
Article:
Basu, S., Harris, A., Mason, S. orcid.org/0000-0002-1701-0577 et al. (1 more author) (2020) A longitudinal assessment of occupational stress in emergency department nursing staff. Journal of Nursing Management, 28 (1). pp. 167-174. ISSN 0966-0429

https://doi.org/10.1111/jonm.12910

TITLE PAGE

A longitudinal assessment of occupational stress in Emergency Department Nursing Staff

Subhashis Basu,[1,2] Angela Harris[2], Sue Mason[2], Joseph Norman[2]

[1] Sheffield Occupational Health and Wellbeing Service, Northern General Hospital, Sheffield, S5 7AU, England

[2] Emergency Department, Northern General Hospital, Sheffield, S5 7AU, England

[3] School of Health and Related Research, University of Sheffield, Sheffield, UK

Address for Correspondence

Subhashis Basu

Emergency Department

Northern General Hospital

Sheffield

S5 7AU

England

Email: subhashis.basu@sth.nhs.uk

Acknowledgments: The authors would like to thank Professor Michael West and Professor Johannes Siegrist for their advice regarding this work.

Keywords: occupational stress, nursing, evaluation, accident and emergency departments

Conflicts of Interest: None

Funding: None

DR SUBHASHIS BASU (Orcid ID : 0000-0002-6439-4411)

Article type : Original Article

MAIN FILE

Abstract

Aims

To examine perceptions of occupational stress in Emergency Department (ED) nurses and measure the impact of interventions to address them.

Background

Cross-sectional studies internationally have established that Emergency Department (ED) nursing staff experience high levels of occupational stress. Few however have examined changes in perceptions of stress over time or the impact of interventions to address them.

Evaluation

A structured questionnaire completed by volunteer nursing staff in one United Kingdom ED assessing perceptions of occupational stress and job satisfaction. Questionnaire rounds were administered in 2014 (T1), 2015 (T2) and 2017 (T3) at 18-month intervals. Statistical analyses were conducted using multivariate regression, t-tests and Mann Whitney U-Tests.

Key Issue

Statistically significant improvements in effort-reward balance, relational justice and job satisfaction were seen between T2 and T3 for nurses completing questionnaires at all three timepoints, but not for other stressors.

Conclusion

This study suggests that organisational interventions, supported by robust research data and consistent departmental leadership can positively influence perceptions of organisational stress in ED nurses. Our approach is generic, internationally applicable and can be adopted in all EDs.

Implications for Nursing Management

These occupational stressors are common to all EDs. Nurse managers should know their distribution amongst their staff. Such data can inform interventions to achieve maximal benefits for staff wellbeing and may be of value when targeting resources in times of financial pressure.

MAIN PAPER

Introduction

Work stress is a recognised hazard for those working in the Emergency Department (ED). ED nursing staff may become distressed through a variety of exposures. These may occur acutely through exposure to violence, bereavement and traumatic events (Healy & Tyrrell 2013); or occur more insidiously through persistent elevated workload, low work autonomy and insufficient social support. Physical symptoms arising from exposure to acute stress include sleep disturbance, fatigue and gastrointestinal upset, whereas chronic stress exposure may lead to early cardiovascular disease, insulin resistance, musculoskeletal complaints and psychiatric complaints (Kivimaki & Kawachi 2015; Verkuil et al 2015). Occupational consequences include burnout, compassion fatigue and leaving the profession (Adriaenssens et al 2015; Johansen & Cadmus 2015). The presence of these exposures and their adverse outcomes has been noted in several studies of nursing staff across the globe in the past two decades (McGrath et al 2003; Tyson & Pongruengphant 2004; Sveinsdottir et al 2006; Bonzini et al 2015; Sarafis et al 2016; Adriaenssens et al 2017).

Past studies of stress from violence, unexpected death and trauma in ED nurses raise concerning findings. In a study of 80 ED nurses, three-quarters stated that they had experienced at least one secondary traumatic stress symptom in the preceding week (Morrison & Joy 2016). A study conducted in ED nurses working in hospitals in Ireland found that staff nurses were more likely to report secondary traumatic stress symptoms than senior nursing groups, with a corresponding propensity to consider career changes and misuse alcohol (Duffy et al 2015). Several studies have established the damaging physical and emotional effect of workplace violence upon ED nurses (Darawad et al 2015; Jeong & Kim 2018; Hasshankhani et al 2018). Such findings have led to recommendations to be made regarding measures to reduce exposure to violence, including consideration of how EDs should be designed (Lenaghan et al 2018).

