	0.337	-0.006	0.074	0.172	0.104	-0.008	-0.012

*[a]HSPSC – Hospital Survey on Patient Safety Culture adverse events reported by nurses for the last 12 months; Note: standardized regression coefficients Beta are displayed; *p ≤ 0.05; **p < 0.01; ***p < 0.001*

negatively with management at the hospital and unit level, and positively with feedback related to patient safety. The number of recorded medication errors increased with the level of nurse burnout, with negative perception in the domain of staffing, and positively associated with the domain of organizational learning and continuous safety improvement. Recorded falls with injury and peripheral venous catheter infections were negatively associated with non-punitive responses, teamwork across units, and management support on the hospital level, and positively associated with feedback and communication about error.

Discussion

The aim of this study was to evaluate the associations between patient safety, adverse events, the hospital patient safety climate, and nurse burnout syndrome.

In our sample of nurses, we recorded a medium to high burnout level with the CBI. This is also pointed out by other studies (Slezáková et al., 2015; Pilárik & Tobákošová, 2013), which also identified a medium to high burnout rate in 50–90% of cases of nurses in Slovakia (using the Maslach Burnout Inventory questionnaire). The issue of the shortage of nurses on the labor market, their excessive workload, and burnout has a chronic character in Slovakia. In our sample, the burnout rate of the nurses increased with the number of weekly working hours and the negative safety climate in the workplace.

With a higher rate of burnout, the number of reported adverse events, especially medication errors, increased, and the patient safety grade and overall patient safety perceived by nurses decreased. A strong association between nurse burnout and the hospital patient safety climate has also been reported in recent studies (Liu et al., 2018; Hall et al., 2016; Vifladt et al., 2016; Zarei et al., 2016), indicating the need to improve the nurses' work environment. For healthcare organizations, it would be appropriate to focus on creating a work environment that promotes personal well-being and job satisfaction, thus preventing burnout, which would in turn lead to the provision of safe services (Wang et al., 2014). Adequate staffing of the nurse job position, monitoring nurses' burnout, work demands, and resources in the work environment also seem to be appropriate in our case. Their recording could be part of systems monitoring patient safety (local and national), which would allow a more comprehensive analysis of burnout predictors and the subsequent selection of effective measures to eliminate it.

In our study, less than half of the nurses rated overall patient safety positively. More than three-quarters of nurses reported more than one adverse event in the past year, and only about one-third of nurses were positive about the frequency of adverse events reporting. Many nurses considered communication to be insufficient and less open, and felt afraid of having personal consequences when reporting an adverse event. Most nurses considered staffing to be undersized in relation to patient safety. At the hospital level, cooperation between units and transfer of information were evaluated negatively too. Compared to other countries, the percentage of positive responses in the HSPSC domains was similar to that in Poland and Croatia, but lower than the results achieved in Slovakia and the Czech Republic in a study by Gurková et al. (2020). National adverse event recording systems could explain the perception of a patient safety climate – e.g., a national patient safety system is not mandatory in Poland and Croatia, partially regulated in Slovakia, and anonymous in the Czech Republic, where it has been mandatory since 2018 (Gurková et al., 2020). The percentage of positive answers in the domain of non-blaming atmosphere and staffing was similarly low in earlier studies conducted in Slovakia (Sováriová Soósová et al., 2017) and abroad (Bodur & Filiz, 2010; Okuyama et al., 2018; Wang et al., 2014). In other domains, we observed worse results compared to recent scientific studies and meta-analysis (Bodur & Filiz, 2010; Gurková et al., 2020; Okuyama et al., 2018; Vifladt et al., 2016; Wagner et al., 2013; Wang et al., 2014). We explain the different results in the HSPSC domains of our study in comparison with previous studies by a slightly different composition of our sample in some parameters, but especially by differences not only in national but also in local, institutional patient safety systems.

