

# Safety during night shifts: a cross-sectional survey of junior doctors' preparation and practice

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## ABSTRACT

**Objectives:** We aimed to determine whether junior doctors and trusts in the region make use of published evidence relating to best practice during night shift work that can safeguard alertness, reduce fatigue and limit mistakes. We surveyed junior doctors' preparation for and practice during night shifts, and the working and living conditions offered by hospitals for junior doctors carrying out night duties.

**Design:** Cross-sectional survey.

**Setting:** An anonymous online questionnaire was sent to junior doctors training within Health Education North West from 13 December 2012 to 14 February 2013.

**Participants:** 32% (16/42) of trusts within Health Education North West sent the survey to 2139 junior doctor email addresses; 24.5% (524/2139) entered data into the survey.

**Results:** 91.6% of surveyed junior doctors worked night shifts. Prior to starting night shifts, 65% do not have a 'prophylactic' afternoon nap. At work, half (49%) can access a room with a reclining chair while 24% have a room with a bed. 37% 'never' achieve a 'natural break' on night shift; 53% 'never' achieve the recommended 20–45 min nap. 91% of respondents were unaware of the duration of sleep inertia that can affect alertness upon waking. When converting between day/night shifts, 2% use light lamps and 6% use non-benzodiazepine sedatives. Principal themes from free text analysis were feeling lethargic or unwell during night shifts, concern for patient and personal safety and inability to rest or take breaks.

**Conclusions:** The trainees surveyed find night shifts difficult, yet do not/are unable to implement evidence-based recommendations to limit fatigue. Results suggest those surveyed experience a lack of rest facilities within their place of work and a demanding workload. The results may indicate the need to increase awareness of the potential benefits associated with different interventions that can help mitigate the fatigue associated with rotating shift work.

## INTRODUCTION

The UK Working Time Regulations (WTR) came fully into force in 2009, necessitating that junior doctors not work more than 48 h/week on average and not spend more

## ARTICLE SUMMARY

### Strengths and limitations of this study

- The survey represents the greatest number of junior doctors surveyed on this topic to date.
- This is a small-scale study carried out in one region. The low response rate could result in non-response bias, and care should be exercised when generalising from the junior doctors' views.
- The article can help to raise the profile of safe night shift working amongst the junior medical workforce.

than 13 h at their workplace in a 24 h period. Consequently there has been a move to shift working with a successive shortening of shift length, but with a tendency for more intense night-time work. The General Medical Council (GMC) recently published a report<sup>1</sup> investigating the impact of the WTR on trainee doctors. This showed that while the regulations have led to fewer hours, some problems such as stress and fatigue remain. The report identifies that some doctors in training are working long hours in their busiest shifts and are unable to take rest breaks, increasing the potential for mistakes.

Working at night presents additional risks for both patient and personal safety. People who work night shifts are subject to disturbances of the body's circadian rhythms: sleep-wake patterns, core body temperature and hormone levels. Of the many health-related effects of shift work, disturbed sleep is the most common. Acute symptoms are difficulty getting to sleep, shortened sleep, and somnolence during working hours that continues into the following days off.<sup>2</sup> Night shift workers sleep on average 25–33% less than day shift workers,<sup>3</sup> and they lose 1–4 h of sleep each night for 3 days after they rotate shifts.<sup>4</sup> The combination of disturbed circadian rhythm and fatigue increases the risk of making poor decisions, mistakes and accidents.<sup>5 6</sup> Such negative sequelae include the occurrence of

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needle-stick injuries, increased risk of accidents while driving home, increased clinical errors and diagnostic mistakes.<sup>7</sup>

In 2006 The Royal College of Physicians (RCP) recognised the need to educate junior doctors on how to prepare for night shifts and manage their sleep in order to minimise risk to themselves and their patients, publishing the document “working the night shift: preparation, survival and recovery—a guide for junior doctors”.<sup>8</sup> However, there is evidence that doctors do not recognise the potential effects and dangers of fatigue for their practice.<sup>7</sup> This study seeks to examine junior doctors’ knowledge and practice of published measures to safeguard alertness during shift; and gather evidence of the provision of night-time facilities in hospitals that facilitate healthy working in North West England.

