Health effects of working unsocial hours and shift work
A briefing from the BMA Board of Science

Rationale

This paper has been produced following a request from the BMA Central Consultants and Specialists Committee (CCSC) to consider the impact working unsocial hours can have on health. This is in light of the fact that consultants are increasingly being asked to cover rota gaps, created as a result of the new restrictions on working hours which came into force in 2009.

Defining ‘unsocial hours’

‘Normal’ hours of work are generally taken to mean a working day with hours left over for recreation and rest in the evening and at night-time [Harrington, 2001]. For the purposes of this paper, working ‘unsocial hours’ is taken to mean working hours outside the conventional socially recognised working week (typically 8am to 6pm from Monday to Friday). It does not include working excessive hours.

It is important to note that the definition of ‘shift work’ varies in the research literature, often without any distinction of the pattern of shift work or changes in shift patterns. The majority of studies refer to shift work that includes night work [Costa, 2003]. There is also a wide variation in the types of study and methodology used in relation to the groups of shift workers examined (eg in age, shift work schedules, job activity) [Costa, 1996].


1. Introduction

Shift working and working unsocial hours are a common feature across many professions, in particular where there is a requirement to provide a 24 hour service. The 2000 European Union (EU) survey on working conditions, for example, found that only 24 per cent of working population of 15 EU countries worked normal hours [European Foundation for the Improvement of Living and Working Conditions, 2000].
Traditionally doctors have been required to work unsocial hours during their training, when on-call, in providing out-of-hours care, or when working in emergency care. The last two decades have seen a drive to cut doctors’ working hours, in particular to meet new European Union (EU) employment directives. The Working Time Regulations (WTR) – the UK legislation encompassing the European Working Time Directive (EWTD) – now limits doctors (and all other workers) to working 48 hours per week, which, according to the UK Department of Health (DH), is consistent with “patient safety, high quality patient care and a good work-life balance for doctors”.* To accommodate these changes, many NHS trusts are increasingly requiring doctors to work variable shift patterns. The resultant increase in the number of unsocial hours that some doctors are expected to work and the frequent changes in working patterns present concerns as to the impact of this pattern of working on their health.

This paper examines the impact of working unsocial hours and shift work on physical and mental health, considers how this relates to performance and personal safety, and examines the effects of shift work on social relationships. It concludes by outlining some of the measures to counter the adverse effects of working unsocial hours on health.


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* The European Commission has announced a review of the EWTD including a two-stage consultation on the direction and content of the initiative. The Commission will also carry out a full legal, social and economic impact assessment, a draft version of which is due in August 2010. The full review process may take up to five years.
2. Impact of shift work on physical health

There is a considerable body of evidence that shift work can result in adverse health effects on the worker, in particular working variable shift patterns. The main effects result from disruption to normal circadian rhythms, sleep disturbance, and altered eating patterns. These disruptions are interconnected and underlie many of the short- and long-term health problems associated with shift working [Arendt J, 2010].

In considering the health impacts outlined in this paper, it should be noted that much of the evidence comes from research in sectors traditionally associated with workers from lower socioeconomic groups (eg manufacturing and hospitality services) who are likely to have an increased level of underlying ill health compared to higher socioeconomic groups.

It is also important to note that there is very limited research on the health impacts of patterns of shift working specifically on doctors, with the majority focusing on the effect of working extended shifts and excessive hours [Gaba, 2002; Lockley, 2004; Okie 2007]. Evidence is beginning to emerge on the effect of the new working patterns [McIntyre, 2010], however, further research is required.


2.1 Tolerance to shift work

The health impacts of shift working can vary between individuals. Some personality traits or behaviours can make it easier or more difficult to adapt to changing shift patterns (eg rigid or relaxed sleeping habits, morningness, neuroticism and ability to cope with tiredness or a lack of sleep) [Costa, 2003]. Older people may have an increased intolerance to shift work due to decreased psycho-physical fitness, decreased restorative properties of sleep, and being more susceptible to
desynchronisation of circadian rhythms [Costa, 2003; Harrington, 2001]. It has been suggested that women may have increased difficulties managing the effects of shift work due to their greater family obligations. Women may also be at increased risk of adverse reproductive health effects associated with shift working (see section 2.5) [Harrington, 2001].


