Title: A cross sectional multisite exploration of Italian paediatric nurses' reported burnout and its relationship to perceptions of clinical safety and adverse events using the RN4CAST@IT-Ped.

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ABSTRACT

Aim

To explore Italian paediatric nurses' reported burnout and it relationship to their perceptions of safety and adverse events.

Design

A cross-sectional study utilizing the RN4CAST@IT-Ped database using a web based survey design.

Methods

The RN4CAST@IT-Ped questionnaire was used to collect data in 2017. This comprised three main components: three dimensions (22 items) of the Maslach Burnout Inventory including emotional exhaustion, depersonalization and personal accomplishment. Participants also scored an overall grade of patient safety and estimated the occurrence of adverse clinical events.

Results

Nurses (n=2243) reported high levels of burnout. Most rated clinical safety highly. The risk of adverse events ranged from 1.3-12.4%. The degree of burnout appeared to influence the perception of safety and adverse events.

Conclusion

The association between nurses' burnout and perceptions of higher rates of adverse events and reduced safety in clinical practice is an important finding. However, it is unclear whether this was influenced by a negative state of mind, and whether reduced safety and increased adverse events negatively influenced nurses' well-being, thus leading to burnout. Regardless, the association between nurses' burnout and these quality concepts needs further exploration to examine the effect, if any, on burnout and safety, and identify supportive mechanisms for nurses.

Impact:

- The association between reported burnout and perception of safety and risk of adverse events in Italian paediatric nurses has been reported for the first time.

- Nurses reporting burnout are at greater risk of intensely negative perceptions of clinical safety and adverse events. This is an important finding as perceptions can influence practice and behaviours.

- Quality measures in children's clinical environments need to go beyond obvious indicators to examine nurses' well-being as this also influences quality and safety.

1.INTRODUCTION

The World Health Organization (WHO) has recently recognized burnout as an "occupational phenomenon" and, as such, has included it in the *11ᵗʰRevision of the International Classification of Diseases* (ICD-11) (2019). They declared burnout a "syndrome resulting from chronic workplace stress that has not been successfully managed" (WHO, 2019). This recognition comes over 20 years after Maslach's initial definition of burnout (Maslach, Jackson, & Leiter, 1996). The scientific literature in the field related to health professions is voluminous. Healthcare professionals - especially nurses - seem particularly vulnerable to burnout because they often work in stressful and burdensome environments (Koinis et al., 2015). In the past decade, economic crises, cuts in healthcare budgets and the contraction of the workforce have further compounded this issue (Wray, 2013; Granero-Lázaro, Blanch-Ribas, Roldán-Merino, Torralbas-Ortega, & Escayola-Maranges, 2017). At the same time much is known about nurses' experience of burnout and the effects of this on clinical outcomes (Hall, Johnson, Watt, Tsipa, & O'Connor, 2016), including the pediatric setting (Lake et al., 2018). However there is substantially less understanding of these factors in paediatric settings. Of course several studies have deepened understandings, including the RN4CAST project, which highlighted how the characteristics of nursing staff, such as burnout, affect patient outcomes (Aiken et al., 2012). What is clearly known is that burnout is widespread internationally and there differences in experience, presentation and effects of nurses' burnout across clinical settings. This is known to be an important feature to consider when addressing this issue and when exploring strategies to combat contributory factors. Less is known about whether or not these experiences have an influencing effect on nurses' perceptions of the clinical environment thus accentuating their burnout. For example we know that when nurse feels burnt out they are more likely to want to leave their job (Basar & Basim, 2016). This continuous feeling of wanting to leave, and feeling stuck, likely accentuates their

burnout. The question then is whether or not burnout is a potentiating factor that alters nurses' perceptions of their clinical environmental issues, and affects their performance in the paediatric setting.

