Supporting occupational health and wellbeing professionals

North-west NHS Consultant Occupational Health Physicians' **Consensus document on fatigue risk management**

February 2025

som.org.uk

Author and contributors

Author: Dr. Bernadette Dalton

The following Consultant Occupational Health Physicians have acted as contributory authors to this consensus document, and confirm they have no conflict of interest.

- Dr. Donald Menzies
- Dr. Surinder Kumar
- Dr. Ron McCaig
- Dr. Susan Robson
- Dr. Philip Atkinson
- Dr. Paula Nunes
- Dr. Martin Seed
- Dr. Peter Oliver
- Dr. Alex Mijares

Acknowledgements

The Society of Occupational Medicine would like to thank the North-west NHS Consultant Occupational Health Physicians Special Interest Group who gave their time and expertise in developing this guide. The Special Interest Group welcomes comments or suggestions regarding this publication. The SOM will assist members by directing specific enquiries about the publication to an appropriate member of the Group.

The views expressed do not necessarily represent the views of any particular member of the Special Interest Group but are considered best practice by members at the time of publication. Practitioners are encouraged to seek further specialist advice where appropriate. SOM guidelines and publications advise the Occupational Health and wider work and health community on how best to apply statutory guidance such as from the Health and Safety Executive (HSE). If you or your organisation has concerns about the impact of HSE and statutory guidance, representations should be made directly to the HSE and statutory organisation concerned.

Key points

1. North-West NHS Consultant Occupational Health Physicians (OHPs) highlight fatigue as an emerging threat to health and safety

This document is intended for NHS' Occupational Health (OH) clinicians and its purpose is to lift the lid and promote discussion on fatigue, a long-standing psychosocial hazard of significant relevance in the NHS.[1] Since the COVID-19 pandemic, challenges relating to fatigue and burnout in the NHS have become crucial considerations.[2]

OHPs therefore are raising awareness that night work is not comparable with the daytime equivalent[3] and the risk of error and relapse of workers' energy-limiting medical conditions may increase when staff return to current under-staffed, high-pressured, NHS environments, where *fatigue has typically not been managed as an occupational hazard*,[4] but often seen as a staff wellbeing issue.[5] To mitigate a legacy of fatigued workers taking long-term sick leave, and the consequent overall deconditioning, occupational health principles need to be reasserted and policies, (including the way time is organised) at work should facilitate a safe work environment.

As a strong response to the dangerous combination of serious injury and even potential death as well as ill health associated with sleep loss and circadian dysregulation, conjoined with the casual attitude of many in authority, OHPs are advocating a quantum shift in improved management of staff health and safety, highlighting the importance of fatigue risk, as part of the Risk Management Framework. Managing staff fatigue is a legal duty,[6] makes good business sense,[7] and is in line with the principles of the NHS net zero target[8] and equity.[9] Solving the problem of insufficient sleep is a potential 'win–win' for individuals, employers and wider society.

2. Suggested interventions

In compliance with the Health and Safety at Work etc. Act 1974 and Management of Health and Safety at Work Regulations 1999, employers are advised to:

2. 1. Manage fatigue like any other human factor hazard, *register fatigue as a risk on the Risk Management Framework*, and develop a *Fatigue Risk Management Strategy* (a systems approach based on principles of risk and safety management).[10] Complying with the Working Time Regulations is not sufficient to control the risks arising from worker fatigue. Managing fatigue includes:

- **Assessing risk:** There are many causes of fatigue, and a main concern in healthcare is fatigue relating to circadian disruption from shift work (SW).[5] Guidance for OH clinicians on meeting the legal standards for SW has been published by the Health, Safety and Wellbeing in Healthcare Partnership Group.[11] Risk assessments can be delegated to operational managers, supported by Trusts' health and safety advisers, who can estimate fatigue likelihood by measuring obtained sleep, wakefulness, time of day, work type, workload intensity, supervision, support and individual experience.
- **Controlling risk:** For example, preventing excessive hours of work and sleep deprivation, protecting and optimising staff sleep, scheduling work safely 24/7, factoring in food and drink options, time, and a place to rest and recover from work, particularly when working on call or overnight.

- **Reviewing risk:** This could include considering fatigue as a possible contributory factor to patient safety incidents, when proportionately responding and recording on the Patient Safety Incident Response Framework.[12]

2. 2 Use night-worker health assessments, sickness absence policies and wellbeing conversation to identify struggling workers and refer them to occupational health, particularly those with protected characteristics (for example, pregnant and menopausal women, older and disabled workers, time-limited medication users), ensuring that workers are kept safe and advised about adjustments, in concordance with the Equality Act. Employers should also enable screening for sleep disorders and SW-related medical conditions.[13]

2.3 Use Patient Safety Training[14] to provide sleep and circadian health education, including coping strategies for night work, prioritising sleep as a 'pillar of health' ('Fight Fatigue' resources[15]).

2.4 Note guidance published by the SOM,[13] the TUC,[16] Business in the Community,[17] the Association of Anaesthetists,[18] the HSSIB,[19] the Royal College of Nursing,[20] the Royal College of Midwives,[21] the Royal College of Physicians,[22] the Royal College of Surgeons,[23] the Paediatric Critical Care Society,[24] the British Medical Association,[25] NHS Employers,[7] Queensland Health,[26] the Royal Society for Public Health,[27] the Chartered Institute of Ergonomics and Human Factors,[10] and the HSE.[28]

3. Likely benefits to organisation from fatigue risk management

3.1 Operational (health and safety, clinical, patient safety outcomes)

Fatigue impacts cognition, reducing a worker's ability to stay alert, which is essential for safe and quality healthcare.[22] More than one in four workers may struggle with night working.[29] Fatigue is one of the top workplace safety risks, and arguably one of the most modifiable.[30] Preventable risks relate to a higher risk of fatigue-related incidents in workers where the following factors are relevant:

- **sleep problems:** approximately 13% of work injuries could be attributed to sleep problems; workers with sleep problems have 1.62 times higher risk of injury than workers without sleep problems.[31]
- **prolonged wakefulness:** wakefulness of >15.84 hours predicts performance lapses;[32] after 17 hours of being awake, reaction times are equivalent to being at the limit of the drug/alcohol level for driving.[33]
- **long shift length:** the injury risk increases substantially beyond the 9th hour on duty; and beyond 12 hours the injury risk increases by 34%.[34]
- **night work:** compared to morning shifts, the injury risk increases significantly on night shifts, by 36%.[34]
- **driving home** after the night shift: 20–25% of road-traffic accidents are fatigue-related.[35]
- **rest breaks** are not taken frequently enough (<4 hours) or are too short (<30 minutes): Risk is reduced for any rest break duration.[34]

3.2 Workforce (supply, performance and retention)

Working, eating and sleeping at incongruous biological times leads to derailment of body systems, physiological stress, increased risk of inflammation and disturbed immunity, and ultimately ill health[36] and mortality.[37] Shift workers (SWs) experience fatigue not just because their work results in disturbed circadian rhythms and sleep loss, but also because they may carry a burden of disease relating to long-standing illnesses and lifestyle.[38] They are not as healthy as non-SWs, being more

likely to have more than one long-standing illness, to be obese and to have diabetes. They are also more likely to be from a lower socio-economic class, to smoke, to have a poor diet,[39] to find exercise more difficult,[40] and, in some cases, to be heavy drinkers.[41]

Fatigue from work-related sleep loss can act as a catalyst, fuelling fatigue linked to the SW's comorbid medical and psychosocial factors – the double whammy (synergistic) effect. Work outcomes are likely to include lower performance,[42] more burnout[43] and more sickness absence[44]. Poor staff health and wellbeing is known to be associated with lower quality of care and patient satisfaction, increased staff absenteeism, staff turnover and 'intention to quit', worse financial performance and higher patient mortality.[45] Supporting fatigue management and a healthy workforce is therefore likely to improve attendance, performance, retention rates and patient care.

3.3 Financial (legal, governance, regulatory, reputational)

- Annually, the UK loses an equivalent of around 207,000 working days because of insufficient sleep, costing £40 billion, or 1.86% of GDP.[37]
- The cost to the UK annually of fatigue-related accidents at work is £115 million –£240 million.[6]
- The NHS, an 'anchor organisation',[46] would be exposed to significant reputational damage and legal liability in the event of a fatigue-related error/adverse event. The total estimated cost of clinical negligence claims in 2022/23 was £6,278 million,[47] and the number of incidents reported by NHS staff per month roughly doubled between 2010 and 2020,[48] with 11,000 avoidable deaths per year due to patient safety failings.[49] The Care Quality Commission lists fatigue as a human factor for consideration in medicine errors.[50] Fatigue has been identified as a contributory factor in several Healthcare Safety Investigation Branch (HSIB) reports.[5]

4 Likely benefits to worker from fatigue risk management

The individual will be empowered by education on sleep health, learning that – like nutrition and physical activity – sleep health influences every facet of human function,[51] is essential for optimal cardiometabolic and immune health,[52] and was recently recognised as 'a determinant of brain health'.[53] Improving sleep and regulating circadian rhythm will have positive effects on overall health and weight regulation, may reduce the risk of Alzheimer's disease,[54] and will support job retention and financial security.