Staffing and non-punitive responses were the worst rated patient safety domains in our sample. These domains are usually the worst evaluated in other research studies, as pointed out by Okuyama et al. (2018) in a systematic review study and meta-analysis. This is a serious and widespread problem in healthcare systems around the world. Inadequate staffing, a higher proportion of patients per nurse, often lead to an increase in the nurses' workload, increased job dissatisfaction, professional burnout of nurses with negative consequences for the quality of healthcare and patient safety in the form of higher incidence of adverse events, and higher morbidity and mortality of patients (Aiken et al., 2012; Cho et al., 2015; Griffiths et al., 2019; Hall et al., 2016; Zarei et al., 2016). Sufficient staff, with adequate

knowledge, skills, and a value system focused on quality and safety of care, seems to be a key strategy for ensuring patient quality and safety (Griffiths et al., 2019). A non-blaming and non-punitive climate was also evaluated negatively by the nurses of our sample in relation to patient safety. Most nurses did not report a problem with recording adverse events. The problem is the fear that mistakes will be used against them to punish them, and therefore they prefer "silence" to reporting events (Wang et al., 2014). Negatively evaluated domains in relation to adverse events in this study, and thus potential areas for improvement, were teamwork across units, and management support at the hospital and unit level. These domains were usually negatively evaluated in other research studies and meta-analysis (Cho et al., 2015; Griffiths et al., 2019; Gurková et al., 2020; Okuyama et al., 2018; Wang et al., 2014). Positively perceived patient safety climate regarding organizational learning and continuous improvement, feedback and communication, and teamwork across the unit were strengths of patient safety in this study. These results were consistent with the findings of other scientific studies and meta-analysis (Gurková et al., 2020; Okuyama et al., 2018; Wang et al., 2014).

In our study, it was confirmed that burnout syndrome and selected safety climate domains are related to the perception of the patient safety grade, medication errors, and other adverse events. As the correlation or regression analysis suggests, the results point in particular to a decreasing safety grade in connection with an increase of nurses' burnout and an increasing number of weekly working hours. Likewise, the overall patient safety decreased with the increasing rate of burnout syndrome. However, the overall patient safety perception was positively associated with cooperation across ward units and a non-blame climate. The frequency of reporting various types of errors and adverse events was positively related to the supervisor's support and his expectations in relation to safety. The number of reported adverse events increased with the rate of burnout, positively related to the provision of feedback and communication in relation to patient safety. We can therefore say that a low burnout rate and a positively perceived safety climate are significantly associated with achieving better patient safety results, which needs to be further promoted. As part of the regression analysis, we also reached paradoxical results, where we confirmed a negative relationship between the numbers of reported adverse events in the last 12 months and the hospital management and supervisors support – that is, the more support the nurses felt, the fewer mistakes they reported. This phenomenon evokes the idea that hospital management and direct superiors support the concealment and non-reporting of errors and adverse events. The Institute for Economic and Social Reforms (INEKO) draws attention to the possibility of concealing errors and adverse events, specifically concealing acquired hospital infections in Slovakia (The Institute for Economic and Social Reforms [INEKO], 2014). According to the Analysis of the Epidemiological Situation and Activities of Epidemiology Departments in the Slovak Republic of the Regional Office of Public Health in Banská Bystrica (Regional Office Public Health in Banská Bystrica, 2012), it was stated that 0.54% of nosocomial infections out of the number of hospitalized patients were registered in the Slovak Republic in 2012; according to the European Centre for Disease Prevention and Control, the average prevalence of nosocomial infections in developed European countries was 5.7% (Suetens et al., 2013). In 2014, INEKO launched a portal of hospitals, where the occurrence of acquired hospital infections was also monitored. The available data showed that in the Slovak Republic from 2009–2013, the average incidence of acquired hospital infections was 2.2%. Much more surprising and alarming was that approximately thirty hospitals reported a 0% incidence of hospital-required infections during the study period (INEKO, 2014). It follows from the above that little attention is paid to patient safety in Slovakia. Reserves in this area are not only at the level of hospitals, but also at the level of government authorities. Behind the problem may be not only concerns about repressive measures, inferring criminal liability, but also the resistance of employees themselves and the lack of support from management for an honest and truthful record of adverse events. In view of the above, it is important both to play a more active role in the government and to change the philosophy and policy of the hospitals themselves, whose priority should be patient safety.

Results of this study as well as previous research and meta-analysis (Cho et al., 2015; Griffiths et al., 2019; Gurková et al., 2020; Hall et al., 2016; Kuosmanen et al., 2019; Liu et al., 2018; Okuyama et al., 2018; Wang et al., 2014; Zarei et al., 2016) demonstrate the need to implement comprehensive strategies to ensure quality and safe care. An important strategy for creating a safe working environment and safe care is the development of management supporting quality, safety, education, and continuous improvement at all levels of the hospital (Gurková et al., 2020; Kuosmanen et al., 2019). Another strategy