Background

The paediatric setting is an environment where nurses are thought to be at an increased the risk of burnout (Davis, Lind & Sorensen, 2013). This is reflected in other studies, which demonstrate that the increased vulnerability of children and concern for their welfare places these nurses at a greater risk (Meyer, Li, Klaristenfield, & Gold, 2015). Overall the emotional involvement is potentially higher than when taking care of adults (Meyer, Li, Klaristenfield, & Gold, 2015). The sense of responsibility also seems greater to nurses in this environment given the high risks, associated with medication errors for example (Manias, Cranswick, Newall et al 2019, Lan, Wang, Yu et al 2014), risk of injuries (Jamerson 2014) and the potential detrimental effects of illness (Murni, Duke, Daley, Kinney & Soenarto, 2019, Becknell, Schober, Korbel, & 2015) or tragic events on children and their families (Jestico & Finlay 2017). Within this context there are also a number of unreported errors (Khan et al. 2017), which can add to nurses' emotional burden through guilt of inaction. Indeed it has been found that committing or witnessing errors is a predisposing factor to the onset of stress and burnout (Winning et al. 2018). Nurses also invest heavily in their work and commit very strongly to the child and family (Bagnasco et al., 2019). At the same time their increased compassion for and close relationships with children and families in their care could serve to offset or prevent burnout (Mersin, İbrahimoğlu, Çağlar & Akyol 2020). Certainly being a mother is a protective factor for nurses' burnout, thus interaction with children alone might be protective (Fenwick, Lubomski, Creedy, & Sidebotham, 2018). However these potentially protected factors have not been fully explored.

However despite this, burnout as a phenomenon appears quite widespread in paediatric settings. Overall more than 44.6% of healthcare professionals (not only nurses) working in paediatrics are estimated to suffer from burnout (de Lima Garcia et al., 2019). One recently published review with a meta-analysis has identified that many paediatric nurses suffer burnout symptoms such as emotional exhaustion (31%) and depersonalization (21%) (Pradas-Hernandez et al., 2018). Certainly a recent scoping review (n=65) (Buckley, Berta, Cleverley, Medeiros, & Widger, 2020) confirmed these findings, revealing a moderate level of emotional exhaustion and depersonalization among the groups. This review also elicited the factors that impact the burnout of pediatric nurses (demographics, work environment, and work attitude) and related outcomes (nurse retention, nurse well-being, patient safety, and satisfaction), however it also highlighted the paucity of effective implementation of interventions. At the same time while the there appears to be a moderately high level of burnout among nurses in paediatric settings, it is not clear from these studies whether or not burnout influences nurses' attitudes or affects their behaviours beyond the quantifiable effects on patient outcomes. The reason that these are of interest is that paradoxically environmental issues and effects interact with each other in a synergistic manner than can provoke and compound the issues. For example while risks to safety (Profit et al., 2014) and staff shortages contribute to burnout, at the same time the presence of a safety culture improves well-being and prevents burnout.

Several studies have demonstrated relationships between poor staff well-being and poor outcomes including paediatric care (Hall et al. 2016). However despite this, the emphasis on exploring or improving the safety culture is not necessarily addressed from a well being perspective. It is now 20 years since patient safety became a major issue, yet the literature confirms that errors in healthcare are still common, even in paediatrics (Manias, Cranswick, Newall et al 2019), despite consistent efforts to improve standards of care and

promote safety cultures. In paediatrics medication errors feature highly and have been estimated as high as one in every eight hospitalised patients (Gates, Meyerson, Baysari, & Westbrook, 2019), with a chance of occurrence ten times greater than in adult settings (Stratton, Blegen, Pepper, & Vaughn, 2004). A safety culture is a structural component of services that favour the implementation of practices aimed at reducing the risk of errors and improving the safety of the care provided (WHO, 2009). Promoting safety culture is a priority for healthcare professionals worldwide. However there is little research exploring the relationship between burnout and patient safety, in either the adult or paediatric population. This is of concern especially given paediatric nurses heightened concern with childrens' safety and their risk of burnout from exposure to errors. Thus safety issues might lead to or worsen burnout, but burnout might also contribute to safety risks. There is some evidence that depression for example effects nurses' perceptions of patient safety (Johnson et al., 2017).