Key points: references

1. The British Medical Association. Fatigue and sleep deprivation. https://www.bma.org.uk/advice-and-support/nhs-delivery-and-workforce/creating-a-healthy-workplace/fatigue-and-sleep-deprivation
2. House of Commons Library (8 June 2021). Workforce burnout and resilience in the NHS and social care. https://publications.parliament.uk/pa/cm5802/cmselect/cmhealth/22/2202.htm
3. The Society of Occupational Medicine (Nov 2019). SOM roundtable: Sleep and the workplace. https://www.som.org.uk/som-roundtable-sleep-and-workplace
4. Farquar M. Are aviation industry fatigue risk management strategies needed in healthcare? A reply. Anaesthesia. 2017; 72:1419.
5. The Health Services Safety Investigations Body. 26 March 2024.Fatigue risk in healthcare and its impact on patient safety. https://www.hssib.org.uk/patient-safety-investigations/fatigue-risk-in-healthcare-and-its-impact-on-patient-safety/launch-report/
6. Health and Safety Executive (2021). Human factors: Fatigue. https://www.hse.gov.uk/humanfactors/topics/fatigue.htm
7. NHS employers (5 Jan 2024). Sleep fatigue and the workplace. https://www.nhsemployers.org/articles/sleep-fatigue-and-workplace
8. NHS England (2020). Delivering a 'Net Zero' National Health Service. https://www.england.nhs.uk/greenernhs/wp-content/uploads/sites/51/2020/10/delivering-a-net-zero-national-health-service.pdf
9. NHS England. Equality, diversity and health inequalities. https://www.england.nhs.uk/about/equality/
10. Chartered Institute of Ergonomics and Human Factors (23 April 2024). Fatigue risk management for health and social care. https://ergonomics.org.uk/resource/fatigue-risk-management-for-health-and-social-care.html
11. The Health, Safety and Wellbeing in Healthcare Partnership Group (HSWPG) (Feb 2020). Supporting the wellbeing of shift workers in healthcare. https://www.nhsemployers.org/system/files/media/Supporting-the-wellbeing-of-shiftworkers-in-healthcare_0.pdf
12. NHS England (16 Aug 2022). The Patient Safety Incident Response Framework (PSIRF). https://www.england.nhs.uk/publication/patient-safety-incident-response-framework-and-supporting-guidance/
13. The Society of Occupational Medicine (Sept 2022). What might best practice look like for managing good sleep practice for night workers at work? https://www.som.org.uk/sites/som.org.uk/files/SOM_Managing_good_sleep_practice_for_night_workers_at_work_September_2022.pdf
14. NHS England (2023). The NHS Patient Safety Strategy. https://www.england.nhs.uk/patient-safety/the-nhs-patient-safety-strategy/
15. The Healthcare Fatigue Forum. https://www.frmsc.com/healthcare-fatigue-forum/
16. The TUC. The health and safety impacts of night working. 24 Oct 2024. https://www.tuc.org.uk/research-analysis/reports/health-and-safety-impacts-night-working
17. Business in the Community (Jan 2018). Sleep and recovery: a toolkit for employers. https://www.bitc.org.uk/wp-content/uploads/2019/10/bitc-wellbeing-toolkit-sleeprecovery-jan2018.pdf
18. The Association of Anaesthetists. The culture of fatigue. https://anaesthetists.org/Home/Wellbeing-support/Fatigue/The-culture-of-fatigue
19. The Health Services Safety Investigations Body (HSSIB) (March 2023). Starting the conversation around NHS staff fatigue and patient safety. https://www.hssib.org.uk/news-events-blog/starting-the-conversation-around-nhs-staff-fatigue-and-patient-safety/
20. The Royal College of Nursing (June 2021). Healthy workplace toolkit. https://www.rcn.org.uk/Professional-Development/publications/healthy-workplace-toolkit-uk-pub-009-734
21. The Royal College of Midwives (2016). Caring for You Campaign: Working in Partnership. https://www.rcm.org.uk/media/2899/caring-for-you-working-in-partnership-rcm-campaign-for-healthy-workplaces-delivering-high-quality-care.pdf
22. Royal College of Physicians (Oct 2015). Sleep fatigue. Ways to manage fatigue and ensure excellent patient care around the clock. Commentary. Membership magazine of the Royal College of Physicians, 5:12–14. https://www.som.org.uk/sites/som.org.uk/files/RCP_Commentary_Article_plus_Cover_10.15.pdf
23. The Royal College of Surgeons (2023). Supporting the wellbeing of surgeons and surgical teams during COVID-19 and beyond. https://www.rcseng.ac.uk/coronavirus/recovery-of-surgical-services/tool-6/
24. The Paediatric Critical Care Society (16 Oct 2019). Fighting fatigue resources. https://pccsociety.uk/fighting-fatigue-resources/
25. British Medical Association (2019). Anticipating and managing fatigue associated with doctors' working patterns. https://www.bma.org.uk/media/1073/bma_fatiguesl-sleep_deprivation_guidance_oct_2019.pdf
26. Queensland Health (2021). Fatigue risk management systems. http://www.health.qld.gov.au/__data/assets/ pdf_file/0033/1137975/qh-gdl-401-3.3.PDF
27. Royal Society for Public Health (15 June 2016). Waking up to the health benefits of sleep. https://www.rsph.org.uk/static/uploaded/a565b58a-67d1-4491-ab9112ca414f7ee4.pdf

28. The Health and Safety Executive (2006). Managing Shift Work: Health and Safety Guidance.HSG256. https://www.hse.gov.uk/pubns/priced/hsg256.pdf

29. Pallesen S, Bjorvatn B, Waage S, Harris A, Sagoe D (Mar 2021). Prevalence of Shift Work Disorder: A Systematic Review and Meta-Analysis. Frontiers in Psychology, 23;12:638252.

30. Honn KA, et al. (2019). Working time society consensus statements: prescriptive rule sets and risk management-based approaches for the management of fatigue-related risk in working time arrangements. Industrial Health, 57(2):264–280.

31. Uehli K, Mehta AJ, Miedinger D, et al. (Feb 2014). Sleep problems and work injuries: a systematic review and meta-analysis. Sleep Medicine Reviews, 18(1):61–73.

32. Van Dongen HP, Maislin G, Mullington JM, Dinges DF (Mar 2003). The cumulative cost of additional wakefulness: dose-response effects on neurobehavioral functions and sleep physiology from chronic sleep restriction and total sleep deprivation. Sleep, 15;26(2):117–126.

33. Dawson D, Reid K (Jul 1997). Fatigue, alcohol, and performance impairment. Nature, 17;388(6639):235.

34. Fischer D, Lombardi DA, Folkard S, et al. (2017). Updating the 'Risk Index': A systematic review and meta-analysis of occupational injuries and work schedule characteristics. Chronobiology International, 34(10):1423–1438.

35. The Royal Society for the Prevention of Accidents (July 2020). Driver Fatigue and Road Accidents Factsheet. https://www.rospa.com/media/documents/road-safety/driver-fatigue-factsheet.pdf

36. Boivin DB, Boudreau P, Kosmadopoulos A (2022). Disturbance of the Circadian System in Shift Work and its Health Impact. Journal of Biological Rhythms, 37(1):3–28

37. Hafner M, Stepanek M, Taylor J, Troxel WM, van Stolk C (Jan 2017). Why Sleep Matters – The Economic Costs of Insufficient Sleep: A Cross-Country Comparative Analysis. RAND Health Quarterly, 1;6(4):11. PMID: 28983434; PMCID: PMC5627640

38. The NHS Staff Council's Health, Safety and Wellbeing Group. Shift work in healthcare infographic. 25 October 2023. https://www.nhsemployers.org/articles/shift-work-healthcare-infographic

39. The Health Survey of England (2013). Chapter 6. Shift Work. https://files.digital.nhs.uk/publicationimport/pub16xxx/pub16076/hse2013-ch6-sft-wrk.pdf

40. Arlinghaus A, Bohle P, Iskra-Golec I, Jansen N, Jay S, Rotenberg L. Working Time Society consensus statements: Evidence-based effects of shift work and non-standard working hours on workers, family, and community. Ind Health. 2019 Apr 1;57(2):184-200.

41. Richter K, Peter L, Rodenbeck A, Weess H, G, Riedel-Heller S, G, Hillemacher T (2021). Shiftwork and Alcohol Consumption: A Systematic Review of the Literature. European Addiction Research, 27:9–15.

42. Sutherland C, Smallwood A, Wootten T, Redfern N. Fatigue and its impact on performance and health. Br J Hosp Med (Lond). 2023 Feb 2;84(2):1-8

43. Kancherla BS, Upender R, Collen JF, et al. (May 2020). What is the role of sleep in physician burnout? Journal of Clinical Sleep Medicine, 15;16(5):807–810.

44. Larsen AD, Ropponen A, Hansen J, Hansen ÅM, Kolstad HA, Koskinen A, Härmä MI, Garde AH (Dec 2020). Working time characteristics and long-term sickness absence among Danish and Finnish nurses: A register-based study. International Journal of Nursing Studies, 1;112:103639.

45. The King's Fund. Submission to the Health and Social Care Committee inquiry into workforce burnout and resilience in the NHS and social care. 2021-22 https://assets.kingsfund.org.uk/f/256914/x/4c786a1ddc/health_social_care_select_committee_workforce_burnout_resilience_20.pdf

46. NHS Providers (Feb 2023). Being an anchor institution. https://nhsproviders.org/being-an-anchor-institution/widening-access-to-good-employment

47. NHS Resolution (2022/23). Annual report and accounts 2022/23. https://resolution.nhs.uk/wp-content/uploads/2023/07/NHS-Resolution-Annual-report-and-accounts-2022_23-3.pdf

48. Institute Of Global Health Innovation (2022). National State of Patient Safety. https://www.imperial.ac.uk/media/imperial-college/institute-of-global-health-innovation/National-State-of-Patient-Safety-2022.pdf

49. Parliamentary and Health Service Ombudsman (29 June 2023). Broken trust: making patient safety more than just a promise. https://www.ombudsman.org.uk/sites/default/files/broken-trust-making-patient-safety-more-than-just-a-promise.pdf

50. Care Quality Commission (2 Nov 2022). Reporting medicine related incidents. https://www.cqc.org.uk/guidanceproviders/adult-social-care/reporting-medicine-related-incidents

51. Lim DC, Najafi A, Afifi L, et al. (Oct 2023). The need to promote sleep health in public health agendas across the globe. The Lancet Public Health, 1;8(10): e820–e826.

52. Russell Foster. Sleep, circadian rhythms and health. Interface focus. 2020, 10:20190098 http://doi.org/10.1098/rsfs.2019.0098

53. WHO (9 Aug 2022). Position paper. Optimizing brain health across the life course. https://www.who.int/publications/i/item/9789240054561

54. Musiek ES, Holtzman DM. Mechanisms linking circadian clocks, sleep, and neurodegeneration. Science. 2016 Nov 25;354(6315):1004-1008.

1. Introduction

Fatigue – defined[1] as *'decreased capability to perform mental or physical work, produced as a function of inadequate sleep, circadian disruption or time on task'*– is recognised by NHS consultant occupational health physicians (OHPs) and the BMA[2] as an increasingly significant occupational health and safety psychosocial hazard because of its relationship with working hours and shift work (SW). Of particular concern are the following: clinical staff working nights; SW schedules involving early start or late finish times; short recovery times between shifts; rapidly rotating schedules; working full shifts in succession; long shifts of 12–13 hours; and exposure to excessive and high-intensity workloads.[3] The RN4CAST survey[4] found a rise in the number of UK nurses working long shifts (12 hours or longer) in NHS hospitals, from 31% in 2005 to 51% in 2009. And 32% of day shifts and 36% of night shifts were 12 hours or longer. Working at night is now recognised as the most common cause of fatigue.[5] The resulting fatigue risk, arising from loss of sleep opportunity and circadian dysregulation[6,7] impact both NHS work safety[8,9] and worker health.[10,11] The BMA[2] highlights many factors that may impact fatigue risk, including unplanned and unpredictable interruptions while on call, especially repeat disturbances during a single sleep period or when working on call over consecutive days; being bullied or harassed; stress associated with clinical negligence claims; pressures associated with time for training, education and non-clinical work; changing and unpredictable work patterns; and additional responsibilities and specific work requirements such as telephone triage and telephone consultations. Finally, the growing number of patient consultations increases the risk of decision fatigue.[12]

Despite working hours being regulated, it is evident[13] that staff sometimes opt out of elements of the regulations; and in some cases doctors tacitly agree – or are actively encouraged – to work during days off or after night shifts. Many doctors either do not take breaks at all or use them to catch up on admin tasks. The GMC[14] emphasised that doctors complain of widespread problems relating to poor rota design, coupled with increased demand. Doctors also report that arbitrary rota decisions can be made by people with no daily contact with those affected by decisions, and who do not understand the impact of SW, for example rotas not being available 6 weeks ahead of schedule. And, finally, the GMC reported that doctors feel requests for flexible work are often treated as an inconvenience, and they talk about the conflict between work and home life. However, there is a concern[15] that attempting to solve the 'fatigue problem' by reducing working hours can create unanticipated negative outcomes, including: junior staff finding it difficult to gain critical clinical competencies; a higher clinical workload; failures in the continuity of patient care due to the increased number of patient handovers; and not addressing the most hazardous fatigue-related activity – driving home tired after night work.

The North-West NHS Consultant Occupational Health Physicians wish to raise concerns about the risk of fatigue among workers returning to the NHS after sickness absence. A post-pandemic trend of fatigue-related referrals, highlighted by Long COVID,[16] heightened rates of work-related stress and psychiatric illness[17] was noted by OHPs. Disruption of the hypothalamus-pituitary-adrenal (HPA) systems is known to interfere with normal sleep, increasing the risk of fatigue[18] and the current working environment in the NHS appears to be an unsafe, under-staffed, high-pressured work environment where sleep deprivation is common.

