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## Review

# Sleep: its importance and the effects of deprivation on surgeons and other healthcare professionals

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## Abstract

As clinicians, we sometimes fail to look after ourselves properly and do not regularly eat healthy foods or drink enough. Sleep is another factor that we often neglect. A lack of it can compromise our personal health and performance at work, and the “sleep debt” that results when this is chronic can take far longer to recover from than one might think. Now that junior doctors work more shift rotas and senior colleagues have onerous on-call responsibilities, we all need to be aware of the effects of sleep deprivation, which can lower the mood and motivation, weaken leadership, and result in more clinical errors. In this review we consider what might constitute enough sleep, the consequences of inadequate sleep, and how these might be addressed for surgeons.

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## Introduction

The health of a clinician may be linked to the level of care that they deliver. As surgeons, however, we often forget to consider our own wellbeing, and this can be detrimental not only to our own health, but also to the quality of care that we provide.<sup>1</sup> We have previously shown that appropriate hydration and nutrition are essential for us to function well professionally,<sup>2,3</sup> but we also need adequate sleep and rest to maintain both our physical and our mental health.

The quality of sleep is important to a person's health, and poor-quality sleep is associated with an increase in sick leave and long-term health problems.<sup>4,5</sup> Quality is measured by duration, the number of awakenings during the night, and the

ability to go back to sleep. Buysse suggested that good sleep health is characterised by subjective satisfaction, appropriate timing, adequate duration, high efficiency, and sustained alertness during waking hours.<sup>4</sup>

Sleep is needed to maintain optimum health and performance, as it supports the mechanisms that facilitate physiological and cognitive function - for example, it helps to integrate new memories and to moderate emotions,<sup>6,7</sup> two areas that are important for practising clinicians.<sup>7</sup> Many beneficial functions occur during the rapid eye movement (REM) stage, which the brain enters after we have been asleep for several hours, and a lack of it is associated with disorders such as depression.<sup>7</sup>

The exact duration that qualifies for normal sleep is disputed, and studies that have investigated sleep deprivation have used different values for inadequate amounts. Most, however, concur that anything less than five to seven

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hours/night is short,<sup>6,8,9</sup> while others advocate seven to eight hours as a “healthy” duration for adults.<sup>9,10</sup>

Sleep deprivation, which is common in adults, is particularly prevalent in healthcare workers, and all practising doctors will, at some point, be deprived of sleep.<sup>5,10–12</sup> Many, however, are unaware of the dangers and signs of a lack of it in themselves,<sup>5,6</sup> and this can have potentially dangerous consequences for them personally and for the patients they treat. Physical or mental health conditions can affect the quality of sleep and, as the latter are particularly relevant to surgeons (who are less likely to seek help for them),<sup>5,10,13</sup> it is important that we are all aware that poor-quality or inadequate sleep can be a cause or exacerbating factor.<sup>13,14</sup>

Studies on the effects of the amount and quality of sleep on workplace performance often include poor or incomplete data.<sup>6</sup> This is possibly because the tasks being tested lack uniformity, and different standards are used to denote what is adequate or of good quality. Performance at work is the result of many factors, and it can be difficult to evaluate sleep alone. Much research has been done in this area, but more conclusive evidence is needed to ascertain the minimum amount and the quality that are needed for doctors to function adequately and avoid any associated risks to their own health. Inevitably, the amount will vary among people, but an agreed lower limit would be a good start, and would help when devising rotas, shifts, and on-call obligations.

### Sleep-deprived clinicians increase the risk to patients

Many doctors now work shifts that can totally and erratically change the body clock. For example, after a few days working in the daylight, junior doctors might do a week of nights from 8 pm to 8 pm with little or no time to adapt. During many shift rotas there is no chance to sleep or even the facilities to do so. During the night, clinicians are likely to work with fewer colleagues or even alone, so other members of the team may not be able to compensate for deficits in their performance. Working alone when one is deprived of sleep can create a potentially hazardous environment for patients,<sup>5</sup> and Lenzer reported a three-fold increase in patients’ deaths from preventable events when sleep-deprived, American first-year residency doctors were on call.<sup>15</sup>

Less than five hours of sleep/night reduces the ability to do previously learned tasks and to remember; it also impairs the ability to make decisions, and lowers concentration.<sup>6,10</sup> Studies on sleep-deprived clinicians have also reported slower reaction times.<sup>6,16</sup> Such cognitive deficits can therefore be expected to have a negative impact on the ability of junior doctors to learn when working.<sup>12</sup>

Comparisons between the armed forces, aviation industry, and health service, which all require the highest levels of cognition (often for extended periods of time), are useful, as they allow the findings and application of research to be shared.<sup>17</sup> Tiredness compromises the safety and efficiency of

tasks done by military personnel because they are less alert,<sup>11</sup> and this can equally apply to clinicians who face intense mental challenges. The aviation industry has accepted the need to adapt to changes in sleep patterns, and airline pilots now have rest days both before and after flights at night. This, however, has not been adopted widely in healthcare, and junior doctors often move from a day rota to a week of nights with only one day to adjust.