is to strengthen monitoring systems enabling comprehensive data analysis with the subsequent implementation of effective strategies to enhance the safety and quality of care (Gurková et al., 2020; Kuosmanen et al., 2019; Pokorná et al., 2016). Monitoring systems should evaluate not only patient outcomes (adverse events, morbidity, mortality), but also outcomes related to staff (e.g., job satisfaction, well-being, burnout), work environment (patient safety climate) and other structural ones (e.g., number of staff, staff training, number of patients admitted and discharged, number of weekly working hours), and procedural aspects (e.g., unfinished / missed nursing care) of healthcare. It would be appropriate for monitoring systems to be not only mandatory but also anonymous (Gurková et al., 2020; Pokorná et al., 2016), because the fear of accusation can gradually lead to the closure of employees, a change in their intrinsic values, and consequently a loss of the need to improve patient safety. The aim of the safety system should not be to immediately impose penalties and sanctions, but to apply effective preventive measures. This system could develop and provide each hospital with a safety culture profile, thus specifically guiding the strategic planning of interventions to improve patient safety. Some interventions would focus on patient safety improving at the ward unit level; others would require a hospital-wide policy change. Education aimed at increasing patient safety is considered to be an effective strategy for building a safety culture. As such, it should not only be the subject of interventions at the local hospital level. From a strategic point of view, the topic of safety culture in a comprehensive form should be part of the curriculum in the undergraduate and postgraduate education of nurses and other healthcare professionals so that students – future healthcare professionals – build positive work habits and attitudes in relation to patient safety and quality of healthcare.

This study helped to elucidate the relationship between nurse burnout, patient safety, and the patient safety climate. The cross-sectional descriptive design of the study limits the clarification of causal relationships between variables. The selection and size of the sample, the number and type of hospitals involved in the study, limit the generalizability of the results and may cause a slight skew in the data. The limitation of this study may be the lower overall reliability of the instrument in this study (Cronbach's alpha = 0.62). A systematic review study carried out by Waterson et al. (2019) pointed to lower reliability of the HSPSC too. When evaluating the reliability of HSPSC domains, Cronbach's alpha was lower than 0.70 in 46.16% of cases. We encounter similar results in the review study of Pokojová and Bártlová (2018). They pointed to very low (0.36) to excellent (0.91) values of the Cronbach's alpha of individual domains of the mentioned instrument. The lower values of the Cronbach's alpha of individual domains could be explained by low number of items (3–4) that make up domains. The lower score of the overall reliability of instrument could be explained by its heterogeneity, as it consists of up to 12 domains (Tavakol & Dennick, 2011).

Conclusion

In our study, the burnout of nurses, inadequate staffing, a non-blame climate, and the support of management were the weak point of patient safety. Organizational learning and continuous improvement, feedback, and communication were in positive association, especially with the recording of the number of adverse events. It seems that optimizing the workplace safety climate can contribute to promoting mental health and preventing burnout in employees, and consequently to having better patient safety outcomes. The results of this study indicate the need to have adequate staffing, to prevent burnout syndrome, to build a national system aimed at comprehensively improving patient safety, and to integrate the issue of patient safety culture into education in healthcare study programs.

Ethical aspects and conflict of interest

This study was carried out in accordance with the 1964 Helsinki Declaration, revised in 2013. The study was approved by the Ethics Committee of the Faculty of Medicine of the Pavol Jozef Šafárik University in Košice, decision no. 3N/2018 and by the ethics committees or hospital managements that agreed with the research. Nurses were informed in advance in writing about the intentions of the study and about the fact that their participation in the research is voluntary, anonymous, does not involve any risks and may be cancelled without any reason. Respondents were assured that all data obtained would be anonymous and confidential. We obtained a signed informed consent from the respondents.

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References

Agency for Healthcare Research and Quality. (2019, September). *Nursing and Patient Safety*. https://psnet.ahrq.gov/primer/nursing-and-patient-safety

Aiken, L. H., Sermeus, W., Van den Heede, K., Sloane, D. M., Busse, R., McKee, M., Bruyneel, L., Rafferty, A. M., Griffiths, P., Moreno-Casbas, M. T., Tishelman, C., Scott, A., Brzostek, T., Kinnunen, J., Schwendimann, R., Heinen, M., Zikos, D., Sjetne, I. S., Smith, H. L., & Kutney-Lee, A. (2012). Patient safety, satisfaction, and quality of hospital care: cross sectional surveys of nurses and patients in 12 countries in Europe and the United States. *BMJ*, *344*, e1717. https://doi.org/10.1136/bmj.e1717