Despite time pressure, long working hours and SW being acknowledged as important risk factors for occupational stress, fatigue and burnout,[19] there are no formal approaches, or regulatory oversight, to monitor or investigate the impact of fatigue on clinical performance in healthcare. Management of fatigue risk in the NHS is haphazard or non-existent, with fatigue appearing to be seen as a property of the

individual rather than the organisational environment. Managing fatigue risk has not been considered in the same way as any other risk in a safe system of work, as part of the 'risk management system', under health and safety systems. Unlike other UK high-hazard industries (airline, nuclear, electrical, petrochemical, maritime, road or rail haulage)[13] and healthcare in Australia,[20] where fatigue risk management systems (FRMS) are increasingly used as models to manage fatigue, the NHS has systemically ignored fatigue risk management[21] and does not appear to manage fatigue as an occupational hazard, affecting every aspect of work.

The silence surrounding the issue of fatigue motivated the Health Services Safety Investigations Body (HSSIB) to capture evidence and explore links between healthcare staff fatigue and patient safety incidents.[22] The perceived barriers to reducing fatigue include the following: fatigue does not carry a safety warning; a lack of awareness of the impact of fatigue on performance; fatigue having direct implications for organisational performance measures (efficiency, cost and productivity); concern about professional liability potentially associated with an individual reporting themselves as fatigued; and little enforcement of the European Working Time Directive.[23] No studies on fatigue management have been performed in the UK.[7] This issue is being explored in the Ambulance Service,[24] and OHPs are aware of only one NHS Trust[25] (not in NW England) that has established fatigue risk management, as advised by the Health and Safety Executive (HSE).[26]

After examining how safety management systems (SMSs) are used in other safety-critical industries, to inform the development of SMS in healthcare, the HSSIB[27] also reported that while there is clear accountability for safety at the provider level through CQC regulation, no multi-level framework specifies who should be accountable for managing safety risks across the healthcare system.

Consensus opinion[28, 29, 30, 31, 32, 33, 34, 35] clearly indicates that employers and employees need better education about night work not being comparable with day work, and about the hazard of fatigue, health inequality, circadian rhythm and social desynchronisation relevant to shift workers (SWs), particularly the one in nine likely to be working night shifts.[36] We now present to Occupational Health (OH) clinicians the case for a quantum improvement in the risk management of fatigue, an emerging threat to health and safety that increases the risk of ill health, mortality and accidents.

2. Background to the current increased risk of fatigue in the NHS

The challenges relating to fatigue and burnout in the NHS are increasing, and they are now crucial considerations given that the NHS system was recently graded as being at 'significant risk'.[37] This grading is a result of the demand for NHS services growing beyond what was assumed in the Long Term Plan,[38] and the NHS struggling to recruit and retain enough staff with the skills needed to deliver care. Concerns about fatigue, clinician performance, patient and clinician safety predated the COVID-19 pandemic, which put unprecedented pressure on NHS staff.[21] As discussed in the House of Commons,[39] the emergency of burnout is now a widespread reality in the NHS. The protracted COVID-19 pandemic and the unfavourable conditions in which medical staff operated for a long time gave rise to distinct stressors, including not only staffing difficulties but also overwork, increased patient mortality, inadequate personal protective equipment, potential moral injury, and the need to adapt working practices to manage infection risk. The Kings Fund[40] underlined that, as well as affecting individuals, poor staff health and wellbeing are associated with poorer care quality, patient satisfaction and financial performance, higher levels of staff absenteeism, turnover, intention to quit and, in the acute sector, levels of patient mortality.

Burnout, recognised as a common feature of emotionally demanding occupations comprising SW,[41] is defined in ICD-11 as '*a syndrome conceptualized as resulting from chronic workplace stress that has not been successfully managed*'.[42] Occupational factors considered to contribute to burnout include a challenging work environment (chronic excessive workload, increased paperwork, long hours, poor work–life integration, and high patient demand) and insufficient control (lack of skills, efficiency and autonomy) and/or resources (lack of peer and managerial support or inadequate physical resources).[43] In a pre-pandemic investigation undertaken for the GMC,[14] nearly one in four doctors in training in the UK, and one in five trainers, said they felt burnt out to a high or very high degree because of their work. More than 33% of doctors working in secondary care said they had been unwell because of work-related stress in the previous year; nearly half of doctors in training reported working beyond their rostered hours; and one in five said their working pattern had left them short of sleep. Risk of burnout is now the highest since the GMC began tracking it in 2018. The GMC's National Training Survey 2022[44] found 63% of trainee doctors and >52% of trainers to be at high or moderate risk of burnout; 66% of trainees said they are 'always' or 'often' worn out at the end of their working day; and 44% are regularly 'exhausted in the morning at the thought of another day at work' – an increase of 7% since 2021. Another 2022 survey of NHS doctors[45] revealed that nearly 60% experienced poorer sleep during the pandemic, and 25% felt tiredness affected their ability to treat patients, with 18% reporting an error or near miss as a result.

Despite the NHS Long Term Plan[38] being designed to improve staffing and workload, an unprecedented and sustained high average level of SA continued in England. And the most commonly reported reason was 'anxiety/stress/depression/other psychiatric illness',[17] with minor psychiatric disorder already acknowledged as being at significantly higher levels among NHS workers than the general population.[46]

Heightened rates of fatigue during COVID-19, SA, stress, psychiatric illness[47] and burnout[39] all impacted staff retention. Despite pay being the main point of dispute in the recent strikes, multiple reasons drive NHS staff to leave,[48] with work–life balance and health roughly quadrupling as reasons in the last decade.[49] The increasing burden of SA is not only pushing up costs and disrupting service provision but also creating extra stress for the remaining staff, causing more to leave and creating further disruption for patients and services.[49] The proportion of junior doctors who took a break from training after completing their foundation years reached 65% in 2019, up from 16% in 2010.[50]

It has been observed that, if not well managed, many generation Y trainees do not stay; to them, long hours and working through tiredness are not rites of passage and they have less loyalty to their employers. Generation Z, who will start training soon, may interpret long hours as a sign that management does not value employees, is out of touch or has not understood basic sleep health, given that circadian physiology was not part of the curriculum 20 years ago.[51]

Notably, there has also been a substantial increase in the number of doctors opting for early retirement from the NHS, surpassing the previous count more than three-fold during 2007–21. Repeated surveys from the BMA have shown that >50% of doctors planned to retire before the age of 60, with the strain of working through the pandemic having left many exhausted, battling stress and burnout.[52] Being on call and doing SW may lead to the decision to retire, especially as older people are less likely to adapt to night-shift work, given that they typically have poorer quality sleep because of sleep fragmentation and waking frequently and early. This starts between the ages of 40 and 50, affecting a significant cohort of the current medical workforce.[53] Even relatively small periods of absence are associated with much higher leaving rates for consultants, nurses and midwives, particularly for absences related to mental health. Compared to those that have not had absences, an NHS consultant missing 3 days of work for mental health reasons is 58% more likely to leave 3 months later, and a nurse or midwife 27% more likely to leave.[54] Work–life balance was increasingly reported as a driving factor for nurses leaving, the second most common reason for leaving (after retirement), with >2.5 times as many citing it in 2018/19 than 2011/12, an additional 11,000 people.[55] Among the nurses, midwives and nursing associates leaving the professional register in 2022, physical and mental health was the second most cited main reason, with burnout or exhaustion coming third behind retirement.[56] Night shifts are also acknowledged as stressful and an important motivator for early retirement.[57]

The loss of experienced nurses places pressure on newly graduated nurses joining the workforce, adding to their feelings of fatigue.[58] Coupled with high levels of attrition due to COVID-19 and also natural attrition, these factors have driven nurses to work extended hours and additional shifts to meet the shortfalls in staffing.[59] A total of 59% of those who responded to a 2017 survey conducted by the Royal College of Nursing[60] stated they were not able to take sufficient breaks on their last shift. When surveyed in 2021,[61] 75% of nurses said they regularly work beyond their contracted hours at least once a week, with most of these hours being unpaid; and 17.4% reported doing so every shift or working day. What's more, 77.4% claimed having worked when they should have taken SA on at least one occasion over the previous 12 months. Of those who had worked when feeling unwell, 66.8% identified the reason as stress and 37.9% as mental health issues. Only 40% felt able to achieve a work–life balance, and 50% stated satisfaction with their working hours or the amount of choice they had over shift length or working hours. Meanwhile, 60.2% admitted to considering/planning to leave their job, with the main reasons being feeling undervalued and under too much pressure, and 59.6% declaring exhaustion. In the 2022 NHS Staff Survey,[62] >21% indicated that they often or always felt every working hour was tiring for them. In 2023 only 25% of the NHS workforce said there were enough staff to do their jobs properly, 33% reported feeling burnt out and around 33% often thought about leaving.[63] Among mental health problems explored in recent meta-analysis, staff sleep problems seemed to be the most prominent, second only to stress.[64] Significantly, in their evidence to Parliament,[65] the Royal College of Midwives also complained that most midwifery leaders in NHS Trusts have no access to the board, resulting in midwives often feeling unheard and Trust boards being unaware of their concerns.

3. Types of risk from fatigue

3.1 Operational (health and safety, clinical, patient safety and outcomes)

Fatigue is one of the top workplace safety risks today – and arguably one of the most modifiable. The extraordinary – but preventable – economic cost of fatigue-related incidents is increasingly recognised.[66] We now know that most adults need 7–8 hours of sleep, and poor sleep leads to errors, poor interpersonal interactions and worse customer service.[67] A large systematic review showed that, including increased workload and workflow interruption, the main reasons for medical errors are stress, fatigue and night shifts. Adverse events occur more frequently during less well-staffed shifts and when working hours exceed 12 hours/shift and 40 hours/week. Nurses working night shifts and rotating shifts struggle more to stay awake during their work activities and they are twice as likely to make errors, compared to nurses working day/evening shifts.[68] Nurses working 12-hour shift patterns may sleep, on average, only 5.5 hours between shifts.[69] In a 2021 study of night-shift-working nurses and midwives in England, the median sleep time between night shifts was 5 hours; 86% of participants reported getting ≤6 hours sleep; and the prevalence of sleepiness was 28%.[70]

In a study of military SWs, 62% were classed as poor sleepers.[71] And more than one in four may struggle with working at night because of 'shift work disorder'.[72] Work-related fatigue was reported by 91% of UK anaesthetists in 2018[5] and by 91.6% of anaesthetists in 2024, in 32 European countries.[73] Workers with sleep problems have 1.62 times higher risk of injury than workers without sleep problems; approximately 13% of work injuries could be attributed to sleep problems.[74] Sleep deprivation, putting night workers at up to three times higher risk for excessive sleepiness than day workers, is a particular concern in safety-sensitive environments,[75] as are increased errors and decreased performance.[76]

Sleep studies show that cumulative wakefulness >15.84 hours predicted performance lapses; chronic restriction of sleep to 6 hours or less per night produced performance deficits equivalent to up to 2 nights of total sleep deprivation. Also, subjects are largely unaware of increasing cognitive deficits, which may explain why the impact of chronic sleep restriction on cognitive function is often judged to be benign.[77] A loss of 2 hours' sleep produces measurable decrements in cognitive performance. Being awake for >24 hours (as can happen at the end of the first night shift) can reduce cognitive performance by >70% and clinical performance by >85%, with performance deteriorating with increasing task complexity.[78] After being awake for 17 hours, reaction times are equivalent to being at the limit of the drug/alcohol level for driving.[79] And outcomes are worse for patients operated on in the early hours.[80]

Risk is cumulative: it rises with each subsequent night shift, up to six-fold when comparing the fourth consecutive night with the first.[81] Age is also an important factor in determining resilience to fatigue. Although occupational injuries are less frequent in older workers, those that do occur tend to be more serious, and there is evidence from studies of objectively measured performance capabilities to suggest that older workers may be less able to maintain performance over the course of a night shift and to cope with longer spans of successive night shifts.[82] The age profile of NHS staff is relevant here, with 34% of doctors aged 45 and over, 25% of nurses aged 45–54, and 2% aged 65 and over.[83] Frequency, duration and intensity of work, individual clinical experience, level of supervision and support from the wider team also all influence fatigue-related risk.[15] We know that <3% of permanent night workers adapt completely to night shifts.[84]

In 2017, based on the most recent data in the field, the Risk Index was updated[85] to predict occupational injury risk across different work schedules. Areas of highest risk are:

- **when shift length exceeds 11 hours.** Injury risk increased substantially beyond the 9th hour on duty, and beyond 12 hours the injury risk increased by 34%;
- **when work takes place during the night,** particularly for more than three consecutive night shifts. Compared to morning shifts, the injury risk increased significantly on night shifts, by 36%;
- and **when rest breaks are not taken frequently enough** (<4 hours) or are too short (<30 minutes). Risk is reduced for any rest break duration.