Burnout syndrome is a well-documented problem among nurses internationally. Moreover, paediatrics is a high-risk area. Considering the prevalence of burnout among paediatric nurses (de Lima Garcia et al., 2019) and the incidence of errors and adverse events, a question arises as to whether burnout contributes to these in paediatric settings. However, while burnout is frequently explored and examined, this is usually in the context of the perception of the work environment rather than an exploration of the effect on safety outcomes per se. There is also no information on these issues among paediatric nurses Italy, despite serving a large population serving more than 9 million families. Moreover Italy has low nurse/patient ratios in paediatrics (Sasso et al., 2019), compared with other international areas, and possibly at a greater risk of burnout and adverse events. While there are some studies that examine burnout in nurses in Italy (Di Giulio & Basso, 2018), none to our knowledge involve Italian pediatric nurses. Therefore, the purpose of this

study was to evaluate how the presence of burnout among nurses providing paediatric care could influence the perception of the safety of the care.

THE STUDY

Aim/s

This study aimed to investigate the relationship between burnout, judgment about patient safety and associated risk perception of six adverse events among Italian pediatric nurses. The research questions were:

- What is the prevalence of burnout among Italian paediatric nurses?
- Does nurses' burnout impact on their perception of the safety of the nursing care that they provide in medical, surgical and critical care pediatric settings?

We hypothesized that higher level of burnout would be associated with greater perception of adverse events and a lowered perception of safety in the clinical area.

Design

The study was conducted using a multicentre cross-sectional design in keeping with the RN4CAST consortium protocol (Sermeus et al., 2011). The data were extracted from the RN4CAST study conducted in Italy in the field of paediatric nursing care (Sasso et al., 2019).

Participants

Thirteen Italian hospitals, affiliated to the Italian Pediatric Hospital Association (IPHA), each with 200 or more beds took part in the study. Four of them were solely paediatric hospitals; the remainder had one or more paediatric wards/units. Most of these were teaching hospitals. Within these four hospitals the final sample comprised study 169 different paediatric wards/units. All nurses from these hospitals, who provided paediatric

care, were invited to take part. Thus a census sample, of paediatric nurses associated with the IPHA was used.

Ethical considerations

To conduct the study, permission was obtained from the Regional Ligurian Ethics Committee, on 11[th]April2017 (P.R. 075REG2017). Procedures were put in place to safely manage potentially sensitive data, such as the use of alpha-numeric codes to guarantee the anonymity of nurses, and their management only by researchers involved in the study. Participation in the study was voluntary, and each participant consented to take part.

Data collection

The questionnaire was a version of the one already used for the RN4CAST study collected in 2017 (Sermeus et al., 2011). The questionnaire collects data about the nursing work environment, job satisfaction, intention to leave the hospital, burnout, safety and perception of quality of care provided, care left undone and non-nursing tasks. A selection of demographics was also included to ascertain age, gender, and length of service as a nurse and educational level of the cohort.

The questionnaire was only available online and data were collected using a secure institutional webpage. Full instructions were given to participants who consented to take part. The first webpage presented a description of the study. After reading this, a single question confirming their intention to take part led them to access the survey, if they chose the option 'yes', otherwise they were sent to a thank you page, without being able to see the survey's items. Other than some elements of the demographic data all items were fixed responses, and participants were not permitted to progress with the survey unless all items were completed. To improve the response rate information sessions were held with

each hosptial. The online link was accessible for approximately four months (September 2017-January 2018)

Validity, reliability and rigour

The RN4Cast questionnaire has been used widely internationally with more than 11,000 patients and has been previously confirmed to be robust and psychometrically sound (Bruyneel Van den Heede, Diya, Aiken & Sermeus, 2011). Indeed considerable effort was utilised in developing and testing the instrument in the original study (RN4Cast 2020). It has been translated into several languages including Italian and validated for content in this latter context (Sasso et al., 2016). This team, in collaboration with the Italian Association of Children's Hospitals (AOPI) (Sasso et al., 2018), pioneered its subsequent use in a paediatric context. The internal stability of items has been established over time, and there is consistent validity of the items (Sermeus et al., 2011, The Bruyneel Van den Heede, Diya, Aiken & Sermeus, 2011). As such, and given that there were no changes to the stem questions used in this study, the questionnaire was accepted as rigorous for the purposes of this study.