### 2.2 Circadian rhythm disruptions

The everyday experience of ‘jet-lag’ provides a simple demonstration of the effects associated with the human body functioning ‘out-of rhythm’. Humans are naturally programmed to sleep at night and to be alert and awake during the day, during which time key daily rhythms such as metabolism, alertness and performance are optimal [Arendt, 2010]. This social behaviour is also reflected in the rhythmic fluctuation of bodily functions (respiratory, cardiovascular, digestive, renal) within a 24 hour period (otherwise known as ‘circadian rhythms’) [Costa G, 1996]. Other bodily functions displaying a circadian rhythm include: body temperature, hormone production, the menstrual cycle, urinary excretion, and cell division [Harrington, 2001].

**Shift-lag syndrome**

Shift work, in particular night work, forces the worker to invert their normal ‘activity-rest’ cycle and adjust body function to the night activity period. This requires a progressive phase shift of the body’s daily rhythmic functions, which increases with the number of successive night shifts worked, but rarely reaches a complete inversion. The human body is exposed to continuous stress in the attempt to adjust as quickly as possible to new working hours. This can lead to a series of symptoms known as ‘shift lag’ syndrome, characterised by feelings of fatigue, sleepiness, lethargy, insomnia, digestive problems, poorer mental agility and performance [Costa G, 2003].

**Disturbed sleep**

Disturbed sleep is the commonest effect of shift work on health, and shift workers report more sleep disturbances than non-shift workers [Akerstedt, 2003]. Sleep is affected in two ways – a reduction in the duration of sleep and an alteration in its quality. Sleep is reduced both through the inversion of the ‘sleep-wake’ cycle and as a result of difficulty in sleeping during the day due to unfavourable environmental conditions [Costa G, 1996]. The quality of sleep is also affected by interference in the various phases of sleep (eg there is a reduction in the ‘deep-sleep’ phase which is essential for
recovering from physical fatigue). Over time these conditions may lead to permanent and severe disturbances of sleep [Costa G, 1996].


### 2.3 Increased body mass index and obesity

Exposure to shift work has been found to be associated with increased body mass [Geliebter, 2000], body mass index [Parkes, 2002; Rosmund, 1996], prevalence of obesity [Di Lorenzo, 2003; Karlsson, 2001] and waist-to-hip ratio [Van Amelsvoort, 1999]. These effects are predominantly caused by changes in eating behaviour. Shift workers may be restricted behaviourally in terms of the desired amount and type of food eaten during shift work, and through disruption of meal times. Factors which affect dietary habits during shift work include the type of job, the work environment, and the availability of food. Inadequate canteen facilities, for example, could result in a greater reliance on vending machines [Atkinson, 2008]. The effects on body mass and obesity may also result from disruption to circadian rhythms associated with the metabolism of food eaten during shift work [Atkinson, 2008].


2.4 Gastrointestinal problems
Gastrointestinal complaints have been found to be more prevalent among shift workers than non-shift workers, with wide variations in the reported prevalence [Knutsson, 2003]. Common complaints include pain, irregularity of bowel movements, constipation and diarrhoea. Gastrointestinal problems are linked to the disruption of normal eating habits. While calorie intake remains largely unaltered, the quality of food eaten by shift workers changes. During night shifts it is common to consume quick meals, consisting of pre-packed food, and to have an increased intake of drinks, such as coffee and tea. During day shifts, the timing of at least one of the two main meals is commonly shifted or taken in a hurry, and not always of good quality [Costa, 1996].

A 2003 review of health disorders of shift workers by Knutsson concluded that there is strong evidence linking shift work to peptic ulcer disease. One study found the prevalence of gastric ulcers to be 2.38 per cent in shift workers compared with 1.03 per cent in non-shift workers. For duodenal ulcers the relative risk was doubled in shift workers compared with non-shift workers (1.37 per cent and 0.69 per cent respectively) [Knutsson, 2003].