Commuting, particularly home from the night shift, is another big issue. A worrying 57% of trainee and 45% of consultant anaesthetists described having accidents or near misses while driving tired.[5] Following a night shift, 49% of nurses reported nodding off at the wheel, and 44% reported narrowly avoiding a car accident in the past 12 months. An abnormal ESS score was significantly associated with near-miss car accidents.[70] And 20–25% of road traffic accidents are fatigue-related[86] and 24-hour SWs who have just come off shift have a 55-times greater risk of accident than someone who has just got up.[28] While until recently fatigue was omitted as a causative or contributing factor in the NHS national error reporting systems,[87] the Patient Safety Incident Response Framework (PSIRF)[88] now heralds a significant cultural shift. The HSSIB emphasised the importance of the psychological and physical aspects of staff safety within the NHS Patient Safety Strategy refreshed in 2023.[89]

3.2 Workforce (supply, performance and retention)

In the current workforce crisis, with the risk to patients increased by poor staff health and low morale, SA, early resignation and retirement,[90] it is clear to OH clinicians that poor sleep quality among NHS staff is associated with excess SA,[91] reduced workplace productivity[92] and burnout.[93] As with accidents, sleep and circadian disruption of internal physiological processes is likely to be the pathway to chronic health problems in SWs.[94] Night-shift workers experience shorter sleep durations (≤7 hours) than never-night-shift workers,[6, 94] a more adverse risk profile for chronic diseases[95] and higher risk of long-term SA.[96, 97] The strongest risk of sickness absence appears to be associated with highly irregular working hours, interrupted job contracts, and night and weekend shifts.[98] Shifts of >12 hours were significantly associated with a greater risk of vital nursing care being left undone,[4] and with increased SA for nurses,[99, 100] but not associated with reduced staffing hours/patient day and staffing costs.[101]

The problem of staff SA and underperformance becomes more complex when we note that, in addition to SWs experiencing work-related fatigue because of their disturbed circadian rhythms and sleep loss, overall people doing SW are less healthy than their colleagues working regular hours. Not only was the proportion of men and women in SW recorded highest in the most deprived versus least deprived socio-economic quintile, but SWs were also more likely than non-SWs to report fair or bad health, to have a limiting long-standing illness, to have more than one long-standing illness, to be obese (30% versus 23%), to smoke and to have diabetes[102] (https://www.bbc.co.uk/news/health-30449818). OH clinicians should be aware of growing new evidence that the stress imposed by sleep–wake disruption and living with unfavourable circadian phases is a possible risk factor for SWs, leading to derailment of body systems, physiological stress, and ultimately ill health[103, 104, 11] and mortality.[96] Circadian misalignment affects the risk of cancer and metabolic, cardiovascular and mental health issues by inducing sleep deficiency, sympathovagal and hormonal imbalance, inflammation, impaired glucose metabolism and dysregulated cell cycles.[105] Cell death with severe sleep restriction can be caused by oxidative stress, with the gut appearing central in

this process.[106]

Negative health outcomes linked to circadian misalignment and SW include: multiple forms of cancer,[107] gastrointestinal[108] and cardiovascular disease[109] (the risk of cardiovascular events increased by 7.1% for every 5 years of exposure), type 2 diabetes,[110, 111] metabolic syndrome,[112] obesity,[113] infection,[114] asthma,[115] immunity,[116] inflammation,[117] multiple sclerosis,[118] hyperalgesia,[119] migraine,[120] Alzheimer's disease,[121] alteration to gut microbiota,[122] menstrual irregularity,[123] endometriosis,[124] infertility,[125] miscarriage,[126] small elevations of risk for preterm birth, and indices of foetal growth retardation.[127]

From a mental health perspective, SWs experience more psychiatric disease and greater psychosocial distress, including depression, anxiety,[128,129] and alcohol problems.[130] SW also involves alteration in psychophysical homeostasis, is an obstacle for social and family relationships, and is a risk factor for stress.[131] While poor work–life balance accounted for almost three times as many NHS job leavers in 2021 as in 2011,[132] it is also one of the most powerful predictors of mental health problems in doctors,[133] doctors in training,[134] women with small children, and those lacking support, who are at particular risk.[135]The gender ratio of NHS staff is relevant here, because 88% of nurses and 47% of doctors are female.[83] And 45% women in SW have a long-standing illness versus 39% who work non-shift hours.[36] Also, 90% of 2,000 women doctors admitted that menopause-related fatigue and sleep symptoms impacted their working lives (only 16% discussed these problems with their manager).[136]

OH clinicians could conclude that fatigue mediated by the listed medical and psychosocial factors can be catalysed by work-related sleep loss, compounding functional impairment. Thus, SWs can face a 'double whammy'. Furthermore, an individual who is unable to sustain energy output, finding it difficult to maintain cognitive and physical performance, often needs OH clinicians' advice on work modifications, for example altered hours, more breaks, additional support, working from home, and modifications to PPE or work environment. These adjustments for a fatigued individual may cause asynchrony, frustration and reduced efficiency among the team. Overall, work outcomes are likely to include reduction in SWs' *morale, attendance and productivity, affecting recruitment and retention*.

3.3 Financial (legal, governance, regulatory and reputational)

OH clinicians are likely to be already aware that poor staff health and wellbeing is associated with worse quality of care, patient satisfaction and financial performance and increased staff absenteeism, turnover, 'intention to quit' and patient mortality.[40] Improving UK employee health and wellbeing could, on the other hand, benefit staff and patient care and have an impact of £130–£370 billion/year (£4,000–£12,000/employee) or 6–17% of GDP.[137] Over the 3 years up to 2021/22, expenditure on NHS bank and agency staff increased by 51% (from £3.45 to £5.2 billion) and 23% (£2.4 to £2.96 billion), respectively, reflecting some of the challenges of responding to the COVID-19 pandemic.[138] Around 16% of total temporary (bank and agency) nurse and midwife use (equating in 2020/21 to around £130 million) is to cover long-term sickness.[17] It was recently confirmed that, annually, the UK loses an equivalent of around 207,000 working days because of insufficient sleep, costing £40 billion, or 1.86% of GDP.[96] The increased risk of all-cause mortality relating to SW should also be factored in, as any fatality causes years of lost workplace contribution. Organisational costs will also include clinical negligence claims, the overall total estimated cost of which was £6,278 million[139] in 2022/23. The number of incidents reported by NHS staff per month roughly doubled between 2010 and 2020.[140] And the annual cost to the UK of fatigue-related accidents at work is £115–240 million.[26]

Medication administration errors (MAEs) cause preventable patient harm and cost billions of pounds in already strained healthcare budgets. In a scoping review 82% of studies identified fatigue as a contributing factor in MAEs and near misses.[9] The Care Quality Commission lists fatigue as a 'human factor' for consideration in medicine errors.[141] Noting 11,000 avoidable deaths/year due to patient safety failings, the Parliamentary and Health Service Ombudsman[142] warned in 2023 that: *'Complex systems need robust regulation and oversight to recognise good practice and identify poor systems. Patient safety will always be at risk*

in environments that are under-staffed and where staff are exhausted and under unsustainable pressure.'

Failure to address issues that contribute significantly to fatigue, for example understaffing, not providing legally mandated breaks and overscheduling workloads, or where it can be demonstrated that the working time arrangement contributed to the employee's health problems, indicates a potentially dysfunctional (patient) safety culture and exposes the NHS, an 'anchor organisation',[143] to significant legal liability and reputational damage in the event of fatigue-related errors/adverse events.[144, 145] Because the development of diseases in SWs may be irreversible, and the sequelae associated with fatigue are chronic in nature, prevention is critical.[146] Policies aimed at improving the mental and physical health of staff seem more likely to boost retention than other measures aimed at reducing health-related absences.[147] Solving the problem of insufficient sleep is a potential 'win–win' for individuals, employers and wider society.

4.1 Risk management

To improve organisational health, safety and equity, and in compliance with the Health and Safety at Work etc. Act 1974 and Management of Health and Safety at Work Regulations 1999, OH clinicians should advise employers, as recommended by the Health and Safety Executive (HSE),[148,26] to manage fatigue relating to SW like any other human factor hazard. Best practice is therefore for Trusts to *register fatigue as a risk on the Risk Management Framework and develop a Fatigue Risk Management Strategy* (and policy), containing an integrated programme of measures, to identify the risks associated with fatigue, to quantify

4. Interventions

the risk to staff and patients, and to create strategies to reduce risk.

While fatigue is to a certain extent unavoidable, it is still possible to reduce worker fatigue-related risk using mitigations other than changes to the working time arrangement and complying with the Working Time Regulations is not sufficient to control the risks. A systems approach, based on the principles of risk and safety management, should provide better risk mitigation. However, as Dawson and Thomas[15] warn, and OHPs are aware, solutions developed for other industries may not be suited to healthcare. Patients are not aeroplanes, and hospitals are not production lines.[149] Doctors cannot simply stop work like lorry drivers can, and sometimes, as Dawson[15] says, 'a tired doctor is better than no doctor'.

