Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Editorial

Shift work in nursing: closing the knowledge gaps and advancing innovation in practice

Nurses in hospitals across the world work shifts in order to provide patient care across 24 hours of the day. Shift work, which for nurses often includes practising overnight, causes the disruption of several natural processes, leading to circadian misalignment, disturbed sleep, and light induced suppression of melatonin levels at night (Kecklund and Axelsson, 2016). These are all potential pathways to the development of fatigue, declines in alertness and performance, and several diseases. Research describing potential adverse consequences of shift work on nurses and patients is mounting. It shows that it is not merely the presence or absence of shift work that is potentially detrimental to nurses' health and wellbeing, but also how shifts are organised, in terms of shift length, overtime, weekly hours, rotating and/or permanent schedules (Dall'Ora et al., 2016), and quick returns (<11 h between shifts) (Dahlgren et al., 2016). Undoubtedly, the challenge of ensuring that the nursing workforce is scheduled cost-effectively while minimising negative consequences for staff and patient safety is considerable.

This special issue of the International Journal of Nursing Studies focuses on shift work in nursing, and it is a collection of high quality research that is contributing to close some of the outstanding knowledge gaps around shift work, and to lead the way towards innovative solutions in practice. We invited and selected papers addressing gaps in knowledge related to all aspects of shift work, particularly studies that were based on objective data: with the increase of electronic rosters and registries, the number of studies using such data collection tools rather than self-reported questionnaires is still limited (Harma et al., 2015). The same is true for outcomes including sickness absence, and patient outcomes. Of interest were also papers able to confirm temporality: studies using longitudinal designs which can shed light on the temporal impact of shift work characteristics were scarce in nursing (Dall'Ora et al., 2019, Ropponen et al., 2019), hence our request for more. A further evidence gap we aimed to fill was that of studies evaluating planned change in shift patterns, with robust evaluations post change. We welcomed research clarifying the role of mediating factors: studies considering increased fatigue and lack of sleep as hypothesised mediating factors between negative shift characteristics and adverse outcomes for patients and nurses. Finally, we were interested in papers adopting qualitative designs aiming to investigate the modifiable aspects of shift patterns, and which shed light on the personal factors likely affecting choice of shift patterns.

We have received and considered numerous papers, using different designs, samples and methodologies, highlighting the central role nurses' shift work organisation plays in determining nurses' health and wellbeing, and the quality and safety of care patients receive. Research in this special issue has adopted innovative longitudinal designs with objective data to further our understanding of the negative impact of long shifts on nurses' wellbeing and performance, in particular on nurses' sickness absence (Rodriguez Santana et al., 2020). Shifts of 12 hours or more for nurses were also associated with reduced quality of hand antisepsis, measured with a scanner which can identify the coverage achieved during hand antisepsis (Ritterschober-Böhm et al., 2020). This result is of high importance especially in the light of the current COVID-19 pandemic, during which long shifts have been widely adopted as a strategy to enhance staffing levels to cope with increasing demands on health services (Huh, 2020). Given the essential role correct hand hygiene plays in preventing transmission of COVID-19 (World Health Organization, 2020a), any changes to shift patterns which imply nurses' lower compliance with hand antisepsis may have unintended consequences and should therefore be discouraged. A further innovation in this special issue has been analysing the effects of 12-hour shifts by exploration of ward managers' views of staffing adequacy: by looking at objective shift data, authors found that mixed shift patterns are detrimental to perceptions of staffing adequacy, indicating that 12-hour shifts are not a solution to improving availability of nursing staff (Saville et al., 2020). The consequences of moving to long shifts appear to go beyond decreased job performance, but also include poor nurse wellbeing and reduced opportunities for social support, as investigated by the first study in nursing to follow-up nurses and outcomes over a post implementation period of 12 months (Suter et al., 2020). Nurses' choice of their preferred shift patterns is of fundamental importance to maintain wellbeing (Nijp et al., 2012); however, even when nurses chose to work longer shifts, their wellbeing was not improved, suggesting that work-time control may not be enough to improve wellbeing if 12-hour shifts are worked (Karhula et al., 2020).

This special issue has also shown how the wellbeing and safety of nurses, patients, and the community are influenced by night work. Evidence of the negative effects of night work is mounting (Moreno et al., 2019), and research in this special issue has highlighted how detrimental working a high number of night shifts is to nurses' health and safety, in terms of long-term sickness absence (Larsen et al., 2020) and drowsy driving (Smith et al., 2020). Night shift nurses display more sleep disruptions after three consecutive working shifts, and such disruptions may predict reduced

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job performance (James et al., 2020) Night work can also be perceived as negative by nursing students, who often report that they have little opportunity to learn (Dobrowolska et al., 2020).