Study variables

The variables examined for this study were:

1. *Burnout:* the Maslach Burnout Inventory (MBI) is the international gold standard to assess three components of work-related burnout, namely emotional exhaustion (EE), depersonalization (DP) and personal accomplishment (PA). The MBI included 22 items whose answers are on a 7-point Likert scale, from "never" to "every day". Poghosyan, Aiken, and Sloane (2009) validated this three-factor approach demonstrating high reliability within these subscales. Burnout is to be considered as

a continuous variable that passes from a low level to a moderate level, and to a high level. A score for each subscale is calculated to identify the level. A high level of burnout will occur if the scores in the sub-scales EE and DP are high, and the scores in the PA subscale are low. For EE we consider high level score ≥ 27, for DP score ≥ 13, and low level for PA value ≥ 39. The level of burnout is moderate if the scores of the three subscales are average. A low level of burnout will occur if the scores of the sub-scales EE and DP are low and the scores of the PA subscale are high.

2. *Overall grade of patient safety:* we used the question from the Agency for Healthcare Research and Quality Hospital Survey on Patient Safety Culture, to ask nurses to indicate an overall opinion on safety in their unit, following the RN4CAST project protocol (Sermeus et al., 2011). Then, we divided the grade into two levels of "safety": those who gave a negative judgment (= 1), on a range from 'poor' to fair', and those who gave a positive judgement (= 0), on a range from 'acceptable' to 'excellent'.

3. *Adverse events*: we estimated the frequency perceived by nurses of the risks of six types of adverse events, all of which are nursing sensitive: (i) medication administration errors, (ii) pressure ulcers; (iii) falls (with injuries) and three types of healthcare-associated infections; (iv) urinary tract infections; (v) bloodstream infections; and (vi) pneumonia. For this sub-study, we considered nursing perceptions as appropriate estimates of adverse events, as in previous international studies (Aiken, Clarke, & Sloane, 2002; Aiken, Clarke, Sloane, Lake, & Cheney, 2009; Ausserhofer et al., 2013). Thus, nurses reported the perceived risk of adverse events over the last year on a 7-point Likert-type scale ranging from 'never' (0) to 'daily' (6). Nursing responses were dichotomized for our analyses as follows: 'never', 'a few times a year or less' or 'once a month or less' were recorded as 'Irregularly' (= 0); and 'a few times a month', 'once a week', 'a few times a week' or 'every day' were

recorded as 'regularly' (= 1). These items demonstrated a high internal consistency and reliability (Van Bogaert et al., 2014).

Data analysis

A preliminary data analysis was carried out to identify any inconsistencies or missing data. However given the fixed responses, the only variable with missing data was one of the demographic open ended items, work experience, where 13.2% of the answers were missing. Subsequently, a descriptive and comparative analysis of the variables was conducted. All analyses were performed using IBM SPSS Statistics (version 23.0) statistical software. All the analyses relating to the survey of nurses were carried out in an aggregate form, considering all paediatric nurses as the census sample. No analyses for smaller groups (by unit or hospital) were carried out for the purposes of this study's aim. Subsequently, a detailed analysis of the relationships between the various variables examined was performed, using descriptive and inferential statistical methods. To describe sample characteristics and major variable considered, absolute frequencies, percentage values, and mean values were determined. Then, logistic regression analyses were performed to determine the possible predictors of poor safety of care provided based on each of the explanatory variables. A logistic regression analysis was conducted to test our hypothesis, creating a model for each of the outcomes taken into consideration. We considered the binary qualitative dependent variables, which express, respectively, a negative judgment (1) or positive judgment (0) about the safety of the care provided; and, the regularity (1) or irregularity (0) of nurses' perception about the risk of the adverse events involving the patients. Our explanatory variables were the three dimensions of burnout at nurse level, and all the analyses were conducted by aggregating the data by clinical area: medical, surgical, and critical care (NICU, PICU, and ED). The level of

statistical significance was set at p≤0.05, however we also reported results that showed 95% CI.