Instead of developing and evaluating comprehensive FRMS (as in other safety-critical industries), the healthcare sector has leaned towards discreet interventions to mitigate the psychological and physiological effects of shift work. In 2017 Waclawski and Noone[150,151] highlighted that such countermeasures are an inadequate response to HSE guidance[148] on managing fatigue in safety-critical industries, an incomplete application of the risk management and control paradigm, and have little practical effect. Waclawski and Noone recommended a review of the risk assessment and management control measures used by each employer. OH clinicians were encouraged to promote, facilitate and implement effective FRMS in safety-critical healthcare, to support health professionals, their employers and the communities in which they operate. OH clinicians should however note that hybrid strategies,[66] combining both prescriptive rule sets and risk-management-based approaches, can create the flexibility needed to reduce fatigue-related risk, based on the specific needs of different work environments, while maintaining appropriate regulatory oversight. The guidance by the Health, Safety and Wellbeing in Healthcare Partnership Group (HSWPG) on meeting legal standards,[152] backed by the HSE, includes SW.[153] And in 2023 The Royal College of Anaesthetists established standards for managing staff fatigue.[154] Following a unique collaboration and combined expertise from healthcare and other safety-critical industries, the Chartered Institute of Ergonomics and Human Factors recently developed a roadmap, enabling a systematic and system-based approach to fatigue risk management for all staff groups working within health- and social-care settings.[155]

4.2 Risk assessments

OH clinicians can anticipate risk assessments to be delegated to operational managers, supported by Trusts' health and safety advisers. HSWPG guidance[153] should be recommended and used in OH. Fatigue-related risk requires consideration of many factors, including shift patterns (frequencies/durations), type of work, workload intensity, level of supervision, team support and individual experience. Measuring and monitoring sleep, wakefulness and time of day is often a more effective way to quantify and control fatigue-related risk.[15]

4.3 Risk control

As advised by the Medical Protection Society[39], OH clinicians[156] should be involved in planning and supporting psychological safety, when policy around safe working hours is being re-evaluated, and fatigue management systems are being put in place.Adopting the preventative approach in the NHS Long Term Workforce Plan,[138] employers, collaborating with OH, safety representatives and employees, should

introduce interventions to reduce risk, by following HSWPG guidance[153] and:

- Prioritising sleep as a pillar of health, preventing excessive hours of work and sleep deprivation, scheduling work safely 24/7, factoring in healthy food and drink options, time, and places to rest and recover from work, particularly when working on call or overnight. Rotas should support limiting shift length, reducing frequency of overnight work, and protected time while off duty. A 15- or 20-minute nap can significantly improve alertness. Setting clear boundaries between work and personal life, disengaging mentally from work, and implementing compensatory strategies can reduce symptoms of burnout,[157] with control over shift patterns crucial to achieving recovery from fatigue.[158] A risk stratification process, to identify and target 'at-risk' workers based on rota patterns, overtime and reduced sleep opportunity, is suggested.[70] The Flexible Working (Amendment) Regulations 2023 (SI 2023/1328) and Employment Relations (Flexible Working) Act 2023 now give employees more ability to request flexible work schedules.
- Providing SWs – at induction and as part of Patient Safety Training[89] (now accessible by every NHS member) – with *sleep and circadian health education*. This should focus on the crosscutting theme of health equity, getting better sleep to achieve better brain[159, 160] and overall health[161] and recognising the signs of fatigue and strategies to manage fatigue.[162] Professionals are expected to use their off-duty time wisely, to maximise sleep. Policies should acknowledge that driving when fatigued has similar physiological legal consequences to driving when drunk.[79]
- *Managers using night-worker health assessments, sickness absence policies and wellbeing conversations to identify struggling workers and refer them to OH.*[163] This is particularly relevant for people with protected characteristics (for example, pregnant and menopausal women, older and disabled workers, time-limited medication users), and it should be in concordance with the Equality Act, ensuring that workers are kept safe and advised about adjustments. Employers should also enable screening for sleep disorders and SW-related medical conditions. When managing workers at risk from shiftwork, OH clinicians might find helpful guidance published in 2022 by the SOM.[163]

4.4 Risk review

Risk review could include considering fatigue as a possible contributory factor to patient safety incidents, when proportionately responding on the PSIRF.[88]

4.5 Useful guidance

See guidance published by Business in the Community,[67] the Association of Anaesthetists,[164] the HSSIB,[23] the Royal College of Nursing,[165, 166] the Royal College of Midwives,[167] the Royal College of Physicians,[168, 78] the Royal College of Surgeons,[169] the Paediatric Critical Care Society,[170, 171] the British Medical

5. Conclusions

Association,[172, 32] NHS Employers,[173] Queensland Health,[20] the Royal Society for Public Health,[31] the Chartered Institute of Ergonomics and Human Factors,[155] the HSE[174, 26, 148] and the TUC.[175]

Sleep loss and circadian dysregulation, particularly relating to shift work, have a devastating impact on health and safety, especially given the commercial and logistic implications, also on productivity and national economic performance. Occupational health physicians recognise that fatigue risk management could be considered the perfect example of a 'wicked problem'. In other words, it is part of a system of interrelated problems, where the solution is complex, multi-factorial and requires thoughtfulness, flexibility and time.[175] Work hours control both the duration and timing of wakefulness and the duration and timing of sleep, which affects the manifestation of mental fatigue, which in turn influences performance – including physical,[176] mental,[177] leadership,[178] team-based[179] and safety risks.[180] The complexity of dealing with fatigue by changing working-time arrangements alone can lead to feelings of impotence and an understandable preference to ignore or overlook the problem rather than dealing with it.[15] 'Wicked problems' (such as fatigue) nonetheless should be continually addressed because of their importance.[181]

Lessons can be learned from recent NHS risk management of COVID-19, when prevention measures were not taken at the onset. As a result, compound exponential effects from the disease set in, requiring expensive reactive measures.[182] Employers need to understand that, because of the lack of preventative measures for fatigue, ill health in the population of SWs is similarly becoming embedded, with enormous budgetary implications further down the road. Professor Agius[182] reminds OH clinicians that objective determination of risk should stand on its own merits as a first step in worker protection, before addressing control measures. Also, the primary aim of OH is protection of workers' health.

NHS employers[173] acknowledge that its 1.48 million employees are the NHS' greatest asset. As evidenced above, the consensus from professional/medicolegal bodies is that a move towards prevention is needed, with more emphasis placed on improving underlying working conditions that impact the wellbeing of clinicians and patient safety. Billy Palmer, Nuffield Trust Senior Fellow, said[183] that although there's been a lot of focus on recruitment, "*we need more endeavour to improve the working conditions of existing staff and protect them from illness*". The Nuffield Trust is calling for '*concrete support*' to enable employers to improve the NHS staff experience and to '*break the cycle of staff absences, sickness, and leaving rates*'.

Given the continued need for out-of-hours work and the fatigue that is likely to increase in the current NHS crisis, applying evidence-based, just and effective patient safety principles is more important than ever.[184] OHPs opine that the dangerous combination of serious injury and even potential death, as well as ill health, we now know to be associated with sleep loss and circadian dysregulation in workers, justifies a robust response.

Employers need to acknowledge the reality: sleep is essential to health, and the only remedy for sleep deprivation is sleep. The adverse effect of shift work is mainly due to acute sleep loss, arising from loss of sleep opportunity because of long shifts and circadian rhythm disruption.[94] Improvement to NHS workforce productivity and safety is likely to result from all the workforce taking fatigue seriously, and reassertion of OH principles, while addressing operational needs. Legal obligations need to be translated

into organisational practices, by employing a well-trained, healthy and supported workforce, and by OH clinicians understanding the associated risks of fatigue, and acting to mitigate these risks, advising practices that prevent or reduce ill-health-related job loss and avoid accidents at work or between work and home.

Collaborative work should be undertaken, to act boldly, especially as fatigue is now part of the patient safety agenda.[22] Dots need to be joined with other data,e.g. a health economic analysis around the cost of fatigue and cost effectiveness of FRMS. Further research should be funded, not only into the health impacts of night work and ways to mitigate, but also into a portfolio of biomathematical models that are validated by targeted scientific studies to identify levels of fatigue risk. Addressing the risks arising from fatigue and filling the void of collective action is likely to be the most equitable approach to achieving sustainable change in the NHS, delivering savings and efficiency.

The interventions suggested above are in line with the current NHS focus on 'systems solutions' to both safety and equity, and they avoid creating the paradox of informing staff about errors while offering no solution to the existing risk.[184] As the HSSIB suggested, 'Safety science had established that patient safety would gain more by looking at organisational resilience than staff resilience'.[39] And: 'The question would appear not whether healthcare should start to manage fatigue as a risk but how strategically to develop pragmatic operational fatigue management systems for the many different types of work and workforce'.[23] Prevention is not only better – and cheaper – than cure[185] but also concordant with the NHS net zero policy.[186] Finally, fatigue in the workforce is now centre stage[175] and health improvement and action on health inequalities are embedded in the Health and Care Act's 'triple duty'.[187]

Main document: references

1. OHS Body of Knowledge (April 2012). Psychosocial Hazards: Fatigue. https://www.ohsbok.org.au/wp-content/uploads/2019/07/20-Fatigue-2012.pdf
2. The British Medical Association. Fatigue and sleep deprivation. https://www.bma.org.uk/advice-and-support/nhs-delivery-and-workforce/creating-a-healthy-workplace/fatigue-and-sleep-deprivation
3. Sallinen M, Kecklund G (Mar 2010). Shift work, sleep, and sleepiness—differences between shift schedules and systems. Scandinavian Journal of Work, Environment & Health, 1:121–133.
4. Ball J, Maben J, Murrells T, Day T, Griffiths P (2014). 12-hour shifts: prevalence, views and impact. National Nursing Research Unit. King's College London. https://www.england.nhs.uk/6cs/wp-content/uploads/sites/25/2015/06/12-hour-shifts-report.pdf
5. McClelland L, Plunkett E, McCrossan R, Ferguson K, Fraser J, Gildersleve C, Holland J, Lomas JP, Redfern N, Pandit JJ (Dec 2019). A national survey of out-of-hours working and fatigue in consultants in anaesthesia and paediatric intensive care in the UK and Ireland. Anaesthesia, 74(12):1509–1523.
6. Ganesan S, Magee M, Stone J, et al. (2019). The impact of shift work on sleep, alertness and performance in healthcare workers. Scientific Reports, 9:4635.
7. Querstret D, O'Brien K, Skene DJ, Maben J (2020). Improving fatigue risk management in healthcare: a systematic scoping review of sleep-related/fatigue-management interventions for nurses and midwives. International Journal of Nursing Studies, 106:103513
8. Wagstaff AS, Sigstad Lie JA (2011). Shift and night work and long working hours – a systematic review of safety implications. Scandinavian Journal of Work, Environment & Health, 37(3): 173–185.
9. Bell T, Sprajcer M, Flenady T, Sahay A (Sept 2023). Fatigue in nurses and medication administration errors: A scoping review. Journal of Clinical Nursing, 32(17–18):5445–5460.
10. Rajaratnam SM, Howard ME, Grunstein RR (Oct 2013). Sleep loss and circadian disruption in shift work: health burden and management. Medical Journal of Australia, 199: S11-5.
11. Rivera AS, Akanbi M, O'Dwyer LC, McHugh M (2020). Shift work and long work hours and their association with chronic health conditions: A systematic review of systematic reviews with meta-analyses. PLOS ONE, 15(4):e0231037
12. Persson E, Barrafrem K, Meunier A, Tinghög G (Oct 2019). The effect of decision fatigue on surgeons' clinical decision making. Health Economics, 28(10):1194–1203. DOI: 10.1002/hec.3933. Epub 2019 Jul 25. PMID: 31344303; PMCID: PMC6851887.
13. Greig P, Snow R (2017). Fatigue and risk: are train drivers safer than doctors? BMJ, 359:j5107.
14. West M, Coia D (2019). General Medical Council. Caring for doctors, caring for patients. https://www.gmc-uk.org/-/media/documents/caring-for-doctors-caring-for-patients_pdf-80706341.pdf
15. Dawson D, Thomas MJW (2019). Fatigue management in healthcare: it is a risky business. Anaesthesia, 74:1493–1496.
16. Long Covid and Return to Work – What Works? A position paper from the Society of Occupational Medicine. August 2022: https://www.som.org.uk/sites/som.org.uk/files/Long_COVID_and_Return_to_Work_What_Works.pdf
17. Palmer W, Rolewicz L (2023). All is not well: Sickness absence in the NHS in England. Briefing, Nuffield Trust. https://www.nuffieldtrust.org.uk/resource/all-is-not-well-sickness-absence-in-the-nhs-in-england
18. Åkerstedt T (Dec 2006). Psychosocial stress and impaired sleep. Scandinavian Journal of Work, Environment & Health, 1:493–501.
19. World Health Organization (21 Feb 2022). Occupational hazards in the healthcare sector. Psychosocial risks and mental health. https://www.who.int/tools/occupational-hazards-in-health-sector/psycho-social-risks-mental-health
20. Queensland Health (2021). Fatigue risk management systems. http://www.health.qld.gov.au/__data/assets/ pdf_file/0033/1137975/qh-gdl-401-3.3.PDF
21. Farquhar M (Nov 2017). Are aviation industry fatigue risk management strategies needed in healthcare? A reply. Anaesthesia, 72(11):1419–1420.
22. The Health Services Safety Investigations Body (HSSIB) (26 March 2024). Launch report: Fatigue risk in healthcare and its impact on patient safety. https://www.hssib.org.uk/patient-safety-investigations/safety-management-systems/#the-investigation
23. The Health Services Safety Investigations Body (HSSIB) (March 2023). Starting the conversation around NHS staff fatigue and patient safety. https://www.hssib.org.uk/news-events-blog/starting-the-conversation-around-nhs-staff-fatigue-and-patient-safety/
24. National Institute for Health and Care Research (1 Oct 2021). Fighting fatigue in the NHS ambulance workforce: development, acceptability and feasibility testing of a comprehensive fatigue risk management system to improve staff and patient safety. Study funded by the National Institute for Health and Care Research.