2.5 Cardiovascular disorders
Evidence for the relationship between shift working and cardiovascular disorders is inconclusive [Occupational Cancer Research Centre & Institute for Work & Health, 2010]. Research conducted in the 1990s found an association between shift work and an increased risk of cardiovascular disease (CVD) including angina, arrhythmia and ischaemic heart disease (IHD) [Boggild, Knutsson, 1999; Costa, 1996; Harrington, 2001; Knauth, 1998]. A 1999 review by Boggild and Knutsson, for example, found that the risk of CVD was 40 per cent higher in shift workers compared to non-shift workers. The review also suggested that the increased risk may result from a mismatch in circadian
rhythm (the effects of which can lead to unfavourable metabolic disturbances with risk factors for CVD), social disruption (which can lead to social isolation and stress), and behavioural changes (such as smoking, poor diet and over consumption of alcohol).

In contrast, a 2008 study by Yadegarfar and McNamee found there to be no excess risk of death from IHD for shift workers [Yadegarfar G & McNamee R, 2008]. Similar findings were reported in a 2009 review by Frost, Kolstad and Bonde which examined 16 studies published between 1972 and 2008 and concluded that although shift work might be linked to ischemic heart disease, the epidemiologic evidence for a causal relation is limited [Frost, 2009].


**2.6 Reproductive effects**

There is evidence that shift working may have adverse reproductive effects in women. It is likely that these adverse effects may be caused by disruption of the menstrual cycle and increased stress from the conflicts created by shift work on family life. Knutsson’s 2003 review of health disorders of shift workers concluded that there is strong evidence of an association between shift work and compromised pregnancy outcomes, including miscarriage, low birth weight and preterm births [Knutsson, 2003]. Much of the evidence for this association comes from studies published in the 1980s and 1990s [Armstrong, 1989; Axelsson, 1989; MacDonald, 1988; Mamelle,1984; Uehata, 1982; Xu, 1994].
A 2010 systematic review by Bonzini et al found that shift work has a moderate negative effect on fetal growth in pregnant women, with shift work associated with being small for gestational age or low birth weight [Occupational Cancer Research Centre & Institute for Work & Health, 2010]. No association was found for pre-term delivery (contrary to previous studies) and pre-eclampsia. The review concluded that given the link between shift work and fetal growth retardation, women should be advised against working non-traditional work patterns during pregnancy and should always be allowed to change to daytime work.


### 2.7 Diabetes

There is some evidence that shift work may be a risk factor for diabetes, although the evidence is not conclusive [Knutsson, 2003]. A 1996 study by Kawachi et al found that the prevalence of diabetes increased with increasing exposure to shift work: those never having worked shifts had a prevalence of 3.5 per cent, compared to 3.2 per cent for one to two years of shift work, 3.5 per cent for three to five years shift working, 4.4 per cent for six to nine years, 5.0 per cent for 10 to 14 years, and 5.6 per cent for more than 15 years. A 2006 study found that the risk of developing diabetes was significantly higher for workers on rotating shifts than it was for regular day workers [Suwazono, 2006].

2.8 Cancer
Evidence is continuing to emerge on the association between shift work and cancer, although there is no conclusive evidence of a causal link [Arendt, 2010, Occupational Cancer Research Centre & Institute for Work & Health, 2010]. In 2007, the International Agency for Research on Cancer (IARC) reported that shift work that involves circadian disruption is probably carcinogetic to humans [Straif, 2007], however, this was based primarily on evidence from animal studies and only limited evidence from human studies.

The evidence of association is strongest for breast cancer [Pukkala, 1995; Schernhammer, Laden, Speizer et al 2001; Schernhammer & Hankinson, 2003; Schernhammer, Kroenke, Laden et al 2006; Tynes, 1996], with weaker evidence for colorectal [Schernhammer Laden, Speizer et al, 2003] and prostate cancer [Kubo, 2006]. A 2003 report from the UK Health and Safety Executive (HSE) concluded that the evidence for an association between shift work and breast cancer is appreciable but not definitive, and it remains unclear whether any association is causal or a consequence of confounding factors [Swerslow, 2003]. These findings were confirmed by a 2008 review by Kolstad which concluded that there is limited evidence for a causal association between nightshift work and breast cancer and insufficient evidence for prostate cancer, colon cancer, and overall cancer [Kolstad, 2008].


b In March 2009, the UK HSE noted that the evidence for the increased risk of cancer did not justify preventive action to be taken in workplaces, and that the principal risk from shift work was fatigue. The HSE has commissioned research to look at shift working patterns in relation to cancer and other chronic conditions in men and women using data from two existing large cohort studies; the Million Women Study and EPIC-Oxford (European Prospective Investigation into Cancer and Nutrition). This is expected to report in 2011.