RESULTS

A total of 2243 nurses completed the survey, with an average response rate of 77% (min. 36% - max99%). Table 1 shows the demographic characteristics of the sample. There was an overall higher incidence of EE and DP for nurses working in surgical units, and a poor personal accomplishment among nurses working in the critical care units (Table 2). Overall, safety was positively judged across all clinical areas, from a minimum of 87.5% for medical-surgical units to a maximum of 90.5% in critical care units. The proportion of nurses who claimed to regularly perceive the risk of adverse events in their unit (from 'a few times a month' to 'every day') varied between 1.3% (Patient falls) to 7.8% (Urinary tract infection) in the surgical units, from 2.2% (Pressure ulcer) to 8.2% (Bloodstream infection) in the medical units, and from 1.0% (Patient fall) to 12.4% (Bloodstream infection) in the critical care units (Table 3).

Table 4 summarizes the results explaining associations between the predictive variables (three dimensions of burnout), the level of safety grade, and the nurses' perception of regular adverse events. All analyses were adjusted for demographics and nurses' working characteristics (age, gender, years worked as nurse, university education). Logistic regression showed that all of the three dimensions of burnout had an impact on the nurses' safety grade of their units. Furthermore, all the adverse events examined could be explained by at least one of the burnout dimensions. In particular, higher levels of emotional exhaustion statistically significantly increase the risk of a negative safety grade by nurses in all of the three clinical care areas. Looking at each clinical area we can see that in the surgical units, EE increase the risk of 'Poor or Fair Safety' grade (OR = 1.056.

95% CI = 1.024-1.090) and 'bloodstream infections' (OR = 1.058.95% CI = 1.00-1.120), but PA reducess the risk of 'Poor or Fair Safety' grade (OR = 0.952. 95% CI = 0.906-1.036) and the onset of 'pressure ulcers' (OR = 0.872. 95% CI = 0.794-0.958). In the surgical units, DP had no impact on safety outcomes.

In the medical units, EE increased the risk of reporting a 'poor or fair safety' grade (OR = 1.029. 95% CI = 1.012-1.047) and the onset of patient falls' (OR = 1.041. 95% CI = 1.000-1.083); DP had an impact both on 'poor or fair safety' grade (OR = 1.043. 95% CI = 1.006-1.082) and on the perception of the risk of 'medication administration errors' (OR = 1.050. 95% CI = 1.004-1.098) and 'urinary tract infections' (OR = 1.070. 95% CI = 1.014-1.128). PA was found to reduce the risk of the onset of 'pressure ulcers' (OR = 0.928 95% CI = 0.882-0.976).

In critical units, EE had an impact on several outcomes: 'poor or fair safety' grade (OR = 1.041. 95% CI = 1.014-1.071);'medication administration errors' (OR = 1.070. 95% CI = 1.029-1.113);'pressure ulcers' (OR = 1.041. 95% CI = 1.013-1.069); and 'patient falls' (OR = 1.112. 95% CI = 1.005-1.230). DP had an impact only on specific adverse events, and not on the overall judgment of safety: 'pressure ulcers' (OR = 1.074. 95% CI = 1.01-1.141) and 'pneumonia' (OR = 1.071. 95% CI = 1.003-1.144). PA was not a protective factor for any outcomes investigated in this area.

DISCUSSION

The study utilised the RN4CAST dataset related to research conducted in the Italian paediatric context (Sasso et al. 2018, 2019). It provides comprehensive data about thee prevalence of burnout in the Italian paediatric nursing population. This provides an opportunity to reflect on nursing staffs' perceptions of their clinical environment and

examine its contribution to quality care, exploring perception about safety grade and perception of risk of adverse events for the first time. Overall it was reassuring that safety was ranked highly and the perception of adverse events was low. However these findings bring an interesting perspective in on nurses' well-being and patient safety in a children's hospital setting by highlighting that for some burnout alters perceptions of safety and adverse events. It is thus is a factor to consider taking into account to improve patient safety in nursing care.