25. The Health Foundation (2019). Innovating for Improvement. Improving management of staff fatigue during night shift: A collaborative whole team project. Newcastle upon Tyne NHS Foundation Trust. https://www.health.org.uk/improving-management-of-staff-fatigue-during-night-shift-a-collaborative-whole-team-project

26. Health and Safety Executive (2021). Human factors: Fatigue. https://www.hse.gov.uk/humanfactors/topics/fatigue.htm

27. The Health Services Safety Investigations Body (HSSIB) (2023). Safety management systems, an introduction for healthcare. https://www.hssib.org.uk/patient-safety-investigations/safety-management-systems/#the-investigation

28. The Society of Occupational Medicine (Nov 2019). SOM roundtable: Sleep and the workplace. https://www.som.org.uk/som-roundtable-sleep-and-workplace

29. POSTNOTE 586 (Sep 2018). Shift Work, Sleep and Health. https://researchbriefings.files.parliament.uk/documents/POST-PN-0586/POST-PN-0586.pdf

30. Trades Union Congress. A Hard Day's Night (Aug 2015). https://www.tuc.org.uk/sites/default/files/AHardDaysNight.pdf

31. Royal Society for Public Health (15 June 2016). Waking up to the health benefits of sleep. https://www.rsph.org.uk/static/uploaded/a565b58a-67d1-4491-ab9112ca414f7ee4.pdf

32. British Medical Association (2018). Fatigue and facilities charter. https://www.bma.org.uk/media/1076/bma-fatigue-and-facilities-charter_july2018.pdf

33. The Joint Commission (May 2018). Sentinel Event Alert 48: Health care worker fatigue and patient safety. Addendum. https://www.jointcommission.org/resources/sentinel-event/sentinel-event-alert-newsletters/sentinel-event-alert-issue-48-health-care-worker-fatigue-and-patient-safety/

34. Gurubhagavatula I, Barger LK, Barnes CM, et al. (Nov 2021). Guiding principles for determining work shift duration and addressing the effects of work shift duration on performance, safety, and health: guidance from the American Academy of Sleep Medicine and the Sleep Research Society. Journal of Clinical Sleep Medicine, 1;17(11):2283–2306.

35. General Medical Council (2023). The state of medical education and practice in the UK. https://www.gmc-uk.org/-/media/documents/somep-workplace-experiences-2023-full-report_pdf-101653283.pdf

36. NHS Employers. NHS Staff Council. Health Safety and Well-Being Group (Oct 2023). Shift work in healthcare. https://www.nhsemployers.org/system/files/2023-10/Shiftwork_inforgraphic_Oct_2023.pdf

37. Department of Health and Social Care (2022–23). Annual Report and Accounts 2022–23. https://www.gov.uk/government/publications/dhsc-annual-report-and-accounts-2022-to-2023

38. NHS Long Term Plan 2019 (2019). https://www.longtermplan.nhs.uk/publication/nhs-long-term-plan/

39. House of Commons Library (8 June 2021). Workforce burnout and resilience in the NHS and social care. https://publications.parliament.uk/pa/cm5802/cmselect/cmhealth/22/2202.htm

40. Written evidence submitted by The King's Fund (WBR0017) (Sept 2020). https://committees.parliament.uk/writtenevidence/10944/pdf/

41. Bakker AB, Heuven E (Nov 2006). Emotional dissonance, burnout, and in-role performance among nurses and police officers. International Journal of Stress Management, 13(4):423.

42. World Health Organization (2019). Burn-out an 'occupational phenomenon': International Classification of Disease. https://www.who.int/news/item/28-05-2019-burn-out-an-occupational-phenomenon-international-classification-of-diseases

43. Hall L, Johnson J, Watt I, O'Connor D (2019). Association of GP wellbeing and burnout with patient safety in UK primary care: a cross-sectional survey. British Journal of General Practice, 69(684):e507–e514.

44. General Medical Council (2022). National training survey 2022. https://www.gmc-uk.org/-/media/documents/national-training-survey-summary-report-2022-final_pdf-91826501.pdf

45. Medical Defence Union (2022). Sleep deprived doctors concerned about patient safety. https://www. themdu.com/press-centre/press-releases/sleep-deprived-doctors-concerned-about-patient-safety

46. Wall TD, Bolden RI, Borrill CS, et al. (1997). Minor psychiatric disorder in NHS trust staff: Occupational and gender differences. British Journal of Psychiatry, 171(6):519–523.

47. Scott HR, Stevelink SAM, Gafoor R, et al. (2023). Prevalence of post-traumatic stress disorder and common mental disorders in health-care workers in England during the COVID-19 pandemic: a two-phase cross-sectional study. The Lancet Psychiatry, 10(1):40–49.

48. Academy of Medical Royal Colleges (Feb 2024). Six simple ways to retain doctors in training in the health service. The ATDC REFORM principles. https://www.aomrc.org.uk/wpcontent/uploads/2024/02/ATDC_reform_010224.pdf

49. Palmer W, Rolewicz L (2022). The long goodbye? Exploring rates of staff leaving the NHS and social care. Nuffield Trust explainer. https://www.nuffieldtrust.org.uk/resource/the-long-goodbye-exploring-rates-of-staff-leaving-the-nhs-and-social-care

50. Lok P (2022). Planning has to adjust to doctors taking a break after foundation years, says review. BMJ, 376:o396.

51. Redfern N, Bilotta F, Abramovich I, Grigoras I (1 Feb 2023). Fatigue in anaesthesiology: Call for a change of culture and regulations. European Journal of Anaesthesiology, 40(2):78–81.

52. Moberly T (2021). Doctors' early retirement has trebled since 2008. BMJ, 373:n1594.

53. British Medical Association (19 Mar 2021). The danger of sleep deprivation. https://www.bma.org.uk/news-and-opinion/thedangerofsleepdeprivation#:~:text=In%202018%20the%20BMA%20released,and%20more%20on%2Dcall%20rooms

54. The Institute for Fiscal Studies (Aug 2022). https://ifs.org.uk/sites/default/files/2022-08/IFS-R216-Factors-associated-with-staff-retention-in-the-NHS-acute-sector_0.pdf

55. The Nuffield Trust (30 Sept 2022). Peak leaving? A spotlight on nurse leaver rates in the UK.

56. Nursing and Midwifery Council (2023). 2023 NMC Register Leavers Survey. https://www.nmc.org.uk/globalassets/sitedocuments/data-reports/may-2023/annual-data-report-leavers-survey-2023.pdf

57. Gregory P, Edsell M (Feb 2024). Fatigue and the anaesthetist. Continuing Education in Anaesthesia, Critical Care & Pain, 1;14(1):18–22.

58. Raso R, Fitzpatrick JJ, Masick K, Giordano-Mulligan M, Sweeney CD (May 2021). Perceptions of authentic nurse leadership and work environment and the pandemic impact for nurse leaders and clinical nurses. JONA: The Journal of Nursing Administration, 1;51(5):257–263.

59. International Council of Nurses (2021). The global nursing shortage and nurse retention. https://www.icn.ch/sites/default/files/inline-files/ICN%20Policy%20Brief_Nurse%20Shortage%20and%20Retention_0.pdf

60. Royal College of Nursing (29 Sept 2017). Safe and Effective Staffing: Nursing Against the Odds. https://www.rcn.org.uk/professional-development/publications/pub-006415

61. Royal College of Nursing (30 Dec 2021). RCN Employment Survey 2021, 5–6.

62. NHS Employers (2022). NHS Staff Survey 2022: analysis of the results. https://www.nhsemployers.org/articles/nhs-staff-survey-2022-analysis-results

63. The Health Foundation (9 March 2023). NHS staff burnout highlights desperate need for workforce plan to focus on retention and wellbeing. https://www.health.org.uk/news-and-comment/news/nhs-staff-burnout-highlights-desperate-need-for-workforce-plan-to-focus-on-retention-and-wellbeing

64. Zhu H, Yang X, Xie S, et al. (2023). Prevalence of burnout and mental health problems among medical staff during the COVID-19 pandemic: a systematic review and meta-analysis. BMJ Open, 13:e061945.

65. UK Parliament discussion (8 June 2021). The scale of and impact of workforce burnout in the NHS and social care. https://publications.parliament.uk/pa/cm5802/cmselect/cmhealth/22/2205.htm

66. Honn KA, et al. (2019). Working time society consensus statements: prescriptive rule sets and risk management-based approaches for the management of fatigue-related risk in working time arrangements. Industrial Health,57(2):264–280.

67. Business in the Community (Jan 2018). Sleep and recovery: a toolkit for employers. https://www.bitc.org.uk/wp-content/uploads/2019/10/bitc-wellbeing-toolkit-sleeprecovery-jan2018.pdf

68. Di Muzio M, Dionisi S, Di Simone E, et al. (May 2019). Can nurses' shift work jeopardize the patient safety? A systematic review. European Review for Medical and Pharmacological Sciences, 23(10):4507–4519.

69. Geiger-Brown J, Rogers VE, Trinkoff AM, Kane RL, Bausell RB, Scharf SM (Mar 2012). Sleep, sleepiness, fatigue, and performance of 12-hour-shift nurses. Chronobiology International, 1;29(2):211–219.

70. Westwell A, Cocco P, Van Tongeren M, Murphy E (Dec 2021). Sleepiness and safety at work among night shift NHS nurses. Occupational Medicine (Lond), 24;71(9):439–445.

71. Shattuck NL, Matsangas P (28 April 2017). Work and sleep patterns in military shift workers: promoting health and wellness through informed shift schedules. Sleep, 40(1):A63–A64.

72. Pallesen S, Bjorvatn B, Waage S, Harris A, Sagoe D (Mar 2021). Prevalence of Shift Work Disorder: A Systematic Review and Meta-Analysis. Frontiers in Psychology, 23;12:638252.

73. Camilleri Podesta C AM, Redfern N, Abramovich I, et al. (Jan 2024). Fatigue among anaesthesiologists in Europe: Findings from a joint EBA/NASC survey. European Journal of Anaesthesiology, 41(1):24–33.

74. Uehli K, Mehta AJ, Miedinger D, et al. (Feb 2014). Sleep problems and work injuries: a systematic review and meta-analysis. Sleep Medicine Reviews, 18(1):61–73.

75. Ohayon MM, Smolensky MH, Roth T (2010). Consequences of shiftworking on sleep duration, sleepiness, and sleep attacks. Chronobiology International, 27(3):575–589.