With respect to the effects of chronic occupational stress, a meta-analysis of international studies examining burnout identified a prevalence of emotional exhaustion, depersonalisation and low

personal accomplishment of 31%, 36% and 29% respectively in ED nurses (Gómez-Urquiza et al 2017). Higher percentages for each domain were quoted in another meta-analysis of existing literature on these subjects (Li et al 2018). In contrast to earlier research, no significant association between burnout in ED nurses and patients' perception of their quality of care was found in a study based in the south of Spain (Ríos-Risquez et al 2016). A cross-sectional questionnaire study of ED nurses based in the United States identified high levels of compassion satisfaction amongst surveyed staff, with low levels of managerial support the most significant predictor of compassion fatigue and burnout (Hunsaker et al 2015). Moral distress amongst ED nurse practitioners was found to be a significant prediction of intention to leave in a nationwide survey in the United States (Trautmann et al 2015). Occupational burnout in ED nurses is an established concern as highlighted in a study of over 1000 staff in Shanghai (Jiang et al 2017), but other work has suggested that interventions such as communication skills training and conflict management can offset this (Wei et al 2017).

More broadly, three models have been proposed in the literature to encompass occupational stressors relevant to all workplaces. The first is the Demand-Control-Support (DCS) model (Karasek 2009), in which workers experiencing high work demand, low autonomy and low social support have the lowest wellbeing, whereas higher levels of autonomy and work support may mitigate the influence of work pressures. The second is that of effort-reward (ER) and overcommitment (OC) model. This model hypothesises a social contract with work in which each effort is accompanied by one reward. Rewards may be tangible, such as pay or promotion, or less defined such as a feeling of being valued by colleagues and feeling part of a team (Siegrist 1996). Effort-reward imbalance and overcommitment have been associated with similar adverse health, work and social consequences to that of poor DCS profiles (Siegrist et al 2004). More recently, perceptions of fairness or equity at work has received increasing attention through the organisational justice (OJ) model. These may relate to procedural issues such as the design, implementation and evaluation of policies and processes, as well as management practices; or to relational factors such as interactions with colleagues and management (Ferrie et al 2006).

Research employing these theoretical frameworks in studies of stress amongst ED nurses have mainly been conducted cross-sectionally. One sampling 222 ED nurses identified a preponderance of avoidant conflict management styles in the 27% of participants reporting high stress (Johansen & Cadmus 2016). Another concluded that high work demand and low job control are associated with higher levels of education in ED nurses (Trousselard et al 2016). Workload was also a consistent

predictor of perceived stress in a cross-sectional study of French ED personnel, with a greater reported effect in doctors than in nurses and some junior doctors reporting associated substance misuse (Lala et al 2016). Role ambiguity, high workload and poor job-skill fit were found to be significant occupational predictors of stress in a sample of 510 Chinese ED nurses (Wu et al 2012). In a cross-sectional study across 15 Belgian EDs, nurses were found to report high workload and lower decision authority than hospital nursing colleagues, but better social support and opportunities for skill discretion (Adriaenssens et al 2011). High procedural justice, that is the perceived fairness of organisational policies, practices and interactions has been linked to better emotional health in ED nurses (Joe & Lee 2017).

Of the few longitudinal studies, one stressed the importance of nurse managers to be aware of the causes and consequences of occupational stress with findings to suggest that changes in job demands, control and social support were predictive of job satisfaction and engagement (Adriaenssens et al 2015). Although a variety of occupational stressors and associated psychosocial outcomes have been analysed, few studies have assessed these using the full range of theoretical frameworks described earlier. Furthermore, to our knowledge there is only one published longitudinal study examining interventions in the ED on provider wellbeing (Schneider et al 2019). The aim of this study was to assess perceptions of organisational stress and job satisfaction amongst ED nurses over a three-year period and the impact of interventions to mitigate stress.