3. Impact of shift work on mental health

Mental health is directly affected by sleep levels and circadian rhythms, and disruption to the sleep-wake cycle caused by shift work can result in many interconnected pathologies including depression, anxiety and insomnia [Foster, 2005]. A 2004 Canadian study found that shift workers frequently report higher levels of burnout, emotional exhaustion, job stress and psychosomatic health problems (such as headaches, upset stomach, difficulty falling asleep) than workers on a regular day schedule [Jamal, 2004].

Shift working can also be a psychosocial stressor, which may also lead to anxiety and depression, as well as behavioural changes such as indecisiveness, increased levels of aggression and difficulty sleeping [Costa 1996; Harrington, 2001]. A 2008 study by Haines et al found that the association between shift work and psychological distress, depression, and anxiety was linked to the interference with participation in family life (see section 5) [Haines, 2008]. Poor sleep-maintenance, insomnia and early morning awakening are hallmarks of major depression (with a lifetime risk of approximately 20 per cent in the population) [Foster, 2005]. Depression can also be accompanied by anxiety disorders, which are linked to sleep disruption and sleep loss including panic disorder, post-traumatic stress disorder, generalised anxiety disorder and social phobia [Foster, 2005]. In the longer-term, a 2001 review by Harrington noted evidence for increased neuroticism with increasing years of shift work [Harrington, 2001].

A 2009 longitudinal study using data from the British Household Panel Survey suggests that the effects of shift work on mental health may vary between men and women [Bara, 2009]. The study found that men who had worked nights for four or more years were more than twice as likely as to report mental health problems compared to men who had never worked nights, but that working varied shifts had no significant impact on their mental health. Among women, the study found that those working varied shifts for four or more years were more than twice as likely to report mental health problems compared to women who did not work varied shifts, but that night work did not have a significant impact.


4. Effects on performance and safety

4.1 Performance
The physical and mental health effects of working unsocial hours can impact on performance. Fatigue caused by sleep deprivation and disruptions to the sleep-wake cycle can lead to impaired memory, attention deficits, lower concentration levels, reduced problem-solving and decision-making skills, and slower reaction times. Indirectly fatigue and sleep deprivation can also affect performance by reducing motivation levels. These effects on performance can adversely impact on personal and patient safety.

4.2 Personal safety
Working unsocial hours and shift work has a direct impact on personal safety. Shift workers have been found to be more tired when driving to and from home than non-shift workers, and the likelihood of crashing on the way home is also greater following a night shift compared with other shifts [Horrocks, 2006, Rogers, 2001]. With increasing tiredness, shift workers are also less able to judge their own performance accurately [Horrocks, 2006].


4.3 Patient Safety
A large body of evidence has shown that fatigue and sleep deprivation can reduce medical task performance and compromise patient safety [Association of Anaesthetists of Great Britain and Ireland, 2004; Horrocks, 2006]. A number of studies have found that junior doctors who are sleep deprived have more attention failures and make more clinical errors compared to when they are able to gain enough sleep [Eastbridge, 2003; Landrigan, 2004; Lockley, 2004]. These findings are reflected in doctors’ own perceptions of patient safety and shift work. A 2008 study of neurosurgical registrars found that the majority (86 per cent) felt that on-call working was safer when compared to shift working [Tait, 2008].

A 2005 review of the available published literature on shiftwork and safety found that the risk of medical errors and adverse incidents/incorrect diagnoses increases exponentially over the course of the night and increases still further over consecutive night shifts worked [Folkard, 2005]. Incident risk was found to be 30 per cent higher on the night shift compared with a morning shift and is highest in the first two to three hours of the shift. The risk then increases over successive night shifts so that
the fourth night shift worked carries 36 per cent more risk than the first. The incident risk is also increased by not taking breaks and increases exponentially with time from the last break [Folkard, 2005].