What is novel about our findings is that when nurses reported burnout, they also perceived that there was a greater risk of patient adverse events. This contrasts with previous studies that show an inverse relationship (Van Bogaert et al., 2013). Moreover, they most frequently reported that care was potentially unsafe (either poor or fair) in this scenario. Ultimately we demonstrated that there is a potential impact on perception of children's safety and reporting of adverse events when nurses suffer burnout. At least, it seems more common in this study to report such lapses in care when nurses are affected by burnout, possibly due to their negative thoughts (Chang, Lu, Chyi, Hsu, et al 2017) rather than being an accurate and objective representation of events. Negative thoughts and attitudes that accompany burnout have a powerful influence on perception of reality (Moen, Hrozanova, Stiles & Stenseng, 2019). Thus while nurses' perceptions could be deemed to be inaccurate or unreliable, it is already a concern that nurses hold these negative views as this could negatively influence nurses' behaviours in practice and lead to a poorer quality of care. This is a cause for concern and it is uncertain what effect these perceptions have on practice. Additionally these nurses' concerns about child safety could worsen their burnout thus perpetuating their problems. It is also possible that these nurses have a heightened awareness of the situation, and others are less attuned, possibly due to dissonance (DeVries & Timmins 2016), and thus denying adverse situations as a coping

mechanism. Thus there is a need to explore the relationship between burnout and safety, and the potential for burnout to contribute to worsening of quality environments or whether or not these nurses have a more or less accurate perception of events.

Overall, safety in the paediatric context needs closer attention globally. There are variant levels of staffing ratios internationally and nurses are under greater pressure where staffing ratios are low (Aiken, 2018). Potential lapses in quality due to staff shortages may lead to a chronic culture of burnout, which from our study begins to affect perceptions and possibly worsens matters. Improvements in safety may be achieved through greater collaboration with parents and caregivers who could be encouraged to assist with monitoring quality and safety along with the healthcare team during the hospitalization (Rees, Wimberg, &Walsh, 2019). Indeed, families' perceptions of the safety culture and risk of adverse events might be an important measure that could be introduced and compared with nurses' views and other data to both measure and improve clinical practice but also to verify the nurses' perceptions (Rosenberg et al., 2018). In the event that nurses affected by burnout are thinking more negatively it might be useful for them to understand the parent/carers' views as it might offset some of the negative thinking and lead to greater positivity in practice. Their involvement in the evaluation of outcomes related to patient safety needs of course to be considered in controlled situations with application of sound ethical principles. Considering the prevalence of burnout among paediatric nurses (de Lima Garcia et al., 2019) and the incidence of errors and adverse events, a question arises as to whether nurses' burnout potentiates risks to safety, and what mechanisms could be developed to address this. Ultimately there is a need to explore the relationship between burnout and safety, and the potential for burnout to contribute to worsening of quality environments needs to be explored internationally.

Nurses in this study had medium levels of emotional exhaustion, depersonalization, and a poor level of personal accomplishment comparable with other recent findings (Buckley, Berta, Cleverley, Medeiros, & Widger, 2020). These results are of concern, particularly in the paediatric context where children are so vulnerable. What is needed both in Italy and internationally is the implementation of local initiatives to promote nurses' well-being. One example in a recent study showed that introducing that introducing expressive arts interventions were a was a good method to improve nurses' well-being, reduce burnout and promote team building (Phillips & Becker, 2019). Regular team reflection in clinical practice (Dewar et al 2014) is another good sources of support that could help to buffer the effects of stress on paediatric nurses and also serve to debrief nurses following difficult situations and adverse events. Team reflective practice is not only supportive for nurses is it useful for improving safety and quality and reflecting as a team on these matters on a regular basis. Overall improving and developing work environments that support and nourish nurses needs exploration. Current recommendations about nurse staffing also emphasize the importance of a favourable work environment and a climate that allows the employee to flourish within the system (Aiken, 2018). Indeed the National Academy of Science (2019) recently published a report about burnout among health professionals, highlighting the need to remedy this by deepening research on the subject but also through improving environments.

Limitations

The cross-sectional study does not allow determining a causal relationship between the variables analysed. Moreover, data about patient safety grade and adverse events are nurses' perceptions and not objective data. However much of the literature, in particular studies related to the RN4CAST project, used this type of data, and while a limitation, is the most prudent way to perform studies with large data sets, which by their nature provide

robust meaningful data. Our data were adjusted for the characteristics of the nurses; but not for those of the hospitals although we carried out the analysis by splitting the sample into three groups based on clinical settings.