Focusing on the mediators between shift characteristics and outcomes for nurses and patients, research in this special issue has furthered our understanding around the impact of sleep disturbance on nurse turnover; using latent growth curve modelling, Han and colleagues showed that when newly qualified nurses experienced severe sleep disruption, they were more likely to leave their job within two years (Han et al., 2020). Fatigue has also been explored as a mediator, and a matrix that predicts the likelihood of nurses reporting fatigue-related safety outcomes has been developed, and can be used to compare the impact of rosters both at work and outside work (Gander et al., 2020). A comprehensive review of shift working nurses concluded that factors including control over shift patterns are crucial factors in achieving recovery from fatigue (Gifkins et al., 2020). Giving nurses increased control over shift patterns has been explored as an intervention to reduce sickness absence, and found that it was successful in decreasing absenteeism by 6%, when compared to traditional scheduling systems (Turunen et al., 2020).

Research in this special issue has demonstrated the health and safety risks of long work hours, overtime work, sleep problems and fatigue. The current Covid-19 pandemic has increased the risk of health care staff being exposed to long work hours and shift work (World Health Organization, 2020b). This highlights the need for increased knowledge around how to schedule work 24/7 during periods of extreme workload, while ensuring nurses achieve recovery between shifts and fatigue is minimised. Many hospitals have suffered from a shortage of nurses which has contributed to the challenge to create sustainable shift schedules. There have been reports of fatigued nurses working under extreme working conditions and long work hours. The working time solutions often adopted (long hours and overtime work) may be functional in the short term, but carry severe risks if continued in the longer term, with increases in nurses' sick leave and turnover exacerbating the situation of severe overload. Thus, it is important that we learn from this situation. Firstly, we need more knowledge about how scheduling can be done in a sustainable way and the main risk factors that should be avoided. Are the already known risk factors related to shift scheduling (Dall'Ora et al., 2016) also applicable under high workload situation? So far, there is little data on work hours and fatigue during Covid-19. Cao and colleagues (2020) reported that medical staff preferred shorter shifts, similar to those in shipping, and that concentration deteriorated after working long hours (Cao et al., 2020). Future research should examine working time solutions taking into account the extreme work environment, including the need to fully concentrate on patients that quickly can deteriorate as well as the physical load of wearing personal protective equipment. It has also been highlighted that workers who have been directly impacted by Covid-19 may need to be given additional flexibility and support when it comes to shift scheduling (Billings et al., 2020, Maben and Bridges, 2020). Secondly, extreme work hours can be unavoidable at times, and we need to know how to support nurses and employers to manage recovery and fatigue in these situations. Various bodies have issued written recommendations, for example the Centers for Disease Control and Prevention (2020), but we need to know how to support implementation of these in practice. Since fatigue is likely to raise dramatically in the current circumstances, organisations and individuals need to understand the associated risks and act to mitigate these.

A pressing priority lies in the practical assessment of fatigue in the workplace; there have been several fatigue risk management systems proposed in nursing and in healthcare (Steege et al., 2018, Steege and Pinekenstein, 2016), including using biomathematical models (Dawson et al., 2011, Sagherian et al., 2018). While these have been welcome and much needed additions to the literature, there still needs to be further development in regards to how these models could be adopted and implemented in practice. Some of these fatigue risk management systems have been developed in the aviation sector and then transferred to healthcare; however, these occupational sectors are inherently different (Catchpole and Russ, 2015), so while the potential to learn from industries where fatigue has been managed successfully is welcome, any direct comparison should be approached with caution, and the feasibility, acceptability and effectiveness of such models in nursing and healthcare should be tested.

For this to be achieved, a much needed culture shift in how fatigue is viewed and managed is required. Compared to other high risk industries, health care personnel are less likely to acknowledge that fatigue might affect performance (Sexton et al., 2000), and recent qualitative studies have pointed towards a "*supernurse* culture" where nurses' view themselves as super humans who can work long hours with lack of breaks, food and hydration, and can do without rest (Steege and Rainbow, 2017). The attitude towards fatigue as a risk is created and maintained within the healthcare system. Thus, the whole system needs to be addressed with a more systematic approach to monitor and manage fatigue, where nurses and employers have a shared responsibility to assess fatigue. A culture where managers encourage staff to report feeling fatigued will enable taking safety precautions for fatigued individuals, and ultimately will help to avoid accidents which may prove catastrophic for staff, patients and the community. This Special Issue has highlighted how various approaches to organising shift work have potential to improve the lives of the nursing workforce and of patients alike; to ensure that such breadth and quality are not lost, a continuous and substantial investment in research on shift work in nursing is required.