76. de Cordova PB, Bradford MA, Stone PW (2016). Increased errors and decreased performance at night: A systematic review of the evidence concerning shift work and quality. Work, 53:825–834.

77. Van Dongen HP, Maislin G, Mullington JM, Dinges DF (Mar 2003). The cumulative cost of additional wakefulness: dose-response effects on neurobehavioral functions and sleep physiology from chronic sleep restriction and total sleep deprivation. Sleep, 15;26(2):117–126.

78. Royal College of Physicians (Oct 2015). Sleep fatigue. Ways to manage fatigue and ensure excellent patient care around the clock. Commentary. Membership magazine of the Royal College of Physicians, 5:12–14. https://www.som.org.uk/sites/som.org.uk/files/RCP_Commentary_Article_plus_Cover_10.15.pdf

79. Dawson D, Reid K (Jul 1997). Fatigue, alcohol, and performance impairment. Nature, 17;388(6639):235.

80. Cortegiani A, Ippolito M, Misseri G, et al. (May 2020). Association between night/after-hours surgery and mortality: a systematic review and meta-analysis. British Journal of Anaesthesia, 1;124(5):623–637.

81. Folkard S, Lombardi DA, Tucker PT (Jan 2005). Shiftwork: safety, sleepiness and sleep. Industrial Health, 43(1):20–23.

82. Folkard S (Jan 2008). Shift work, safety, and aging. Chronobiology International, 1;25(2–3):183–198.

83. Commons Library Research Briefing (29 Feb 2024). The NHS workforce in England. https://researchbriefings.files.parliament.uk/documents/CBP-9731/CBP-9731.pdf

84. Folkard S (2008). Do Permanent Night Workers Show Circadian Adjustment? A Review Based on the Endogenous Melatonin Rhythm. Chronobiology International, 25(2–3):215–224.

85. Fischer D, Lombardi DA, Folkard S, et al. (2017). Updating the 'Risk Index': A systematic review and meta-analysis of occupational injuries and work schedule characteristics. Chronobiology International, 34(10):1423–1438.

86. The Royal Society for the Prevention of Accidents (July 2020). Driver Fatigue and Road Accidents Factsheet. https://www.rospa.com/media/documents/road-safety/driver-fatigue-factsheet.pdf

87. Sutherland C, Smallwood A, Wootten T, Redfern N (2023). Fatigue and its impact on performance and health. British Journal of Hospital Medicine,84(2):1–8.

88. NHS England (16 Aug 2022). The Patient Safety Incident Response Framework (PSIRF). https://www.england.nhs.uk/publication/patient-safety-incident-response-framework-and-supporting-guidance/

89. NHS England (2023). The NHS Patient Safety Strategy. https://www.england.nhs.uk/patient-safety/the-nhs-patient-safety-strategy/

90. The Care Quality Commission (20 Oct 2023). The health and care workforce. https://www.cqc.org.uk/publications/major-report/state-care/2022-2023/workforce

91. Lallukka T, Kaikkonen R, Härkänen T, Kronholm E, Partonen T, Rahkonen O, Koskinen S (Sep 2014). Sleep and sickness absence: a nationally representative register-based follow-up study. Sleep, 1;37(9):1413–1425.

92. Kucharczyk ER, Morgan K, Hall AP (2012). The occupational impact of sleep quality and insomnia symptoms. Sleep Medicine Reviews, 16:547–559.

93. Kancherla BS, Upender R, Collen JF, et al. (May 2020). What is the role of sleep in physician burnout? Journal of Clinical Sleep Medicine, 15;16(5):807–810.

94. Kecklund G, Axelsson J (Nov 2016). Health consequences of shift work and insufficient sleep. BMJ, 1;355: i5210.

95. Ramin C, Devore EE, Wang W, Pierre-Paul J, Wegrzyn LR, Schernhammer ES (Feb 2015). Night shift work at specific age ranges and chronic disease risk factors. Occupational and Environmental Medicine, 1;72(2):100–107.

96. Hafner M, Stepanek M, Taylor J, Troxel WM, van Stolk C (Jan 2017). Why Sleep Matters – The Economic Costs of Insufficient Sleep: A Cross-Country Comparative Analysis. RAND Health Quarterly, 1;6(4):11. PMID: 28983434; PMCID: PMC5627640.

97. Larsen AD, Ropponen A, Hansen J, Hansen ÅM, Kolstad HA, Koskinen A, Härmä MI, Garde AH (Dec 2020). Working time characteristics and long-term sickness absence among Danish and Finnish nurses: A register-based study. International Journal of Nursing Studies, 1;112:103639.

98. Rosenström T, Härmä M, Kivimäki M, Ervasti J, Virtanen M, Hakola T, Koskinen A, Ropponen A (Jul 2021). Patterns of working hour characteristics and risk of sickness absence among shift-working hospital employees: a data-mining cohort study. Scandinavian Journal of Work, Environment & Health, 1;47(5):395–403.

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

100. Santana IR, Montes MA, Chalkley M, Jacobs R, Kowalski T, Suter J (Dec 2020). The impact of extending nurse working hours on staff sickness absence: Evidence from a large mental health hospital in England. International Journal of Nursing Studies, 1;112:103611.

101. Griffiths P, Dall'Ora C, Sinden N, Jones J (Apr 2019). Association between 12-hr shifts and nursing resource use in an acute hospital: Longitudinal study. Journal of Nursing Management, 27(3):502–508.

102. The Health Survey of England (2013). Chapter 6. Shift Work. https://files.digital.nhs.uk/publicationimport/pub16xxx/pub16076/hse2013-ch6-sft-wrk.pdf

103. Sletten TL, Cappuccio FP, Davidson AJ, Van Cauter E, Rajaratnam SMW, Scheer FAJL (Jan 2020). Health consequences of circadian disruption. Sleep, 13;43(1):zsz194.

104. Boivin DB, Boudreau P, Kosmadopoulos A (2022). Disturbance of the Circadian System in Shift Work and its Health Impact. Journal of Biological Rhythms, 37(1):3–28.

105. James SM, Honn KA, Gaddameedhi S, Van Dongen HPA (Jun 2017). Shift Work: Disrupted Circadian Rhythms and Sleep-Implications for Health and Well-Being. Current Sleep Medicine Reports, 3(2):104–112.

106. Vaccaro A, Dor YK, Nambara K, et al. (2020). Sleep Loss Can Cause Death through Accumulation of Reactive Oxygen Species in the Gut. Cell, 181(6):1307–1328. https://www.sciencedirect.com/science/article/pii/S0092867420305559

107. International Agency for Research on Cancer (2 June 2020). IARC Monographs working group, Lyon, France, IARC Monographs on the evaluation of carcinogenic risks to humans: night shift work. IARC Monographs, 124. https://www.iarc.who.int/news-events/iarc-monographs-volume-124-night-shift-work/

108. Bishehsari F, Levi F, Turek FW, Keshavarzian A (Sep 2016). Circadian Rhythms in Gastrointestinal Health and Diseases. Gastroenterology, 151(3):e1–5.

109. Torquati L, Mielke GI, Brown WJ, Kolbe-Alexander T (May 2018). Shift work and the risk of cardiovascular disease. A systematic review and meta-analysis including dose-response relationship. Scandinavian Journal of Work, Environment & Health, 1;44(3):229–238.

110. Mason IC, Qian J, Adler GK, Scheer FAJL (Mar 2020). Impact of circadian disruption on glucose metabolism: implications for type 2 diabetes. Diabetologia, 63(3):462–472.

111. Vetter C, Dashti HS, Lane JM, et al. (Apr 2018). Night Shift Work, Genetic Risk, and Type 2 Diabetes in the UK Biobank. Diabetes Care, 41(4):762–769.

112. Wang F, Zhang L, Zhang Y, Zhang BA, He Y, Xie S, Li M, Miao X, Chan EY, Tang JL, Wong MC (Sep 2014). Meta-analysis on night shift work and risk of metabolic syndrome. Obesity Reviews, 15(9):709–720.

113. Sun M, Feng W, Wang F, et al. (2018). Meta-analysis on shift work and risks of specific obesity types. Obesity Reviews, 19:28–40.

114. Irwin MR (Nov 2019). Sleep and inflammation: partners in sickness and in health. Nature Reviews Immunology, 19(11):702–715.

115. Maidstone RJ, Turner J, Vetter C, et al. (Jan 2021). Night shift work is associated with an increased risk of asthma. Thorax, 76(1):53–60.

116. Boudreau P, Dubeau-Laramée G, Cermakian N, Boivin DB (Mar 2016). Simulated Night Shift Disrupts Circadian Rhythms of Immune Functions in Humans. The Journal of Immunology, 15;196(6):2466–2475.

117. Irwin MR, Olmstead R, Carroll JE (Jul 2016). Sleep Disturbance, Sleep Duration, and Inflammation: A Systematic Review and Meta-Analysis of Cohort Studies and Experimental Sleep Deprivation. Biological Psychiatry, 1;80(1):40–52.

118. Hedström AK, Åkerstedt T, Olsson T, Alfredsson L (Aug 2015). Shift work influences multiple sclerosis risk. Multiple Sclerosis Journal, 21(9):1195–1199.

119. Davies KA, Macfarlane GJ, Nicholl BI, Dickens C, Morriss R, Ray D (2008). Restorative sleep predicts the resolution of chronic widespread pain: results from the EPIFUND study. Rheumatology (Oxford), 47:1809–1813.

120. Fernández-de-las-Peñas C, Fernández-Muñoz JJ, Palacios-Ceña M, et al. (2018). Sleep disturbances in tension-type headache and migraine. Therapeutic Advances in Neurological Disorders, 11.

121. Chen SJ, Deng YT, Li YZ et al. (2022). Association of circadian rhythms with brain disorder incidents: a prospective cohort study of 72242 participants. Translational Psychiatry, 12:514.

122. Lopez-Santamarina A, Mondragon ADC, Cardelle-Cobas A, et al. (Jul 2023). Effects of Unconventional Work and Shift Work on the Human Gut Microbiota and the Potential of Probiotics to Restore Dysbiosis. Nutrients, 7;15(13):3070

123. Lawson CC, Johnson CY, Chavarro JE, et al. (2015). Work schedule and physically demanding work in relation to menstrual function: the nurses' health study 3. Scandinavian Journal of Work, Environment & Health, 41:194–203.

124. Marino JL, Holt VL, Chen C, Davis S (2008). Shift work, hCLOCK T3111C polymorphism, and endometriosis risk. Epidemiology, 19:477–484.

125. Stocker LJ, Macklon NS, Cheong YC, Bewley SJ (2014). Influence of shift work on early reproductive outcomes: a systematic review and meta-analysis. Obstetrics & Gynecology, 124:99–110.

126. Begtrup LM, Specht IO, et al. (2019). Night work and miscarriage: a Danish nationwide register-based cohort study. Occupational and Environmental Medicine. 76:302–308.

127. Bonzini M, Palmer KT, Coggon D, et al. (2011). Shift work and pregnancy outcomes: a systematic review with meta-analysis of currently available epidemiological studies. BJOG, 118:1429–1437.

128. Torquati L, Mielke GI, Brown WJ, Burton NW, Kolbe-Alexander TL (Nov 2019). Shift Work and Poor Mental Health: A Meta-Analysis of Longitudinal Studies. American Journal of Public Health, 109(11):e13–e20.

129. Zhao Y, Richardson A, Poyser C, Butterworth P, Strazdins L, Leach LS (Aug 2019). Shift work and mental health: a systematic review and meta-analysis. International Archives of Occupational and Environmental Health, 1;92:763–793.