Methods

This prospective mixed-methods study was conducted in a large ED in northern England. The department sees approximately 150000 patients per year, averaging 350 patients per day. Changes in staff perceptions of organisational stress were assessed using a questionnaire at baseline (May 2014; T1), 18 months (November 2015; T2) and at the end of the study (June 2017; T3). The first section of the questionnaire captured demographic and occupational information regarding age, gender, job role, years working in the department and part-time status defined as less than 30 hours per week. Tick boxes were included such that participants could indicate whether they had completed one previous round (2014), or both previous rounds (2014 and 2015) of the questionnaire at the relevant sitting. Each participant was given a unique three digit identifying code known only to SB. New participants in 2015 and 2017 were given alternative three-digit codes which followed on numerically from those in previous administrations.

The second part contained the 17-item Swedish Demand-Control-Support questionnaire (α = 0.7-0.85 for all components) measured on a four-point scale from strongly disagree to strongly agree. Scores for the demand, control and support components of the questionnaire were calculated using the approach stipulated by Sanne *et al* (2005), with a maximum score of 20 points assigned to demand and control, and 24 points for the support domain. The total score for each domain was obtained for each respondent, with a mean value calculated for the professional group thereafter. The third part of the questionnaire contained the short version of the Effort-Reward and Overcommitment scale (α > 0.80 for all components), as well as the Finnish Organisational Justice scale (α > 0.80 for both parts). Effort-reward was measured using a five-point scale from strongly disagree (1) to strongly agree (5). Overall mean scores for each professional group were calculated from the mean of participants' scores for each questionnaire item [19, 20]. A correction factor of 7/3 was applied to calculate ER ratios to reflect the unequal number of items (7 for effort, 3 for reward). Overcommitment was measured using six items using a four-point scale from strongly disagree (1) to strongly agree (4), thus producing a possible range of scores from 6-24. Group mean scores were calculated in an identical fashion. Relational and procedural justice were measured using a four-point scale. Participants' mean scores for each domain were calculated from the means calculated from each relevant item. The last section of the questionnaire contained the 10-item job satisfaction scale (JSS) (Macdonald & MacIntyre 1997). This was measured on a five-point Likert scale from strongly disagree (1) to strongly agree (5) for each statement, with a mean score for all respondents

calculated for each item. The final page of the questionnaire allowed for free-text comments in which participants could provide their suggestions as to how ameliorate occupational stress in the department. In addition, after each round, four staff focus groups were held on consecutive weeks to which all nursing staff who had completed the questionnaire were invited to attend one of. SB facilitated these groups which were held in the department seminar room. Comments were recorded anonymously on paper and stored in a secure cabinet in the department for further analysis.

A protocol analysis was conducted with three hospital nurses who were not based in the Emergency Department, following which small amendments were made to the introduction and instructions of the questionnaire, mainly pertaining to wording and clarity. Previous research has identified that ED nursing and medical staff experience similar stressors and has outlined the importance of workplace interventions to support both professions (Smith & Dasan 2018). Our main aim was to assess the effect of departmental interventions over a number of years as relatively few studies have previously done so (Adrianessens et al 2015; Schneider et al 2019). Although we wished to include ED doctors in our sample, we were mindful that doctors rotate through the department every 4 to 6 months. Therefore, we believed this would limit the inferences that could be drawn regarding changes in perceptions of work stress in doctors, as well as the effect of interventions to address them given the likelihood that we would capture data from an entirely different set of individuals between timepoints. An additional driver was that at the time of the study, the welfare of ED nursing staff was of particular concern for hospital managers. For these reasons whilst we did collect data from medical professionals as well as non-medical staff including administration, orderly and domestic; we have focussed our analysis in this paper to those from ED nurses.

Accordingly, all nursing staff working in the ED were invited to complete the paper-based questionnaire over a four-week period in each round. The project was promoted through word-of-mouth by the research team and departmental lead as well as leaflets and e-mails. Reminders were sent at two weeks to all staff using the same means. Staff members were asked to deposit completed questionnaires in sealed collection boxes in the departmental staff room, reception or administrative office. Group scores were fed back to staff via e-mail and using the staff room noticeboard. Participants' free-text comments from the questionnaire and focus groups were listed onto a standardised proforma following each round using the template in Table 4 below. An analysis was subsequently conducted to categorise these data under the assessed stress domains. Where a

comment or recommendation was felt to pertain to more than one domain, it was included as such. An example would be a comment in which the participant stated they their work had not been appreciated and this had eroded the relationship with their line manager. In such a case a comment was listed under effort-reward imbalance and relational injustice. Once the data had been listed, information was grouped into common themes using a thematic analysis. A simple coding system was used in which similar comments appearing through the dataset were collated under a single theme. The process was conducted jointly by two of the researchers and differences in opinion resolved to a mutually satisfactory conclusion through discussion. The departmental nurse managers were subsequently provided the grouped data and outputs of the thematic analysis, with the findings discussed in a 1-to-1 meeting with SB. The purpose of this was to inform the development of interventions to mitigate stress, which management were encouraged to co-produce with staff.