Declaration of Competing Interest

We declare no competing interests.

References

Billings, J., Greene, T., Kember, T., Grey, N., El-Leithy, S., Lee, D., Kennerley, H., Albert, I., Robertson, M., Brewin, C.R., Bloomfield, M.A.P., 2020. Supporting Hospital Staff During COVID-19: Early Interventions. Occupational Medicine. Volume 70, Issue 5, July 2020, Pages 327–329, https://doi.org/10.1093/occmed/kqaa098.

Cao, J., Wei, J., Zhu, H., Duan, Y., Geng, W., Hong, X., Jiang, J., Zhao, X., Zhu, B., 2020. A study of basic needs and psychological wellbeing of medical workers in the fever clinic of a tertiary general hospital in Beijing during the COVID-19 outbreak. Psychother. Psychosom. 89 (4), 252–254.

Catchpole, K., Russ, S., 2015. The problem with checklists. BMJ Qual. Saf. 24 (9), 545–549.

Centers for Disease Control and Prevention, 2020. What workers and employers can do to manage workplace fatigue during COVID-19. Available at: https://www.cdc.gov/coronavirus/2019-ncov/hcp/managing-workplace-fatigue.html [accessed 20/08/2020].

Dahlgren, A., Tucker, P., Gustavsson, P., Rudman, A., 2016. Quick returns and night work as predictors of sleep quality, fatigue, work-family balance and satisfaction with work hours. Chronobiol. Int. 33 (6), 759–767.

Dall'Ora, C., Ball, J., Recio-Saucedo, A., Griffiths, P., 2016. Characteristics of shift work and their impact on employee performance and wellbeing: a literature review. Int. J. Nurs. Stud. 57, 12–27.

Dall'Ora, C., Ball, J., Redfern, O., Recio-Saucedo, A., Maruotti, A., Meredith, P., Griffiths, P., 2019. Are long nursing shifts on hospital wards associated with sickness absence? A longitudinal retrospective observational study. J. Nurs. Manag. 27 (1), 19–26.

Dawson, D., Ian Noy, Y, Harma, M., Akerstedt, T., Belenky, G., 2011. Modelling fatigue and the use of fatigue models in work settings. Accid. Anal. Prev. 43 (2), 549–564.

Dobrowolska, B., Visintini, C., Pokorná, A., Nascimento, C., Ferrão, S., Ziakova, K., Solgajova, A., Rybarova, L., Machul, M., Gorizza, G.L., Palese, A., 2020. Exploring the meaning of night shift placement in nursing education: a European multicentre qualitative study. Int. J. Nurs. Stud., 103687.

Gander, P., O'Keeffe, K., Santos-Fernandez, E., Huntington, A., Walker, L., Willis, J., 2020. Development and evaluation of a matrix for assessing fatigue-related risk, derived from a national survey of nurses' work patterns. Int. J. Nurs. Stud., 103573.