## METHODS

Medical education managers in Health Education North West were emailed with a request to distribute the online questionnaire through email to trainee doctors working in their trust. The survey period ran from 13 December 2012 to 14 February 2013.

The questionnaire was constructed by EJ and AM and approved by the Interim Director of Workforce and Education for Health Education North West. No demographic details were asked for and the survey was anonymous. It was designed to collect information regarding preparation for and practice during night shifts, and the working and living conditions offered by hospitals for junior doctors carrying out night duties. Additional information collected included free text covering attitudes towards night shifts. Items were based on the RCP guidelines<sup>8</sup> on working the night shift and other published evidence<sup>9 10</sup> relating to best practice during night shift work.

Questions required ‘yes’ or ‘no’ replies, or were multiple choice with one, or more than one, answer. Free text boxes were provided for some multiple choice questions. Quantitative data were presented as number (n). The qualitative free text comments from each respondent were aggregated for each question and analysed independently by EJ and AM using Word Lists and Key Words in context to uncover themes. Further analysis was then conducted to refine the final thematic outputs.

## RESULTS

Sixteen different trusts responded, representing 32% (16/42) of trusts within Mersey and North Western deaneries, and capturing trusts in the regions of Merseyside, Greater Manchester, Cumbria, Lancashire and the Isle of Man. The survey was sent to a total of 2139 junior doctor email addresses. Five hundred and twenty-four trainees from the 16 trusts entered data into the survey, giving a 24.5% response rate. Four hundred and eighty-one (92%) of the trainees worked resident night shifts. No survey question was compulsory so the denominator varies for each.

Closed question results are presented by subject. Themes of the free text analysis are shown in table 1, and sample responses given in boxes 1–3.

### Hospital good practice

Two per cent (9/442) of trainees participated in designing their rota. Twenty-four per cent (110/462) had an ‘on call’ room with a bed, and 49% (225/462) had a quiet room with the facility to recline where they could take a break.

### Preparing for shift and adapting between shifts

Four hundred and sixty-three trainees responded to the item regarding preparing for the first night shift. Thirty per cent of trainees have a long lie-in to at least midday; 17.5% have a short nap in the afternoon (less than 1.5 h), and 29% have a long nap in the afternoon (more than 1.5 h). One per cent stay up late the night before and consume alcohol, while 14% make no preparation. Of the 9% (45) who chose “none of the above”, 22/45 stay up late (2:00–6:00) with no alcohol; others have a lie-in but not until midday; or a combination of a late night, lie-in and nap.

There were 450 respondents to the question concerning how trainees adapt from day-to-night or night-to-day shifts. Two per cent use light therapy lamps, 0.4% use melatonin, 6% use non-benzodiazepine sedatives and 93% do not use any intervention. Thirty respondents chose ‘other’ expanding with free text. Themes from free text analysis revealed use of ‘medication’ to adapt to shift patterns (14/30). These included alcohol, benzodiazepines, codeine, sedating antihistamines, modafinil, antidepressants and phenergen. The next two most common themes were “staying up for 24 h” after the last night shift in order to assist sleeping at night (5/30) and use of “earplugs and blackout blinds” during a run of nights (3/30). The other eight comments did not cluster into a theme.

### Fatigue-limiting techniques and safety

Of the 462 trainees who replied to the question examining whether they achieved a 20–45 min nap on a night shift, 53% said ‘never’, 36% ‘sometimes’ and 11% ‘usually’. Eight per cent (39/461) were aware that a

**Table 1** Themes from free text analysis

Theme	Number of responses reflecting theme, n (%)
Mood disturbance/feeling unwell/lethargy	28 (25)
Patient and personal safety	19 (16)
Not able to rest on shift	19 (16)
Negative expressions	11 (10)
Benefits of a nap during shift	9 (8)
Unrelated comments	28 (25)