5. Effects on social relationships

Shift workers, particularly those regularly engaging in night shift work, are frequently out of sync with the rest of society, and can experience significant disruption of family and social activities [Costa, 2003]. This can lead to social marginalisation where, for example, shift working during the weekend may limit an individual’s ability to participate in sporting events or religious activities [Harrington, 2001]. Shift work can also have a negative influence on family and marital responsibilities. Difficulties coordinating childcare, housework and shopping, as well as having to leave a partner alone at night can lead to marital strain and family dysfunction [Harrington, 2001; Bauer, 1993] and cause problems in couples’ relationships [Crew, 2006]. The physical and mental health effects outlined in Section 2 and 3 such as fatigue, stress, depression and anxiety may also adversely impact on social relationships.

There is very little research on the positive effects of working unsocial hours on social relationships. A 2006 qualitative study of nurses identified a number of benefits to working unsocial hours including easier childcare arrangements, pay incentives, time off in the week and extra time off for working longer shifts [Crew, 2006]. Shift workers who enjoy relatively solitary leisure pursuits or who dislike crowds of people may find that shift scheduling provides them with greater opportunities to do what they want in their non-working time [Harrington, 2001].

6. Reducing the impact of working unsocial hours and shifts

While the adverse effects of working unsocial hours and shift working cannot be eliminated, a number of preventative and compensatory measures have been identified to reduce their impact [Bambra, 2008; Knauth, 2003]. These include organisational factors and actions an individual can take.


6.1 Design of the shift system

A number of studies have considered the design of shift systems and suggested having shorter length shifts, fewer shifts before a rest day, stable rather than rotating shifts, and frequent rest breaks or scheduled napping within a shift [Barger, 2009; Folkard, 2005; Fritschi, 2009; Knauth, 2003; Murray, 2005].

There is clear evidence that long stretches of night shifts result in an accumulation of daily sleep deficits and do not allow adjustment of circadian rhythms [Härmä, 2000]. A 2005 review by Murray et al noted that any shift system should have as few successive night shifts as possible, with a maximum of three consecutive nights. A single night shift, with a day off before and after, was reported to show the least distortion of circadian rhythms. The authors suggest that doctors should be rostered for single nights, with one or two night shifts over a weekend as this is flexible enough to cope with unexpected staffing changes, reduces sleep deprivation, and any additional loss of daytime specialist experience is limited [Murray, 2005]. The use of bright light exposure to accelerate circadian adaptation has also been suggested [Czeisler 1995; Eastman, 1990], however, the efficacy of this technique in real-life settings remains unclear.

A 2001 review concluded that a rapid rotation of shifts (ie a change in shift pattern every few days) is preferable to a slow rotation, as this schedule interferes less with circadian rhythms. Clockwise rotation (ie morning shift, followed by afternoon shift, then night) is preferable to counter-clockwise rotation because it allows for greater rest periods between shifts [Harrington, 2001]. Restricting shift length, scheduling frequent breaks and limiting the number of successive night shifts have also been found to mitigate some of the risks associated with night shifts [Folkard, 2005].
Engaging shift workers in system design is an important strategy in developing a shift pattern that is effective and accepted [Jeppesen, 2000; Knauth 2001; Tucker 2001]. It has also been suggested that workers may be screened to select those who are better suited to tolerate shift work (e.g., doctors who describe themselves as being an "evening person," who have better family support, and have fewer responsibilities at home) [Fritschi, 2009].


### 6.2 Working conditions
High workloads or inadequate staffing levels are likely to exacerbate the adverse effects of shift work on health, alertness, and performance [Bourdouxhe, 2000; Tzischinsky 2000]. It has been noted that appropriate attention should therefore be given to staffing levels, workload, job rotation, environmental exposures, emergency contingencies, and rest breaks [Rosa, 1995].
6.3 Measures to improve alertness and adaptation

A range of measures can help to enhance alertness during shift work, particularly during night shifts. As highlighted in the 2007 BMA Junior Doctors Committee and Academy of Medical Royal Colleges’ Trainees’ Committee joint position statement on on-call rooms, there is evidence that a nap of between 5 and 120 minutes during a night shift improves performance and alertness, and decreases fatigue [Purnell, 2002; Sallinen, 1998]. The importance of napping during shift work is also recognised by the Royal College of Physicians (RCP) and the Association of Anaesthetists of Great Britain and Ireland (AAGBI) [Association of Anaesthetists of Great Britain and Ireland, 2004; Horrocks, 2006].