Gifkins, J., Johnston, D.A., Loudoun, A.P.R., Troth, P.A., 2020. Fatigue and recovery in shiftworking nurses; A scoping literature review. Int. J. Nurs. Stud., 103710.
Han, K., Kim, Y.H., Lee, H.Y., Lim, S., 2020. Novice nurses' sleep disturbance trajectories within the first 2 years of work and actual turnover: a prospective longitudinal study. Int. J. Nurs. Stud., 103575.
Harma, M., Ropponen, A., Hakola, T., Koskinen, A., Vanttola, P., Puttonen, S., Sallinen, M., Salo, P., Oksanen, T., Pentti, J., Vahtera, J., Kivimaki, M., 2015. Developing register-based measures for assessment of working time patterns for epidemiologic studies. Scand. J. Work Environ. Health 41 (3), 268–279.
Huh, S., 2020. How to train the health personnel for protecting themselves from novel coronavirus (COVID-19) infection during their patient or suspected case care. J. Educ. Eval. Health Prof 17, 10.
James, L., James, S.M., Wilson, M., Brown, N., Dotson, E.J., Dan Edwards, C., Butterfield, P., 2020. Sleep health and predicted cognitive effectiveness of nurses working 12-hour shifts: an observational study. Int. J. Nurs. Stud., 103667.
Karhula, K., Turunen, J., Hakola, T., OjajÄRvi, A., Puttonen, S., Ropponen, A., KivimÄKi, M., HÄRmÄ, M., 2020. The effects of using participatory working time scheduling software on working hour characteristics and wellbeing: a quasi-experimental study of irregular shift work. Int. J. Nurs. Stud., 103696.
Kecklund, G., Axelsson, J., 2016. Health consequences of shift work and insufficient sleep. BMJ 355, i5210.
Larsen, A.D., Ropponen, A., Hansen, J., Hansen, Å.M., Kolstad, H.A., Koskinen, A., Härmä, M.I., Garde, A.H., 2020. Working time characteristics and long-term sickness absence among Danish and Finnish nurses: A register-based study. Int. J. Nurs. Stud., 103639.
Maben, J., Bridges, J., 2020. Covid-19: Supporting nurses' psychological and mental health. J. Clin. Nurs. doi:10.1111/jocn.15307, n/a (n/a).
Moreno, C.R.C., Marqueze, E.C., Sargent, C., Wright Jr., K.P., Ferguson, S.A., Tucker, P., 2019. Working Time Society consensus statements: evidence-based effects of shift work on physical and mental health. Ind. Health 57, 139–157.
Nijp, H.H., Beckers, D.G., Geurts, S.A., Tucker, P., Kompier, M.A., 2012. Systematic review on the association between employee worktime control and work-non–work balance, health and well-being, and job-related outcomes. Scand. J. Work Environ. Health 38 (4), 299–313.
Ritterschober-Böhm, J., Bibl, K., Schneider, M., Klasinc, R., Szerémy, P., Haidegger, T., Ferenci, T., Mayr, M., Berger, A., Assadian, O., 2020. The association between shift patterns and the quality of hand antisepsis in a neonatal intensive care unit: an observational study. Int. J. Nurs. Stud., 103686.
Rodriguez Santana, I., Anaya Montes, M., Chalkley, M., Jacobs, R., Kowalski, T., Suter, J., 2020. The impact of extending nurse working hours on staff sickness absence: Evidence from a large mental health hospital in England. Int. J. Nurs. Stud., 103611.
Ropponen, A., Koskinen, A., Puttonen, S., Harma, M., 2019. Exposure to working-hour characteristics and short sickness absence in hospital workers: A case-crossover study using objective data. Int. J. Nurs. Stud. 91, 14–21.
Sagherian, K., Zhu, S., Storr, C., Hinds, P.S., Derickson, D., Geiger-Brown, J., 2018. Bio–mathematical fatigue models predict sickness absence in hospital nurses: An 18 months retrospective cohort study. Appl. Ergon. 73, 42–47.
Saville, C., Dall'Ora, C., Griffiths, P., 2020. The association between 12-hour shifts and nurses-in-charge's perceptions of missed care and staffing adequacy: a retrospective cross-sectional observational study. Int. J. Nurs. Stud. 109, 103702.
Sexton, J.B., Thomas, E.J., Helmreich, R.L., 2000. Error, stress, and teamwork in medicine and aviation: cross sectional surveys. BMJ 320 (7237), 745–749.
Smith, A., McDonald, A.D., Sasangohar, F., 2020. Night-shift nurses and drowsy driving: a qualitative study. Int. J. Nurs. Stud., 103600.
Steege, L.M., Pasupathy, K.S., Drake, D.A., 2018. A work systems analysis approach to understanding fatigue in hospital nurses. Ergonomics 61 (1), 148–161.
Steege, L.M., Pinekenstein, B., 2016. Addressing occupational fatigue in nurses: a risk management model for nurse executives. J. Nurs. Adm. 46 (4), 193–200.
Steege, L.M., Rainbow, J.G., 2017. Fatigue in hospital nurses - 'Supernurse' culture is a barrier to addressing problems: a qualitative interview study. Int. J. Nurs. Stud. 67, 20–28.
Suter, J., Kowalski, T., Anaya-Montes, M., Chalkley, M., Jacobs, R., Rodriguez-Santana, I., 2020. The impact of moving to a 12 hour shift pattern on employee wellbeing: a qualitative study in an acute mental health setting. Int. J. Nurs. Stud., 103699.
Turunen, J., Karhula, K., Ropponen, A., Koskinen, A., Hakola, T., Puttonen, S., Hämäläinen, K., Pehkonen, J., Härmä, M., 2020. The effects of using participatory working time scheduling software on sickness absence: a difference-in-differences study. Int. J. Nurs. Stud., 103716.
World Health Organization, 2020a. Rational Use of Personal Protective Equipment (PPE) for Coronavirus Disease (COVID-19): Interim Guidance, 19 March 2020. World Health Organization.
World Health Organization, 2020b. WHO calls for healthy, safe and decent working conditions for all health workers, amidst COVID-19 pandemic. World Day for Safety and Health at Work: WHO Key Facts & Key Messages to Support the Day. World Health Organization.

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