**Box 1** Theme: feeling unwell and lethargy

- ▶ Severely affected by mood disturbance during and after night shifts.
- ▶ 7 nights in a row, 7 twilight shifts in a row, too many long days... this is very tiring.
- ▶ I struggle to sleep during the day and by the third and fourth night shifts I start to feel very unwell and tired.
- ▶ We do 7 night shifts in a row, and by the end of the week you're so exhausted and you have very little concentration, and as a result, likely to have poor performance.
- ▶ By the fourth night I notice an increase in my tiredness and lethargy.
- ▶ By night 5, 6 and 7 we are all very tired and feel it is somewhat dangerous.
- ▶ [training] that we do get is less beneficial due to prolonged fatigue caused by working night shifts on a very regular basis.
- ▶ Most junior doctors are depressed/tired/not efficient after nights.
- ▶ I am concerned working night shifts may have long term health implications.
- ▶ Always feel tired on nights.
- ▶ I feel very tired and stressed at the end of a month when ive worked a lot of night shifts.
- ▶ I feel awful on nights.

period of sleep lasting more than 45 min could result in a delay to full alertness of >25 min.

Thirty-seven per cent of 462 trainees do not achieve a 'natural break' as defined by the junior doctor contract—30 min after approximately 4 h of work during a shift.

**Box 2** Theme: patient and personal safety

- ▶ Driving home after nights is very dangerous.
- ▶ Such shifts put patients' lives at risk [a stretch of 7 night shifts].
- ▶ My concern is feeling tired might make me doing medical mistakes.
- ▶ Towards the end of 12 hr night shifts ... I am not able to do simple arithmetic and I feel unsafe doing simple practical procedures because of lack of coordination. I have often had near misses while driving.
- ▶ I perform high precision surgery... if I have not slept my surgery is often below par.
- ▶ The worst part and most dangerous part is ... that you get no sleep all night... you have to drive home exhausted. Both me and my colleague have fallen asleep at the wheel...
- ▶ Having to drive back home in the morning after a night shift is a real concern.
- ▶ ..the sleep I do get is often broken getting only 1–2 hrs sleep some days, this is not conducive to providing a safe working environment, and on occasion I have fallen asleep whilst queuing in traffic on my way home from work...
- ▶ Never get rest and by 8 hours into the shift you can feel yourself not being alert? patient safety issue.
- ▶ You are not productive or efficient after that time [7 and 8am] ... most importantly I don't think you are a safe doctor because you are too tired to think or act rationally.

**Box 3** Theme: Negative Expressions

- ▶ Night shifts are horrendous.
- ▶ I dread them.
- ▶ There is nothing good about night shifts.
- ▶ I hate nights.
- ▶ Nightshift is a nightmare. it leaves me shattered.
- ▶ It is life destroying.
- ▶ Night shifts are fights for survival!

A further 35% 'sometimes' do, 19% 'usually' do and only 9% 'always' do.

Sixty-nine per cent (316/460) of trainees do not eat regular meals (equivalent of breakfast, lunch and dinner) during night shifts. Seventy-eight per cent (360/462) drink caffeine during shifts.

**Sleep debt and after effects**

After arriving home following a night shift that ends at 8:00 or 9:00, 22.5% of 462 respondents go to bed immediately. Fifty-nine per cent wait until 10:00–11:00, whereas 23% wait until 11:00–13:00. Five per cent chose 'other'.

The subjective feeling of tiredness after night shifts affects 37% of trainees for 2 days. For 25% this lasts 3 days, and for 24% this continues for a week following the end of a set of nights. Thirteen per cent only feel affected for a day, and a minority (2%) recover the same day they finish.

**Free text analysis**

One hundred and fourteen (23%) trainees utilised the free text option to pass comment on night shift working. Principal themes from free text were: feeling unwell and fatigued; patient and personal safety concerns; not able to take breaks while on shift; and negative expressions towards night shifts. Number of responses grouped by theme are shown in [table 1](#).

Boxes 1–3 give samples from free text comments for the three themes with the most responses. The responses have been reproduced verbatim, and qualified in square brackets as required.

**DISCUSSION**

The results of this survey reveal that the respondents find night shifts difficult, but do not or are unable to practice evidence-based recommendations to safeguard their alertness on shift and enhance sleep quality. Some hospitals represented by the survey group do not provide medical staff with the rest facilities that would enable the doctors to optimise their performance, and work intensity is high such that natural breaks cannot be achieved.