CONCLUSION

The relationship between burnout and safety has not been previously examined from this particular perspective. The association between burnout, children's safety, and adverse events among nurses working in children's surgical, medical, and critical care areas were explored. Nurses reported high levels of burnout but clinical safety was rated high. The risk of adverse events was low. The degree of burnout appeared to influence the perception of safety and adverse events; those nurses with higher reported levels of burnout judged safety and risk of adverse events more negatively. The association between nurses' burnout and perceptions of higher rates of adverse events and reduced safety in clinical practice is an important finding. However, it is unclear whether this was influenced by a negative state of mind, and whether reduced safety and increased adverse events negatively influenced nurses' well-being, thus leading to burnout. Regardless, the association between nurses' burnout and these quality concepts needs further exploration to examine the effect, if any, on burnout and safety, and identify supportive mechanisms for nurses.

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	Clinical setting		
	Surgical (n= 399)	**Medical** (n= 1208)	**Critical Care** (n= 631)
Female (%)	337 (84.5%)	1067 (88.3%)	545 (86.4%)
Age, mean (SD)	42.12 (10.17)	40.43 (10.16)	39 (9.59)
Years worked as nurse, mean (SD)	16.67 (10.63)	16.02 (10.51)	14.75 (10)
Degree, nursing (%)	165 (41.4%)	594 (49.2%)	296 (46.9%)
Degree, paediatric nursing (%)	123 (30.8%)	351 (29.1%)	209 (33.1%)

Table 1. Sample characteristics stratified by clinical setting.

	Clinical setting		
Maslach Burnout Inventory sub-scales:	**Surgical** (n= 399)	**Medical** (n= 1208)	**Critical Care** (n= 631)
Emotional Exhaustion, mean (SD)	20.50 (11.6) [m]	19.93 (12.19) [m]	19.02 (11.86) [m]
Depersonalization, mean (SD)	5.02 (5.4) [l]	4.54 (5.32) [l]	4.68 (4.79) [l]
Personal Accomplishment, mean (SD)	37.84 (7.7) [m]	37.72 (7.70) [m]	35.68 (7.79) [m]

Table 2. Burnout prevalence, stratified by clinical setting.
Value for Emotional Exhaustion: high level (≥ 27), medium level (17-26), low level (≤ 16).
Value for Depersonalization: high level (≥ 13), medium level (7-12), low level (≤ 6).
Value for Personal Accomplishment: high level (≤ 31), medium level (32-38), low level (≥ 39).
[h]= high level
[m]= medium level
[l]= low level

	Clinical setting		
	Surgical (n= 399)	**Medical** (n= 1208)	**Critical Care** (n= 631)
Poor or fair safety grade	12.5%	12.5%	9.5%
Nurse-reported adverse event †			
Medication administration error	7.5%	7.6%	4.9%
Pressure ulcer	2.3%	2.2%	11.3%
Patient falls	1.3%	2.3%	1.0%
Urinary tract infection	7.8%	5.2%	9.2%
Bloodstream infection	4.5%	8.2%	12.4%
Pneumonia	2.0%	5.7%	10.3%

Table 3 Safety grade and frequency of reported adverse events, stratified by clinical setting.
†Frequency of 'regularly' risk perception (from "a few times a month" to "every day")