In its 2006 guide to working night shifts the RCP recommends that doctors should try not to miss proper meals or start a shift hungry or dehydrated. They also recommend having a full meal prior to coming on duty, with a ‘lunch’ type meal consumed halfway through the duty period and a lighter meal consumed at the end of the shift [Horrocks, 2006]. The AAGBI further note the importance of providing access to good quality refreshments at all times in order to minimise the effects of poor eating habits during shift work.

Other measures to improve alertness include opportunities to contact colleagues, good physical fitness, on-the-job exercises, adequate light levels, a cool workplace, and regular breaks [Costa, 2003; Harrington, 2001; Knauth, 2003].

### 6.4 Education of managers and shift workers

Employers may have insufficient experience of shift work planning as well as the problems associated with shift working and their possible solutions. A potential method to overcome this is for employers to recognise the value of shift work experience when hiring managers and exposing new managers to an organisation’s shift pattern [Moore-Ede, 1995].

Educating shift workers on how sleep-wake cycles are controlled and how this knowledge can be used to maximise sleep quality, sleep duration, and alertness at work may provide a useful method to reduce the impact of working unsocial hours and shift working [Fritschi L 2009; Monk, 1992]. The AAGBI has recognised that the introduction of educational programmes about sleep medicine into basic medical training may lead to a better understanding of fatigue and its effect upon the individual [Association of Anaesthetists of Great Britain and Ireland, 2004].

6.5 Commuting
As noted in section 4.2, shift workers have been found to be more tired when driving to and from work than non-shift workers. A range of measures have been suggested to limit the adverse effect of shift working on driving, including:
- providing transport to take workers home
- offering a place where employees can take a nap before driving home
- when driving, keeping the interior of the car cool, listening to talk or music on the radio, varying the route, or using public transport [Moore-Ede, 1995; Prunier-Poulmaire, 2000; Shapiro, 1997].


6.6 Ensure adequate rest before, during and after duty
Establishing a successful sleeping routine is essential for mitigating the adverse effects of working shifts and unsocial hours. A range of measures have been identified to improve sleeping duration and minimise sleep disturbance associated with shift working and night shifts (see Box 1).
**Box 1: Measures to improve sleeping duration and minimise sleep disturbance resulting from shift work**

<table>
<thead>
<tr>
<th>Measures to improve sleeping duration and minimise sleep disturbance resulting from shift work</th>
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<tbody>
<tr>
<td>Build a successful normal sleep routine by maintaining a regular bedtime and wake-up time</td>
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<tr>
<td>Ensure two nights of good sleep before a work period</td>
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<tr>
<td>Get extra sleep before coming on duty</td>
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<tr>
<td>On getting home, try to sleep immediately</td>
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<tr>
<td>Develop a routine for sleeping during the daytime</td>
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<tr>
<td>Keep your sleep debt to a minimum</td>
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<tr>
<td>Ensure the bedroom is only associated with sleep and no work is done there</td>
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<tr>
<td>Ensure the bedroom is quiet, dark and cool (including the use of heavy curtains, eye masks, ear plugs, silenced telephone answering machines and mobile phones, air conditioning, and sound insulation on the doors and windows)</td>
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<tr>
<td>Avoid alcohol, caffeine, nicotine, and heavy eating and drinking before bedtime</td>
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<tr>
<td>Avoid exercise &lt;3 hours before sleeping</td>
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<tr>
<td>If unable to fall asleep within 30 mins, get up and do a relaxing activity</td>
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</table>


Measures to promote quick adaptation to shift work during the night include:

- using phototherapy lamps (especially those producing blue light, which is most efficient in resetting melatonin release time)
- wearing goggles/glasses which block the short wavelengths which are most likely to suppress melatonin
- wearing sunglasses when driving home
- the use of medications that are stimulants, hypnotics, or chronobiotics (substances that control the body clock) [Fritschi, 2009]. It should be noted that these medications can affect an individual’s judgement and performance, and should not be used during periods of patient care.

6.7 Efficacy of intervention strategies

It has been noted that there have only been a small number of low quality studies evaluating the effects of measures to reduce the impact of shift working, and these have found only limited effects [Bambra, 2008; Knauth, 2003]. The 2008 systematic review conducted by Bambra et al found beneficial effects were associated with the following types of interventions:

- increasing the speed of shift rotation (which was associated with improved sleep and reduced fatigue)
- changing from backward to forward rotation (which also led to improved sleep)
- allowing shift workers to have some control over which shifts they work, when they start work or when their rest days occur (which was associated with decreases in work absence, lower levels of fatigue, improved work-life balance and improvements in productivity) [Bambra, 2008].