No incentives were provided for participation and the study was unfunded. Ethical approval was gained through the Clinical Effectiveness Unit at Sheffield Teaching Hospitals. Participants were aware that their data would be used anonymously for research purposes in completing the questionnaire and attending the focus groups. Data were analysed using Microsoft Excel and SPSS Version 23.0. Mann Whitney U-Tests were conducted for each administration to examine response bias between early (first 2 weeks) and late (weeks 3-4) responders. Where possible, data was captured for patient attendances, patient acuity and nursing staff numbers to determine if changes in these factors may have influenced perceptions of stress.

Results

Participant Characteristics

Yearly patient attendances were 150468 in 2014-15, 152143 in 2015-16 and 149643 in 2016-17. Average patient length of stay in the department rose by 24 minutes across the three years. Total and average shift staffing levels remained consistent across the study period, with an average of 14.4 nurses in the department at any one time, a minimum of 12 and maximum of 17. The demographic and occupational characteristics of respondents in each round of questionnaires are shown below in Table 1, with percentages shown to the nearest whole number. Overall response rates were similar across rounds. Responding numbers of junior and senior nurses (team leaders, sister-in-charge, charge nurse) also remained consistent. Nursing management personnel with operational responsibilities for the department remained unchanged throughout the study, with all 8 responding on each occasion. No significant differences between rounds for any characteristic or between early and late responders using the Mann-Whitney U Test. Separate multivariate regression analyses did not identify any of the three demographic predictor variables to be associated with the outcome variables measured.

Insert Table 1 here

Questionnaire Responses

The overall results for the 2014, 2015 and 2017 surveys, with their associated 95% confidence intervals are shown in the table below. Mann-Whitney U Tests showed no significant differences between respondents completing the questionnaire in the first two weeks or the last two weeks of the data collection period for all three administrations.

Insert Table 2 here

A separate analysis was conducted for nurses completing all three rounds of the questionnaire (n=63). Results indicate statistically significant improvement in effort-reward balance, perceptions of relational justice and job satisfaction in this subset. It should be noted that a change of nursing leadership occurred in early 2016 and no further changes to the management setup in the department took place until the completion of the study.

Insert Table 3 here

Thematic Analysis of Questionnaire and Focus-Group Comments

Participants' comments gave credence to the numerical results from the questionnaire at both T1 and T2. Patterns in the dataset indicated greater concern regarding insufficient work autonomy, support, lack of reward for efforts and perceived injustices, than for concerns about workload. Several respondents described high workloads but noted this may be expected in the profession. A few ED nurses described this as a driver for them to become an ED nurse and a few raised concerns as to whether they would find lower workloads sufficiently stimulating long-term. A majority of nurses however expressed their concerns about decision latitude such as the lack of flexibility to take breaks in quieter work periods and in actioning patient care. At T1, several nurses described a culture of competitiveness between different areas of the department which they felt was destructive to overall morale. Concerns about lack of education and cancelled training session were common to most nurses at T1 and T2, with a corresponding concern about lack of career development opportunity such that some nurses had left to pursue these elsewhere despite being valued and well-respected members of staff. For illustration, the findings from the thematic analysis following the 2014 administration are shown in Table 4 with the associated corroborative comments. The corresponding interventions introduced by management outlined in Table 5.