Aiken, L. H., Sloane, D. M., Bruyneel, L., Van den Heede, K., Sermeus, W., & RN4CAST Consortium. (2013). Nurses' reports of working conditions and hospital quality of care in 12 countries in Europe. In *International Journal of Nursing Studies*, *50*(2), 143–153. https://doi.org/10.1016/j.ijnurstu.2012.11.009

Alves, D. F. S., & Guirardello, E. B. (2016). Safety climate, emotional exhaustion and job satisfaction among Brazilian paediatric professional nurses. *International Nursing Review*, *63*(3), 328–335. https://doi.org/10.1111/inr.12276

Bae, S.-H., & Fabry, D. (2014). Assessing the relationships between nurse work hours/overtime and nurse and patient outcomes: systematic literature review. *Nursing Outlook*, *62*(2), 138–156. https://doi.org/10.1016/j.outlook.2013.10.009

Bakker, A. B., Demerouti, E., & Sanz-Vergel, A. I. (2014). Burnout and work engagement: the JD-R approach. *Annual Review of Organizational Psychology and Organizational Behavior*, 1, 389–411. https://doi.org/10.1146/annurev-orgpsych-031413-091235

Bodur, S., & Filiz, E. (2010). Validity and reliability of Turkish version of "Hospital Survey on Patient Safety Culture" and perception of patient safety in public hospitals in Turkey. *BMC Health Services Research*, *10*, 28. https://doi.org/10.1186/1472-6963-10-28

Cho, E., Sloane, D. M., Kim, E.-Y., Kim, S., Choi, M., Yoo, I. Y., Lee, H. S., & Aiken, L. H. (2015). Effects of nurse staffing, work environments, and education on patient mortality: an observational study. *International Journal of Nursing Studies*, *52*(2), 535–542. https://doi.org/10.1016/j.ijnurstu.2014.08.006

Cho, E., Lee, N.-J., Kim, E.-Y., Kim, S., Lee, K., Park, K.-O., & Sung, Y. H. (2016). Nurse staffing level and overtime associated with patient safety, quality of care, and care left undone in hospitals: a cross-sectional study. *International Journal of Nursing Studies*, *60*, 263–271. https://doi.org/10.1016/j.ijnurstu.2016.05.009

Council of the European Union (2009) *Council Recommendation of 9 June 2009 on patient safety, including the prevention and control of healthcare associated infections* (2009/C 151/01). https://eur-lex.europa.eu/legal-content/SK/TXT/PDF/?uri=CELEX:32009H0703(01)&from=EN

Dong, Y., & Peng, C. Y. (2013). Principled missing data methods for researchers. *SpringerPlus*, *2*(1), 222. https://doi.org/10.1186/2193-1801-2-222

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: tests for correlation and regression analyses. *Behavior Research Methods*, *41*(4), 1149–1160. https://doi.org/10.3758/BRM.41.4.1149

Griffiths, P., Maruotti, A., Recio Saucedo, A., Redfern, O. C., Ball, J. E., Briggs, J., Dall'Ora, C., Schmidt, P. E., Smith, G. B., & Missed Care Study Group (2019). Nurse staffing, nursing assistants and hospital mortality: retrospective longitudinal cohort study. *BMJ Quality & Safety*, *28*(8), 609–617. https://doi.org/10.1136/bmjqs-2018-008043

Guldenmund, F. W. (2000). The nature of safety culture: a review of theory and research. *Safety Science*, *34*(1–3), 215–257. https://doi.org/10.1016/S0925-7535(00)00014-X

Gurková, E., Soósová, M. S., Haroková, S., Ziaková, K., Serfelová, R., & Zamboriová, M. (2013). Job satisfaction and leaving intentions of Slovak and Czech nurses. *International Nursing Review*, *60*(1), 112–121. https://doi.org/10.1111/j.1466-7657.2012.01030.x

Gurková, E., Zeleníková, R., Friganovic, A., Uchmanowicz, I., Jarošová, D., Papastavrou, E., & Žiaková, K. (2020). Hospital safety climate from nurses' perspective in four European countries. *International Nursing Review*, *67*(2), 208–217. https://doi.org/10.1111/inr.12561

Hall, L. H., Johnson, J., Watt, I., Tsipa, A., & O'Connor, D. B. (2016). Healthcare staff wellbeing, burnout, and patient safety: a systematic review. *PloS One*, *11*(7), e0159015. https://doi.org/10.1371/journal.pone.0159015