	Surgical Area		Medical Area		Critical Care Area	
	OR (*p*)	95%CI	OR (*p*)	95%CI	OR (*p*)	95%CI
Poor or fair safety grade						
Emotional Exhaustion	1.056 (0.001)***	1.024-1.090	1.029 (0.001)***	1.012-1.047	1.042 (0.004)**	1.014-1.071
Depersonalization	0.969 (0.355)	0.906-1.036	1.043 (0.023)*	1.006-1.082	1.048 (0.139)	0.985-1.115
Personal accomplishment	0.952 (0.019)**	0.906-1.036	0.980 (0.104)	0.956-1.004	1.004 (0.846)	0.966-1.043
Nurse-reported adverse events						
Medication administration error						
Emotional Exhaustion	1.020 (0.419)	0.973-1.069	1.020 (0.081)	0.998-1.043	1.070 (0.001)***	1.029-1.113
Depersonalization	1.043 (0.354)	0.954-1.141	1.050 (0.031)*	1.004-1.098	1.000 (0.999)	0.921-1.085
Personal accomplishment	0.948 (0.05)*	0.898-1.002	0.976 (0.121)	0.947-1.006	1.044 (0.141)	0.986-1.104
Pressure ulcer						
Emotional Exhaustion	1.079 (0.055)	0.999-1.165	1.018 (0.411)	0.975-1.063	1.041 (0.004)**	1.013-1.069
Depersonalization	0.964 (0.606)	0.837-1.109	1.051 (0.231)	0.969-1.139	1.074 (0.021)*	1.011-1.141
Personal accomplishment	0.872 (0.004)**	0.794-0.958	0.928 (0.004)**	0.882-0.976	0.998 (0.926)	0.962-1.036
Patient falls						
Emotional Exhaustion	1.009 (0.861)	0.914-1.113	1.041 (0.047)*	1.000-1.083	1.112 (0.041)*	1.005-1.230
Depersonalization	1.156 (0.114)	0.966-1.383	1.005 (0.906)	0.929-1.086	1.001 (0.992)	0.827-1.212
Personal accomplishment	1.020 (0.761)	0.900-1.156	0.960 (0.122)	0.912-1.011	1.019 (0.789)	0.886-1.173
Urinary tract infection						
Emotional Exhaustion	1.013 (0.569)	0.968-1.060	1.002 (0.902)	0.975-1.029	1.016 (0.285)	0.987-1.047
Depersonalization	0.965 (0.480)	0.873-1.066	1.070 (0.014)*	1.014-1.128	1.027 (0.446)	0.959-1.099
Personal accomplishment	0.970 (0.279)	0.917-1.025	1.003 (0.868)	0.966-1.042	1.009 (0.664)	0.968-1.052
Bloodstream infection						
Emotional Exhaustion	1.058 (0.05)*	1.00-1.120	1.017 (0.134)	0.995-1.040	1.021 (0.114)	0.995-1.047
Depersonalization	0.999 (0.982)	0.897-1.112	1.026 (0.267)	0.980-1.075	1.044 (0.146)	0.985-1.1106
Personal accomplishment	0.950 (0.153)	0.885-1.019	0.976 (0.120)	0.946-1.006	1.008 (0.667)	0.973-1.043
Pneumonia						
Emotional Exhaustion	1.028 (0.487)	0.950-1.113	1.003 (0.813)	0.977-1.030	1.000 (0.981)	0.972-1.030
Depersonalization	1.078 (0.328)	0.928-1.252	1.035 (0.216)	0.980-1.093	1.071 (0.039)*	1.003-1.144
Personal accomplishment	0.985 (0.758)	0.893-1.086	0.986 (0.449)	0.952-1.022	0.967 (0.076)	0.932-1.004

Table 4 Binary Logistic Regression: Univariate Risk Factors Associated with Poor or fair Safety grade and perceived-Adverse Events adjusted for age, gender, years worked as nurse, university education.

* p≤.05, ** p≤.01, ***p≤.001.

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1-2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-6
Objectives	3	State specific objectives, including any prespecified hypotheses	6-7
Methods			
Study design	4	Present key elements of study design early in the paper	7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8-9
Bias	9	Describe any efforts to address potential sources of bias	/
Study size	10	Explain how the study size was arrived at	7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8-9
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	9-10
		(*b*) Describe any methods used to examine subgroups and interactions	/
		(*c*) Explain how missing data were addressed	9
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	Not applicable
		(*g*) Describe any sensitivity analyses	Not applicable
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	10
		(b) Give reasons for non-participation at each stage	/
		(c) Consider use of a flow diagram	Not necessary
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	10
		(b) Indicate number of participants with missing data for each variable of interest	/
Outcome data	15*	Report numbers of outcome events or summary measures	10-11
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	/
		(*b*) Report category boundaries when continuous variables were	Not

		categorized	applicable
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not applicable
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Not applicable

Discussion

Key results	18	Summarise key results with reference to study objectives	12-13
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14-15
Generalisability	21	Discuss the generalisability (external validity) of the study results	/

Other information

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Title page

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.