Insert Table 4 here

Insert Table 5 here

Discussion

Main Findings

Significant improvements were seen for nurses completing all three questionnaire rounds in perceptions of effort-reward, relational justice and job satisfaction from T2 to T3. This study is one of few to employ a longitudinal design and to our knowledge also one of the first to examine the impact of departmental interventions to address organisational stress. Whilst the findings cannot confirm cause and effect in the absence of a control group or consideration of wider external policy changes in the hospital and beyond, they are suggestive that interventions are not only effective, but their effects can be sustained for considerable periods. Towards the end of the study, automatic admission rights to medical specialities and the reorganisation of front-door triage were introduced in response to national recommendations and not directly due to the survey findings. It is difficult to specify to what degree these departmental changes influenced perceptions of these occupational stressors but plausibly they were introduced primarily to reduce workload. One would surmise therefore that these interventions would have their most significant impact in the demand-control domain of stress. Nonetheless, no changes in scores were noted in these domains across the three timepoints, and it is noted that the average patient length of stay and patient volumes remained consistent throughout. In addition, by the end of the study, there was no significant success in sustainably increasing nursing staff numbers which also may explain the findings for this domain.

Strengths and Limitations

Whilst this study has several strengths including a longitudinal design, consistent response rate and mixed-methods approach, several limitations are notable. The first relates to a change in leadership just prior to T2 with adjustments to some senior nursing roles. Such changes are known to influence the development and sustainability of organisational interventions. Furthermore, some interventions, such as the introduction of exit interviews for staff leaving the department were not sustained through the study. The improvements in perceptions of some organisational stressors seen amongst nursing staff completing all questionnaire rounds are subject to survivor bias, which is

a recognised limitation of prospective studies. No data was captured on wellbeing states or occupational-behaviour states such as intention to leave. Although staff turnover was not measured, department records indicated that 107 nursing staff were employed across 2014-2017 continuously, suggesting a total turnover of about 33% across the three years. It is indeed possible that those most interested in this area were the individuals that responded, and unfortunately no data was captured on non-responders, which represented approximately 40% of staff. Another limitation is that of common-method variance of using questionnaires on a repeated basis, which would apply to those participating in more than one round. We did not analyse differences in questionnaire results and comments according to nursing grade. It is indeed plausible that some sources of stress may have differed between senior and junior nurses. Finally, we have not included ED doctors in our study for reasons described earlier. Nonetheless, this is a notable omission, given their close interaction with nursing staff and shared stressors and further work should examine this to develop interventions of mutual benefit.

Implications for Nursing Management and Conclusions

Several findings from this study resonate with those in other countries, and thus have international implications. Research in the Netherlands identified an association between work autonomy and social support with job satisfaction in nursing staff, as well as a relationship between demands and emotional exhaustion (Gelsema et al 2006). Similarly, another study identified considerable variation in changes of perceptions of work stressors over time in Belgian ED nurses, and also determined a positive relationship between rewards and worker engagement, as well as social harassment and emotional exhaustion (Adrianessens et al 2015). A more recent publication has examined the impact of ten multi-professional meetings in which staff at one German ED developed co-produced solutions to mitigate work stress through a moderated process (Schneider et al 2019). Workers reported higher work autonomy and less overtime 12 months post-intervention but in contrast to the findings of this study, a decline in job satisfaction. The approach here and methods employed to assess perceptions of occupational stress are transferable to all EDs. A mixed-methods approach using questionnaire responses and data from focus groups, interviews or other qualitative inquiry methods can provide a comprehensive evidence base for the co-production of interventions with staff in a systematic way. Other metrics by which the efficacy of interventions can be measure include patient satisfaction reports, staff turnover and recruitment data, crowding and waiting times. This highlights the importance of nurse managers and relevant colleagues knowing the range

of stressors affecting their staff and having access to robust data to evidence interventions. Organisational cultures undoubtedly differ according to the norms associated with different societies, and thus perceptions of stressors amongst the workforce will do so accordingly, as well as other indices such as job satisfaction. Medical practice systems may also be important considerations; for instance, perceptions of stress in ED nurses may differ in public and private sectors (Tyson & Pongruengphant 2004) and how departments are subsequently managed. International collaborations examining these issues can help determine the relevance of these factors in tailoring interventions to alleviate worker stress. Where resources are scarce such in poorer countries or those experiencing periods of austerity, the approach used here can help determine where best to invest such resources to achieve maximal gains.