Halligan, M., & Zecevic, A. (2011). Safety culture in healthcare: a review of concepts, dimensions, measures and progress. *BMJ Quality & Safety*, *20*(4), 338–343. https://doi.org/10.1136/bmjqs.2010.040964

Inštitút pre sociálne a ekonomické reform [Institute for social and economic reforms]. (2014). *Slovensko má vraj zázračne čisté nemocnice* [Slovakia is said to have miraculously clean hospitals]. http://www.ineko.sk/clanky/slovensko-ma-vraj-zazracne-ciste-nemocnice

Johnston, R., Jones, K., & Manley, D. (2018). Confounding and collinearity in regression analysis: a cautionary tale and an alternative procedure, illustrated by studies of British voting behaviour. *Quality & Quantity*, *52*(4), 1957–1976. https://doi.org/10.1007/s11135-017-0584-6

Kirwan, M., Matthews, A., & Scott, P. A. (2013). The impact of the work environment of nurses on patient safety outcomes: a multi-level modelling approach. *International Journal of Nursing Studies*, *50*(2), 253–263. https://doi.org/10.1016/j.ijnurstu.2012.08.020

Kristensen, T. S., Borritz, M., Villadsen, E., & Christensen, K. B. (2005). The Copenhagen Burnout Inventory: a new tool for the assessment of burnout. *Work & Stress*, *19*(3), 192–207. https://doi.org/10.1080/02678370500297720

Kuosmanen, A., Tiihonen, J., Repo-Tiihonen, E., Eronen, M., & Turunen, H. (2019). Changes in patient safety culture: a patient safety intervention for Finnish forensic psychiatric hospital staff. *Journal of Nursing Management*, *27*(4), 848–857. https://doi.org/10.1111/jonm.12760

Liao, L.-M., Sun, X.-Y., Yu, H., & Li, J.-W. (2016). The association of nurse educational preparation and patient

outcomes: systematic review and meta-analysis. *Nurse Education Today*, *42*, 9–16.

Liu, X., Zheng, J., Liu, K., Baggs, J. G., Liu, J., Wu, Y., & You, L. (2018). Hospital nursing organizational factors, nursing care left undone, and nurse burnout as predictors of patient safety: a structural equation modeling analysis. *International Journal of Nursing Studies*, *86*, 82–89. https://doi.org/10.1016/j.ijnurstu.2018.05.005

Maslach, C., & Leiter, M. P. (2016). Understanding the burnout experience: recent research and its implications for psychiatry. *World Psychiatry: Official Journal of the World Psychiatric Association (WPA)*, *15*(2), 103–111. https://doi.org/10.1002/wps.20311

Mitchell, P. H. (2008). Defining patient safety and quality of care. In Huges R. G. (Ed.), *Patient safety and quality: an evidence-based handbook for nurses*. Rockville: The Agency for Healthcare Research and Quality US. https://www.ncbi.nlm.nih.gov/books/NBK2681

Mitchell, I., Schuster, A., Smith, K., Pronovost, P., & Wu, A. (2016). Patient safety incident reporting: a qualitative study of thoughts and perceptions of experts 15 years after 'To Err is Human'. *BMJ Quality & Safety*, *25*(2), 92–99. https://doi.org/10.1136/bmjqs-2015-004405

Nielsen, K. J. (2014). Improving safety culture through the health and safety organization: a case study. *Journal of Safety Research*, *48*, 7–17. https://doi.org/10.1016/j.jsr.2013.10.003

Okuyama, J. H. H., Galvao, T. F., & Silva, M. T. (2018). Healthcare professional's perception of patient safety measured by the hospital survey on patient safety culture: a systematic review and meta-analysis. *The Scientific World Journal*, *2018*, 9156301. https://doi.org/10.1155/2018/9156301

Pilárik, Ľ., & Tobákošová, Z. (2013). Emocionálna inteligencia a syndróm vyhorenia u sestier [Emotional intelligence and burnout syndrome in nurses]. *Ošetrovateľstvo: teória, výskum, vzdelávanie*, *3*(1), 5–10.

Pokojová, R., & Bártlová, S. (2018). The hospital survey on patient safety culture: use of the questionnaire in European hospitals. *Ošetrovateľstvo: teória, výskum, vzdelávanie*, *8*(1), 19–25.

Pokorná, A., Mužík, J., Švancara, J., & Gregor, J. (2016). Perceived effectiveness and attitudes of health professionals towards the Czech Incident Reporting System. *Ošetrovateľstvo: teória, výskum, vzdelávanie*, *6*(2), 44–51.