7. Conclusion

There is a large body of evidence that shift working, in particular working variable shift patterns, can disrupt the body's circadian rhythm and may lead to adverse health effects for the worker. In the short-term it can lead to sleeping difficulties (shorter sleep duration and/or poor sleep quality), digestive problems and anxiety. In the longer term, the evidence is less clear:

- shift work that involves circadian disruption is probably carcinogenic to humans and there is evidence of an increased risk of certain cancers, most notably breast cancer
- a number of studies have found there to be an increased risk of gastrointestinal disorders, including a strong association between shift working and peptic ulcer disease
- shift work has been found to have a moderate negative effect on fetal growth in pregnant women (including being small for gestational age and low birth weight)
- there is evidence that shift work is associated with an increased risk of cardiovascular disease (in particular ischemic heart disease) but limited evidence for a causal relationship
- the disruption of the cycle caused by shift work has been found to be associated with a number of interconnected mental health disorders including depression and insomnia.

The evidence for the health effects of shift working originates from research in sectors traditionally associated with workers from lower socioeconomic groups who are likely to have an increased level of underlying ill health compared to higher socioeconomic groups. It is particularly noteworthy that there is very limited research on the health impacts of patterns of shift working specifically on doctors, with the available evidence focusing on the effect of working extended shifts and excessive hours.

Shift work may have a detrimental effect on performance – which may affect patient and personal safety. Effects on performance are largely a result of fatigue and disruption to the sleep/wake cycle.

There are a range of strategies aimed at mitigating the adverse effects of shift working, there is however limited high quality evidence to support their effectiveness. Interventions found to have a positive effect on sleep, fatigue, and/or work-life balance include increasing the speed of shift rotation, moving from backward to forward rotation, and involving workers in the design of shift schedules.

7.1 Way forward

The findings outlined in this paper indicate that further research is needed (in particular research specific to the health impacts of shift working on doctors) before formal policy can be developed on this matter. Further research is also needed on the health effects of working different shift patterns and the impact of interventions aimed at mitigating the adverse health effects of shift work.
8. Previous BMA work and policy

Reports and guidance

Shift work, Rest and Sleep: minimising the risks (Scottish Junior Doctors Committee discussion paper, 2010)
Consider the effects of shift work on both the worker and patient safety, and includes suggestions for risk minimisation for doctors working night shifts.

Shift and resident working – guidance for consultants: maintaining the continuity and quality of care (CCSC guidance, 2009)
Provides advice to doctors on contractual and pragmatic position of resident consultant work/shift work.

Sleep deprivation – effect on doctors (Board of Science, 2004 (updated 2006)
This briefing details existing research and outlines the effects of sleep deprivation including as a result of shift work. Notably that:

- work schedules that conflict with the regulating cues, such as light, may result in sleepiness at work and sleep disorders such as insomnia.
- shift workers are more likely to suffer from physical and mental health problems. Accidents at work are more likely to occur at night, and to be of greater severity. For example, medical interns on the night shift have been found to be twice as likely to misinterpret tests as during the day.

Implications for health and safety of junior doctors’ working arrangements (HPERU, 2000)
This provides a detailed account of the the effects of long working hours, sleep deprivation and disruption of circadian rhythms on performance and safety; health and wellbeing; and family and social life. It concludes that:

- there are substantial adverse health and safety effects associated with junior doctors’ working arrangements. The health and safety problems associated with juniors’ working patterns result from a combination of long periods of time spent working, insufficient sleep and working at times when the biological clock is programmed for resting and sleeping. Although it is difficult to separate the influence of these factors on health and safety, each one can be clearly identified with aspects of juniors’ working arrangements: number of hours worked each week, intensity of work and the type of pattern being worked.
the implications for changing working arrangements to minimise adverse effects in the current system may not be appropriate as it would consequently require changes to education and training, service commitments and the expectant lifestyle of doctors as members of a profession.

proper medical staffing planning, is essential if health and safety is not to be compromised.