References

1. Adriaenssens, J., De Gucht, V., Van Der Doef, M. and Maes, S., (2011). Exploring the burden of emergency care: predictors of stress-health outcomes in emergency nurses. *Journal of advanced nursing*, *67*, 1317-1328.
2. Adriaenssens, J., De Gucht, V., & Maes, S. (2015). Causes and consequences of occupational stress in emergency nurses, a longitudinal study. *Journal of Nursing Management*, *23*, 346-358.
3. Bonzini, M., Veronesi, G., Conti, M., Coggon, D., & Ferrario, M.M. (2015). Is musculoskeletal pain a consequence or a cause of occupational stress? A longitudinal study. *International archives of occupational and environmental health*, *88*, 607-612.
4. Darawad, M.W., Al-Hussami, M., Saleh, A.M., Mustafa, W.M. & Odeh, H (2015). Violence against nurses in emergency departments in Jordan: Nurses' perspective. *Workplace health & safety*, *63*, 9-17.
5. Duffy, E., Avalos, G. and Dowling, M. (2015). Secondary traumatic stress among emergency nurses: a cross-sectional study. *International emergency nursing*, *23*, 53-58.
6. Ferrie, J.E., Head, J., Shipley, M.J., Vahtera, J., Marmot, M.G., & Kivimäki, M. (2006) Injustice at work and incidence of psychiat-ric morbidity: the Whitehall II study. *Occup Environ Med*, *63*, 443–450.
7. Gelsema T.I., van der Doef, M., Maes, S., Janssen, M., Akerboom, S., & Verhoeven, C. (2006). A longitudinal study of job stress in the nursing profession: causes and consequences. Journal of Nursing Management, *14*, 289-299.
8. Gómez-Urquiza, J.L., Emilia, I., Albendín-García, L., Vargas-Pecino, C., Ortega-Campos, E.M., Cañadas-De la Fuente, G.A. (2017). Prevalence of burnout syndrome in emergency nurses: A meta-analysis. *Critical care nurse*, *37*, e1-e9.
9. Hassankhani, H., Parizad, N., Gacki-Smith, J., Rahmani, A. & Mohammadi, E. (2018). The consequences of violence against nurses working in the emergency department: A qualitative study. *International emergency nursing*, *39*,20-25.
10. Healy, S. and Tyrrell, M. (2013). Importance of debriefing following critical incidents. *Emergency Nurse*, *20*.
11. Hunsaker, S., Chen, H.C., Maughan, D., Heaston, S. (2015). Factors that influence the development of compassion fatigue, burnout, and compassion satisfaction in emergency department nurses. *Journal of Nursing Scholarship*, *47*, 186-194.
12. Jeong, I.Y. & Kim, J.S. (2018). The relationship between intention to leave the hospital and coping methods of emergency nurses after workplace violence. *Journal of clinical nursing*, *27*,1692-1701.
13. Joe, S.R., & Lee, E.K. (2017). Effects of emotional labor and organizational justice on organizational socialization of emergency room nurses. *Journal of Korean Academy of Nursing Administration*, *23*, 397-405.