Ptáček, R., & Raboch, J. (2010). Určení rozsahu souboru a power analýza v psychiatrickém výzkumu [Determination of sample size and power analysis in psychiatric research]. *Česká a slovenská psychiatrie*, *106*(1), 33–41.

Regionálny úrad verejného zdravotníctva v Banskej Bystrici [Regional Office Public Health in Banská Bystrica]. (2012). *Analýza epidemiologickej situácie a činnosti odborov epidemiológie v Slovenskej republike za rok 2012* [Analysis of the epidemiological situation and activities of epidemiology departments in the Slovak Republic in 2012]. http://www.epis.sk/InformacnaCast/Publikacie/VyrocneSpravy/Files/VS_SR_2012.aspx

Rockville, W., Sorra, J., Gray, L., Streagle, S., Famolaro, T., Yount, N., & Behm, J. (2018, July). *AHRQ Hospital Survey on Patient Safety Culture: User's Guide.* AHRQ Publication No. 15-0049-EF. Rockville, Agency for Healthcare Research and Quality. https://doi.org/10.1016/j.n http://www.ahrq.gov/professionals/quality-patient-safety/patientsafetyculture/hospital/index.html

Salvagioni, D. A. J., Melanda, F. N., Mesas, A. E., González, A. D., Gabani, F. L., & de Andrade, S. M. (2017). Physical, psychological and occupational consequences of job burnout: a systematic review of prospective studies. *PloS One*, *12*(10), e0185781. https://doi.org/10.1371/journal.pone.0185781

Slezáková, Z., Vörösová, G., & Mičinová, G. (2015). Burnout syndrome in neurological nursing. *Activitas Nervosa Superior Rediviva*, *57*(4), 122–127.

Sorra, J. S., & Dyer, N. (2010). Multilevel psychometric properties of the AHRQ hospital survey on patient safety culture. *BMC Health Services Research*, *10*, 199. https://doi.org/10.1186/1472-6963-10-199

Sováriová Soósová, M., Zamboriová, M., & Murgová, A. (2017). Kultúra bezpečnosti pacienta v nemocniciach na Slovensku [Hospital patient safety culture in Slovakia]. *Ošetrovateľstvo: teória, výskum, vzdelávanie*, *1*(1), 12–19.

Suetens, C., Hopkins, S., Kolman, J., & Högberg, L.D. (2013) *Point prevalence survey of healthcare associated infections and antimicrobial use in European acute care hospitals 2011–2012.* European Centre for Disease Prevention and Control. https://www.ecdc.europa.eu/sites/default/files/media/en/publications/Publications/healthcare-associated-infections-antimicrobial-use-PPS.pdf

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, *2*, 53–55. https://doi.org/10.5116/ijme.4dfb.8dfd

Vifladt, A., Simonsen, B. O., Lydersen, S., & Farup, P. G. (2016). The association between patient safety culture and burnout and sense of coherence: A cross-sectional study in restructured and not restructured intensive care units. *Intensive & Critical Care Nursing*, *36*, 26–34. https://doi.org/10.1016/j.iccn.2016.03.004

Wagner, C., Smits, M., Sorra, J., & Huang, C. C. (2013). Assessing patient safety culture in hospitals across countries. *International Journal for Quality in Health Care*, *25*(3), 213–221. https://doi.org/10.1093/intqhc/mzt024

Waterson, P., Carman, E.-M., Manser, T., & Hammer, A. (2019). Hospital Survey on Patient Safety Culture (HSPSC): a systematic review of the psychometric properties of 62 international studies. *BMJ Open*, *9*(9), e026896. https://doi.org/10.1136/bmjopen-2018-026896

Wang, X., Liu, K., You, L.-M., Xiang, J.-G., Hu, H.-G., Zhang, L.-F., Zheng, J., & Zhu, X.-W. (2014). The relationship between patient safety culture and adverse events: a questionnaire survey. *International Journal of Nursing Studies*, *51*(8), 1114–1122. https://doi.org/10.1016/j.ijnurstu.2013.12.007

World Health Organization & World Alliance for Patient Safety. Research Priority Setting Working Group. (2008). *Summary of the evidence on patient safety: implications for research*. https://apps.who.int/iris/handle/10665/43874

Zarei, E., Khakzad, N., Reniers, G., & Akbari, R. (2016). On the relationship between safety climate and occupational burnout in healthcare organisations. *Safety Science*, *89*, 1–10. https://doi.org/10.1016/j.ssci.2016.05.011