In 2008 Bambra *et al*<sup>1</sup> published a systematic review of the findings of epidemiological and laboratory-based research, culminating in recommendations to

organisations to address the negative effects of night shifts. Three types of interventions were found to have beneficial effects on health and work-life balance: rapid clockwise rotations, where shifts change every few days in a morning, evening and then night pattern; changing from backward to forward rotation; and self-scheduling of shifts. Three-shift patterns (morning, evening and night) are most commonly experienced by junior doctors working in the emergency department, and the advice by Bambra *et al*<sup>11</sup> should be considered when devising these rotas.

The BMA and RCP also recommend involving staff working a shift rota in its design, yet only 2% of trainees have participated in designing their current shift pattern. However, this could be explained by junior doctors changing post every 4–6 months and the longevity of working patterns relative to this.

The negative impact of the demands of shift work is potentially exacerbated by poorly designed rotas that do not offer sufficient opportunity for rest and recovery. In our survey and others,<sup>1 12</sup> doctors are able to identify certain features of their own rota as being especially disruptive of their life and/or fatiguing. This may be partly addressed by the appropriate sequencing of shifts, and also by engaging junior doctors in rota design to benefit their well-being and performance.

Half of the trainees surveyed do not have facilities such as a quiet room or a reclining chair to use during a 12–13 h night shift. Having facilities for a break or nap can be beneficial for both doctors and their patients, as napping on the night shift may be the most effective countermeasure against fatigue at work.<sup>2</sup> The aeronautical industry utilises a system of planned 30 min naps, which have been shown to significantly improve crew performance and alertness during long-haul flights.<sup>13</sup> Planned naps during night shifts in other industries can improve overall alertness and alleviate fatigue, improving performance.<sup>14–17</sup>

In examining the evidence concerning the hazards of shift work, and techniques that can be used to reduce risk, the main advice endorsed by the RCP is to minimise sleep debt by taking additional 2 h sleeps in the afternoon before a shift, and 20–45 min naps during the night shift. A planned bleep free break would ensure junior doctors can rest at ease knowing their break will be uninterrupted.<sup>16</sup> Only 8% of trainees recognised the extent of sleep inertia after a prolonged sleep. This is important for a junior doctor who may need to be fully alert without warning.

In order for napping to be achieved, a culture that recognises and supports rested doctors needs to be engendered in the workplace. Many hospitals now expect their medical staff to stay awake throughout the night and have withdrawn on-call bedrooms, a move opposed by the BMA and the Academy of Royal Colleges,<sup>18</sup> who recommend that on-call rooms be provided for those doctors working at night regardless of the rota system.

Particular free text remarks indicate a lack of awareness by the junior doctors and their employers regarding

napping on a night shift. These include “actively advised by one trust that we are not allowed to nap due to full shift rota despite this being against BMA guidance...” Another doctor wrote “we aren’t allowed to sleep on night shifts—it’s a sackable offence”, and a third doctor stated “we feel we have to hide the fact that we ‘nap’ from the nurses. Well, I don’t, but other doctors have warned me that I ought to” and lastly “I don’t believe a person should sleep when they are working nights- we are being paid to work”.

It is apparent that many rotas are of such intensity that napping is not possible. Thirty-seven per cent of doctors ‘never’ achieve a natural break after every 4 h of work. Just over a quarter either ‘always’ or ‘usually’ manage this. Folkard and Tucker<sup>6</sup> reviewed the literature relating to productivity and safety during night shifts in industrial workers. Their key findings were that mean relative risk of accidents increases in an approximately exponential fashion with time on shift such that in the twelfth hour it is more than double than that during the first 8 h. The same study also shows that safety declines over successive night shifts, with increasing hours on duty and between successive rest breaks.

When adapting between shift types an important factor in manipulating the circadian system is exposure to and/or avoidance of bright light at specific times.<sup>19 20</sup> With good compliance and correct timing, both light and melatonin, separately or in combination, can be used to hasten phase shift of the circadian system to align it with the new work–rest schedule.<sup>21</sup>

Doctors surveyed were more likely to use sedatives (6%) and other medications (3%) rather than melatonin (0.4%) or light (2%) to adapt from day to night or vice versa. The majority of respondents (93%) did not utilise any method to aid phase shift. Non-photic time cues such as meals, caffeine, exercise and sleep-wake cycle are also important synchronisers of the human circadian clock.<sup>22</sup>

Seventy-eight per cent of doctors used caffeine on night shifts, yet less than a third of doctors manage to eat regular meals (equivalent to breakfast, lunch and dinner). Regular meals are of additional importance in night shift workers due to the increased incidence of digestive problems<sup>23</sup> resulting from the disruption of the body clock and poor diet. The RCP guidance quotes evidence for a high-protein low-carbohydrate meal for maintaining night shift alertness.