14. Johansen, M. L., & Cadmus, E. (2016). Conflict management style, supportive work environments and the experience of work stress in emergency nurses. *Journal of Nursing Management*, *24*, 211-218.
15. Lala, A.I., Sturzu, L.M., Picard, J.P., Druot, F., Grama, F. & Bobirnac, G. (2016). Coping behavior and risk and resilience stress factors in French regional emergency medicine unit workers: a cross-sectional survey. *Journal of medicine and life*, *9*, 363.
16. Li, H., Cheng, B. and Zhu, X.P. (2018). Quantification of burnout in emergency nurses: A systematic review and meta-analysis. *International emergency nursing*, *39*, 46-54.
17. McGrath, A., Reid, N. & Boore, J. (2003). Occupational stress in nursing. *International journal of nursing studies*, *40*, 555-565.
18. Karasek R.A. (1979). Job demands, job decision latitude, and mental strain: implications for job redesign. *Admin Sci Q*, 24, 285–308.
19. Kilcoyne, M., & Dowling, M. (2007). Working in an overcrowded accident and emergency department: nurses' narratives. *Australian Journal of Advanced Nursing, 25*, 21.
20. Kivimäki, M., & Kawachi, I. (2015). Work stress as a risk factor for cardiovascular disease. *Current cardiology reports*, *17*, 74.
21. Lenaghan, P.A., Cirrincione, N.M. & Henrich, S. (2018). Preventing emergency department violence through design. *Journal of emergency nursing*, *44*, 7-12.
22. Macdonald, S., & Maclntyre, P. (1997). The generic job satisfaction scale: Scale development and its correlates. *Employee Assistance Quarterly*, *13*, 1-16.
23. Morrison, L.E., & Joy, J.P. (2016). Secondary traumatic stress in the emergency department. *Journal of advanced nursing*, *72*, 2894-2906.
24. Potter, C. (2006). To what extent do nurses and physicians working within the emergency department experience burnout: a review of the literature. *Australasian Emergency Nursing Journal*, *9*, 57-64.
25. Ríos-Risquez, M.I., & García-Izquierdo, M. (2016). Patient satisfaction, stress and burnout in nursing personnel in emergency departments: A cross-sectional study. *International journal of nursing studies*, *59*, 60-67.
26. Sarafis, P., Rousaki, E., Tsounis, A., Malliarou, M., Lahana, L., Bamidis, P., Niakas, D., & Papastavrou, E. (2016). The impact of occupational stress on nurses' caring behaviors and their health-related quality of life. *BMC nursing*, *15*, 56.
27. Sanne, B., Torp, S., Mykletun, A., & Dahl, A.A. (2005). The Swedish Demand-Control-Support Questionnaire (DCSQ): factor structure, item analyses, and internal consistency in a large population. *Scand J Public Health*, *33*, 166–174.
28. Schneider, A., Weigl, M. (2018). Associations between psychosocial work factors and provider mental well-being in emergency departments: A systematic review. *PloS one*, *13*, p.e0197375.
29. Schneider, A., Wehler, M., Weigl, M. (2019). Effects of work conditions on provider mental well-being and quality of care: a mixed-methods intervention study in the emergency department. *BMC Emergency Medicine*, *19*, 1.

30. Siegrist, J. (1996). Adverse health effects of high-effort/low-reward conditions. *J Occup Health Psychol*, *1*, 27.
31. Siegrist, J., Starke, D., Chandola, T., Godin, I., Marmot, M., Niedhammer, I., Peter, R. (2004). The measurement of effort–reward imbalance at work: European comparisons. *Social science & medicine*, *58,* 1483-99.
32. Smith, E., & Dasan, S. (2018). A system under pressure. *British Journal of Hospital Medicine*, *79*, 495-499.
33. Sveinsdottir, H., Biering, P. & Ramel, A. (2006). Occupational stress, job satisfaction, and working environment among Icelandic nurses: a cross-sectional questionnaire survey. *International journal of nursing studies*, *43*, 875-889.
34. Trautmann, J., Epstein, E., Rovnyak, V. Snyder, A. (2015). Relationships among moral distress, level of practice independence, and intent to leave of nurse practitioners in emergency departments: results from a national survey. *Advanced Emergency Nursing Journal*, *37*, 134-145.
35. Trousselard, M., Dutheil, F., Naughton, G., Cosserant, S., Amadon, S., Dualé, C., Schoeffler, P. (2016). Stress among nurses working in emergency, anesthesiology and intensive care units depends on qualification: a Job Demand-Control survey. *International archives of occupational and environmental health*, *89*, 221-229.
36. Tyson, P.D. & Pongruengphant, R. (2004). Five-year follow-up study of stress among nurses in public and private hospitals in Thailand. *International journal of nursing studies*, *41*, 247-254.
37. Verkuil, B., Atasayi, S. and Molendijk, M.L. (2015). Workplace bullying and mental health: a meta-analysis on cross-sectional and longitudinal data. *PloS one*, *10*, p.e0135225.
38. Wu, H., Sun, W. and Wang, L. (2012). Factors associated with occupational stress among Chinese female emergency nurses. *Emerg Med J*, *29*, 554-558.
39. Zangaro, G.A., & Soeken, K.L. (2007). A meta-analysis of studies of nurses' job satisfaction. *Research in nursing & health*, *30*, 445-458.