130. Richter K, Peter L, Rodenbeck A, Weess H, G, Riedel-Heller S, G, Hillemacher T (2021). Shiftwork and Alcohol Consumption: A Systematic Review of the Literature. European Addiction Research, 27:9–15.

131. Rosa D, Terzoni S, Dellafiore F, Destrebecq A (Jun 2019). Systematic review of shift work and nurses' health. Occupational Medicine (Lond), 24;69(4):237–243.

132. Ocean N, Meyer C (2023). Satisfaction and attrition in the UK healthcare sector over the past decade. PLOS ONE, 18(4):e0284516.

133. Society of Occupational Medicine (Sep 2018). What could make a difference to the mental health of UK doctors? https://www.som.org.uk/sites/som.org.uk/files/What_could_make_a_difference_to_the_mental_health_of_UK_doctors_LTF_SOM.pdf

134. Swinkels S. Trainee fatigue – time for a culture change? (Dec 2017). Anaesthesia, 72(12):1562–1563.

135. Rich A, Viney R, Needleman S, Griffin A, Woolf K (Dec 2016). 'You can't be a person and a doctor': the work–life balance of doctors in training—a qualitative study. BMJ Open, 1;6(12):e013897.

136. British Medical Association (2019). Challenging the culture on menopause for working doctors. https://www.bma.org.uk/media/2913/bma-challenging-the-culture-on-menopause-for-working-doctors-report-aug-2020.pdf

137. Business in the Community (24 April 2023). Prioritise People: unlock the value of a thriving workforce. https://www.bitc.org.uk/report/prioritise-people-unlock-the-value-of-a-thriving-workforce/

138. NHS England (June 2023). NHS Long Term Workforce Plan. https://www.england.nhs.uk/wp-content/uploads/2023/06/nhs-long-term-workforce-plan.pdf

139. NHS Resolution (2022/23). Annual report and accounts 2022/23. https://resolution.nhs.uk/wp-content/uploads/2023/07/NHS-Resolution-Annual-report-and-accounts-2022_23-3.pdf

140. Institute Of Global Health Innovation (2022). National State of Patient Safety. https://www.imperial.ac.uk/media/imperial-college/institute-of-global-health-innovation/National-State-of-Patient-Safety-2022.pdf

141. Care Quality Commission (2 Nov 2022). Reporting medicine related incidents. https://www.cqc.org.uk/guidanceproviders/adult-social-care/reporting-medicine-related-incidents

142. Parliamentary and Health Service Ombudsman (29 June 2023). Broken trust: making patient safety more than just a promise. https://www.ombudsman.org.uk/sites/default/files/broken-trust-making-patient-safety-more-than-just-a-promise.pdf

143. NHS Providers (Feb 2023). Being an anchor institution. https://nhsproviders.org/being-an-anchor-institution/widening-access-to-good-employment

144. Potter RE, O'Keeffe V, Leka S, Dollard M (Jul 2019). Australian work health and safety policy for the regulation of psychosocial risks: perspectives from key informants. Policy and Practice in Health and Safety, 3;17(2):112–132.

145. Lerouge L (ed.) (24 Aug 2017). Psychosocial risks in labour and social security law: A comparative legal overview from Europe, North America, Australia, and Japan. Springer.

146. Ray D (7 July 2020). Addressing the health impacts of night shift work. https://blog.policy.manchester.ac.uk/posts/2020/07/addressing-the-health-impacts-of-night-shift-work/

147. The Institute for Fiscal Studies (Aug 2022). Factors associated with staff retention in the NHS acute sector. https://ifs.org.uk/sites/default/files/2022-08/IFS-R216-Factors-associated-with-staff-retention-in-the-NHS-acute-sector_0.pdf

148. The Health and Safety Executive (2006). Managing Shift Work: Health and Safety Guidance.HSG256. https://www.hse.gov.uk/pubns/priced/hsg256.pdf

149. Macrae C, Stewart K (2019). Can we import improvements from industry to healthcare? BMJ, 364.

150. Waclawski E, Noone P (Nov 2017). Are aviation industry fatigue risk management strategies needed in healthcare? Anaesthesia, 72(11):1417–1419.

151. Noone P, Waclawski E (Nov 2018). Fatigue risk management systems needed in healthcare. Occupational Medicine, 68(8):496–498.

152. The Health, Safety and Wellbeing in Healthcare Partnership Group (HSWPG) (2022). Workplace health and safety standards. https://www.nhsemployers.org/system/files/2022-05/hswpg_workplace-health-safety-standards_may_2022_final.pdf

153. The Health, Safety and Wellbeing in Healthcare Partnership Group (HSWPG) (Feb 2020). Supporting the wellbeing of shift workers in healthcare. https://www.nhsemployers.org/system/files/media/Supporting-the-wellbeing-of-shiftworkers-in-healthcare_0.pdf

154. The Royal College of Anaesthetists (31 Jan 2023). The Guidelines for the Provision of Anaesthetic Services. https://www.rcoa.ac.uk/gpas/chapter-1#ref-58

155. Chartered Institute of Ergonomics and Human Factors (23 April 2024). Fatigue risk management for health and social care. https://ergonomics.org.uk/resource/fatigue-risk-management-for-health-and-social-care.html

156. NHS England (Jan 2023). Growing occupational health and wellbeing together (OHWB) strategy. https://www.england.nhs.uk/publication/growing-occupational-health-and-wellbeing-together-strategy/

157. Society of Occupational Medicine (July 2023). Burnout in healthcare: risk factors and solutions. https://www.som.org.uk/sites/som.org.uk/files/Burnout_in_healthcare_risk_factors_and_solutions_July2023.pdf

158. Gifkins J, Johnston A, Loudoun R, Troth A (Dec 2020). Fatigue and recovery in shiftworking nurses: A scoping literature review. International Journal of Nursing Studies, 1;112:103710.

159. WHO (9 Aug 2022). Position paper. Optimizing brain health across the life course. https://www.who.int/publications/i/item/9789240054561

160. Bassetti CL, Endres M, Sander A, et al. (Sep 2022). The European Academy of Neurology Brain Health Strategy: one brain, one life, one approach. European Journal of Neurology, 29(9):2559–2566.

161. Lim DC, Najafi A, Afifi L, et al. (Oct 2023). The need to promote sleep health in public health agendas across the globe. The Lancet Public Health, 1;8(10):e820–e826.

162. 'Fight Fatigue' campaign. https://anaesthetists.org/Home/Wellbeing-support/Fatigue/-Fight-Fatigue-download-our-information-packs

163. The Society of Occupational Medicine (Sept 2022). What might best practice look like for managing good sleep practice for night workers at work? https://www.som.org.uk/sites/som.org.uk/files/SOM_Managing_good_sleep_practice_for_night_workers_at_work_September_2022.pdf

164. The Association of Anaesthetists. The culture of fatigue. https://anaesthetists.org/Home/Wellbeing-support/Fatigue/The-culture-of-fatigue

165. The Royal College of Nursing (2012). A shift in the right direction: RCN guidance on the occupational health and safety of shift work in the nursing workforce. London: RCN.

166. The Royal College of Nursing (June 2021). Healthy workplace toolkit. https://www.rcn.org.uk/Professional-Development/publications/healthy-workplace-toolkit-uk-pub-009-734

167. The Royal College of Midwives (2016). Caring for You Campaign: Working in Partnership. https://www.rcm.org.uk/media/2899/caring-for-you-working-in-partnership-rcm-campaign-for-healthy-workplaces-delivering-high-quality-care.pdf

168. The Royal College of Physicians (4 March 2019). RCP supports national Fight Fatigue campaign. https://www.rcplondon.ac.uk/news/rcp-supports-national-fight-fatigue-campaign

169. The Royal College of Surgeons (2023). Supporting the wellbeing of surgeons and surgical teams during COVID-19 and beyond. https://www.rcseng.ac.uk/coronavirus/recovery-of-surgical-services/tool-6/

170. The Paediatric Critical Care Society (2019). Fighting fatigue resources. https://pccsociety.uk/fighting-fatigue-resources/

171. Farquhar M (Jun 2017). Fifteen-minute consultation: problems in the healthy paediatrician-managing the effects of shift work on your health. ADC Education & Practice, 102(3):127–132.

172. British Medical Association (2019). Anticipating and managing fatigue associated with doctors' working patterns. https://www.bma.org.uk/media/1073/bma_fatiguesl-sleep_deprivation_guidance_oct_2019.pdf

173. NHS employers (5 Jan 2024). Sleep fatigue and the workplace. https://www.nhsemployers.org/articles/sleep-fatigue-and-workplace

174. Butler C, Bell J (The Health and Safety Laboratory) (2017). Worker Fatigue Risk Management in Practice: Benefits and Challenges. Symposium Series NO 162 Hazards 27. https://www.icheme.org/media/11893/paper-28.pdf

175. Dawson D (17 Sep 2009). Tired doctors need a complex solution, not simplistic headlines. CRIKEY. https://www.crikey.com.au/2009/09/17/tired-doctors-need-a-complex-solution-not-simplistic-headlines/

176. Grandou C, Wallace L, Fullagar HH, Duffield R, Burley S (Aug 2019). The effects of sleep loss on military physical performance. Sports Medicine, 49(8):1159–1172.

177. Jackson ML, Gunzelmann G, Whitney P, Hinson JM, Belenky G, Rabat A, Van Dongen HP (Jun 2013). Deconstructing and reconstructing cognitive performance in sleep deprivation. Sleep Medicine Reviews, 1;17(3):215–225.

178. Barnes CM, Guarana CL, Nauman S, Kong DT (Aug 2016). Too tired to inspire or be inspired: Sleep deprivation and charismatic leadership. Journal of Applied Psychology, 101(8):1191.

179. Banks S, Landon LB, Dorrian J, Waggoner LB, Centofanti SA, Roma PG, Van Dongen HP (Dec 2019). Effects of fatigue on teams and their role in 24/7 operations. Sleep Medicine Reviews, 1;48:101216.

180. Caldwell JA, Caldwell JL, Thompson LA, Lieberman HR (Jan 2019). Fatigue and its management in the workplace. Neuroscience & Biobehavioural Reviews, 1;96:272–289.

181. Rittel HWJ, Webber MM (1973). Dilemmas in a general theory of planning. Policy Sciences, 4(2):155–169.

182. Agius RM (Jan 2024). Prevention of COVID-19 in workers: preparation, precaution, and protection. Annals of Work Exposures and Health, 8;68(1):1–7.

183. Iacobucci G (2023). Sixty seconds on . . . staff sickness. BMJ, 381:p1494. doi:10.1136/bmj.p1494

184. Fowler A (20 June 2023). Reflections on four years of the NHS patient safety strategy. https://www.england.nhs.uk/blog/reflections-on-four-years-of-the-nhs-patient-safety-strategy/#:~:text=It%20is%20critical%2C%20given%20the,is%20more%20important%20than%20ever

185. Nuffield Group (Oct 2022). Prevention is better than cure. https://www.nuffieldgroup.com/prevention-is-better-than-cure/

186. NHS England (2020). Delivering a 'Net Zero' National Health Service. https://www.england.nhs.uk/greenernhs/wp-content/uploads/sites/51/2020/10/delivering-a-net-zero-national-health-service.pdf

187. GOV.UK (2022). Health and Care Act 2022. https://www.legislation.gov.uk/ukpga/2022/31/contents/enacted

Inclusion of references does not imply endorsement of contents by the authors.

Supporting occupational health and wellbeing professionals

2 St Andrews Place, London NW1 4LB

Charity Commission No: 1184142
Scottish Charity No: SC049793
VAT No: 927 0030 57