In preparing for a night shift, few trainees take the opportunity to nap in the afternoon. There is a clear negative correlation between mean relative performance and hours of wakefulness.<sup>24</sup> The RCP recommend developing a napping routine as an indispensable part of working safely overnight, and a 2 h ‘prophylactic’ afternoon sleep before coming on duty to help keep fatigue at bay. Just over a quarter of trainees have a nap of more than 1.5 h in the afternoon before a night shift. Another sixth take a shorter nap of less than 1.5 h. The majority

of junior doctors surveyed go to bed before 11:00 on arriving home from work. Shift workers who go to bed at 10:00 tend to sleep for at least 4 h, whereas those who retire at midday sleep for an hour less.<sup>8</sup>

The survey finding that 86% of trainees feel affected by lethargy for 2 days up to a week postnight shifts suggests that rotas should allow for at least 48 h off work after a full or split set of night shifts. This could sensibly be made a compulsory minimum rest requirement.

### Strengths and limitations

Our results represent the greatest number of junior doctors surveyed on this topic to date. In their report published earlier this year, the GMC<sup>1</sup> studied the opinion of 82 trainees; and Brown and Tucker<sup>12</sup> investigated the impact of shift patterns on junior doctors' perceptions of fatigue, training, and work/life balance by interviewing 10 trainees from 11 trusts in Wales and placing 24 in a focus group to explore their perceptions.

This study was carried out in one region, so feasibility results could be different elsewhere. While a range of hospitals in Mersey, Manchester, Lancashire, Cumbria and Isle of Man were represented, not all hospitals in the region were included. The relatively low response rate may induce non-response bias in survey estimates, so care should be exercised when generalising from the trainees' views. Those trainees who completed the survey are self-selecting and possibly hold a stronger opinion on working night shifts than others. However, the free text comments here are consistent with those of other junior doctors in the UK.<sup>1 12</sup> Several articles indicate that unit non-response does not threaten the quality of survey estimates, with a collective body of work, particularly from national household surveys, suggesting no consistent relationship between response rates and non-response bias.<sup>25–28</sup>

In this survey it is likely the response rate is an underestimate due to inactive email addresses or duplicates being sent to the same doctor through their personal and NHS account. Professional standards still urge high response rates and the results of this survey may not be representative at national level.

Utilising a different design with the use of focus groups would have prevented potential problems arising from a low response rate. However, we felt a survey would enable a greater sample size, participants could be more honest due to anonymity and the data collected easier to analyse to give meaningful results. The high number of respondents relative to similar research in this area attests to success in achieving a large sample population.

### CONCLUSION

Shift working is an essential and accepted role of a doctor that enables hospitals to provide around-the-clock patient care. In providing a 24/7 service, the transportation industry has long recognised operator

fatigue as a key safety issue, yet our results indicate that our survey population struggles to acknowledge the likely impact of sleep deprivation on the performance of junior doctors.

While there have been major reductions to junior doctors' working hours, non-hour issues must be given equal consideration to ensure quality of rest for junior doctors that promotes their ability to learn, their performance and patient care. Following implementation of the WTR, many authors<sup>8–12 14</sup> made recommendations regarding best night shift practice based on research, which is consistent and clear.

While we cannot assume that the junior doctor population in the UK practice night shifts in the same way as those surveyed here, the results do give an interesting perspective from a large group of trainees and suggest a lack of awareness of healthy night shift working. For these, the advice from Murray *et al*<sup>14</sup> remains pertinent: certain health and safety measures could be implemented in the NHS night shift, and doctors should be taught how to cope with night work. In addition to the GMC report,<sup>1</sup> this survey may stimulate other regions to carry out a similar analysis of their junior doctors, as the results may indicate the need to increase awareness of the potential benefits associated with different interventions that can help mitigate the fatigue associated with rotating shift work.

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