Tables

Total N (%)	Female N/ %)	Median Age	Median Years in ED	Part-Time N (%)	Junior Nurse N (%)	Sister/ Senior Sister N (%)	Nurse Manager/ Matron
93 (62)	71 (76)	38.4	7.3	26 (28)	60 (64)	25 (27)	8 (9)
96 (59)	70 (81)	36.2	6.4	27 (31)	63 (66)	25 (26)	8 (8)
100 (60)	71 (80)	34.1	5.9	24 (27)	65 (65)	27 (27)	8 (8)

Table 1: Questionnaire Response Rates and Participant Demographics

	T1	T2	T3
Demand	14.71 (13.51-15.91)	14.24 (12.34-16.14)	14.33 (12.93-15.73)
Control	11.11 (10.34-11.88)	11.37 (10.67-12.07)	11.25 (10.66-11.84)
Support	13.34 (12.11-15.57)	13.47 (12.26-14.68)	14.33 (13.03-15.63)
ER	1.44 (1.27-1.61)	1.36 (1.18–1.54)	1.38 (1.18-1.58)
OC	14.22 (12.82-15.62)	14.56 (13.89–15.23)	14.09 (12.39-15.79)
RJ	2.58(2.37-2.79)	2.65 (2.50–2.80)	2.83 (2.61-3.05)
PJ	2.26 (2.02-2.50)	2.37 (2.28–2.46)	2.33 (2.17-2.59)
JSS	2.65 (2.11-3.01)	2.63 (2.33-2.93)	3.12 (2.77-3.47)

Table 2: Scores for Stress Domains and Job Satisfaction by Timepoint

	T1	T2	T3
Demand	15.11 (14.47-15.75)	15.24 (14.36-16.12)	15.18 (14.13-16.23)
Control	10.33 (10.01-10.55)	10.37 (9.99-10.75)	10.55 (10.09-11.11)
Support	12.94 (11.71-14.17)	13.05 (12.01-14.09)	13.93 (13.10-14.76)
ER	1.46 (1.17-1.75)	1.41 (1.27–1.55)	1.13 (1.01-1.26)
OC	13.87 (12.51-15.23)	13.66 (12.79–14.59)	14.01 (12.88-15.14)
RJ	2.42 (2.13-2.71)	2.34 (2.21–2.47)	2.85 (2.69-3.01)
PJ	2.15 (1.99-2.31)	2.26 (1.95–2.57)	2.70 (2.41-2.09)
JSS	2.56 (2.41-2.71)	2.48 (2.33-2.63)	2.89 (2.75-3.03)

Table 3: Stress domain scores and JSS for nurses completing all questionnaire rounds

Domain	Theme	Example Comments
Demand-Control-Support	*Responsibility*	Loss of autonomy for organising breaks Can't take 5 minutes when it is quiet or a nap at night Can't order Xrays at Night
	Staffing	Insufficient nurses to manage workload Patient safety is at risk with low staff numbers
	Support	No sisters meetings to discuss work issues Management not often seen on 'shop floor' No debriefs after incidents No structured appraisals Destructive Feedback Unclear roles/responsibilities for some tasks
Effort-Reward / Commitment	*Appreciation for Efforts*	Overly critical of errors and lack of support in complaints or concerns about care Lack of praise for hard work Loss of mutual respect from others Insufficient pay especially for overtime
	Competitive Culture	One team tries to out-do another team Not supporting each other in different areas of department
	Compassion Fatigue	Too tired to care for patients properly Emotionally drained all the time Can't wind down when I get home
Justice	*Communication*	Mistakes more often pointed out than positives Destructive Feedback Unclear roles/responsibilities for tasks Nowhere to see whether management are listening to our concerns
	Target Focus	Human element of practice has disappeared
	Education and Training	Limited opportunity and sessions Shop floor work leads to cancellations No exit interviews for learning and improvement
	Caring Culture	All staff should take responsibility for holistic care Some staff are 'lazy' No back-up from seniors in concerns about care Deferral of responsibility for others to do tasks delaying patient care

Table 4: Thematic Analysis post 2014 questionnaire rounds

Interventions Post-2014 Survey	Further Interventions Post-2015 Survey
-Weekly Nursing Team Debrief Meetings -Protected Break Times -Feedback boxes and board for departmental improvements -Open-door weekly drop in discussion with senior staff -Exit Interviews with leaving staff - Use of a staff room comments board to improve communication	- Introduction of Team Leaders to support junior staff -Improved communication of job description and competencies to other staff for support workers -Greater focus on protected time for training and educational sessions - Visible management presence on shop floor -Tea Trolley -Rotation opportunities for new staff outside of ED - Explore funding for additional staff - Greater rota fiexibility -On site support for electronic systems -Extension to email and social media of staff support groups and communication modes such as for arranging shifts and staff cover

Table 5: Main departmental interventions following questionnaire rounds