In emergency, trauma, and ITU settings, the ability to make quick and calculated decisions is essential. Doctors who cannot function to the best of their ability can make attention-related errors that not only compromise a patient’s care,<sup>11,18</sup> but also put themselves in danger. For example, studies have shown an increased incidence of self-inflicted needle-stick injuries when clinicians are tired.<sup>6,11</sup>

Fatigue that is attributed to a lack of sleep can have a negative impact on mental flexibility (a measure of the ability to adapt to changes in a procedure) and can affect surgeons in acute settings in which changes and complications develop quickly. Its effects can be counteracted if surgeons take a short break of about 20 seconds every 20 - 30 minutes, as it makes the procedure less taxing and scarcely affects the operating time.<sup>1</sup> We use this technique routinely and, if it is safe to do so, simply turn away from the operating table, walk around, or look out of a window. It is well worth trying.

Where possible, we also advocate taking a short break (5-10 minutes is usually adequate) every two to three hours to drink and eat. This “lost” time is readily caught up, as the break can refresh and improve performance.<sup>2</sup> Further suggestions to mitigate the effects of a lack of sleep include increasing the duration of sleep taken before starting a shift (“banking” sleep<sup>11</sup>) or taking a short rest whenever possible (Fig. 1).

Chronic sleep deprivation is worrying. It has been shown that eight hours of sleep/day for three days is not enough to recover normal levels of cognitive function after chronic sleep deprivation because of the “sleep debt”.<sup>11,17</sup> It is imperative that clinicians try to avoid being deprived of sleep for long, as it is hard to recover from, and will have a considerable impact on their clinical performance and their health. After a period of night shifts, it is therefore important that there are a few days for rest and recuperation before the next shift begins.

### Lack of sleep is associated with marked changes in behaviour

Burnout is a serious problem for doctors and is associated with demanding working conditions and emotional stress.<sup>19,20</sup> The strains of working in such environments increase the risk of suicide, and clinicians are 2.45 times more likely to take their own lives than those in other fields of employment.<sup>14,21</sup> Many surgeons think that there is not enough support to counteract burnout, though individuals themselves often know when their work is being affected.<sup>19</sup>



Fig. 1. Children are well adapted for sleep, even for a short period (published with one of the authors' (DAP) permission).

The consequences of burnout include poorer performance, lower motivation, and depersonalisation. Surgeons can become overly detached from their patients and teams, and this may jeopardise a patient's care.<sup>14,20</sup> Conflicts of interest and uncertainty (whether real or perceived) that arise from burnout, can affect clinicians in this situation and have a negative impact on their physical and their mental health.<sup>20</sup>

Effective work by healthcare teams improves the care of patients. A considerable number of preventable errors have been attributed to deficits in teamwork and communication,<sup>22</sup> and the team needs to work efficiently if patients are to be treated safely.<sup>22,23</sup> Changes in character, mental instability, anxiety, depression, and suicide, have all been seen in doctors who were deprived of sleep,<sup>6,10,14,15</sup> and the effects on mood have been noticed more than those on cognition or performance.<sup>6,16</sup> A study of US army officers reported that chronic sleep deprivation had strong associations with a reduction in the quality of leadership, which included lower levels of morale, optimism, and emotional intelligence.<sup>1</sup> These qualities are essential for a multidisciplinary team to be effective, and it will be less so if the leader, such as a consultant surgeon in theatre, is deprived of sleep.

Poor sleep can lower levels of performance at work and result in people taking more risks,<sup>24</sup> possibly because of changes in self confidence.<sup>1</sup> This, together with alterations in perception and empathy (which are also attributed to sleep deprivation) could also compromise patients' safety.

Chronic fatigue and loss of sleep can cause longer lasting changes, including mental health issues. Two studies

found that fatigue from being on call was a causal factor in the development of apathy and medical errors, and subsequently led to burnout.<sup>18,25</sup> Another reported that five hours of sleep/night over one week led to the development of emotional instability.<sup>7</sup> In a study on the effects of limiting the working hours of resident doctors, Hutter et al found that burnout scores had been reduced and doctors felt less emotionally drained.<sup>26</sup> Further work has suggested that rest in the form of leisure may be beneficial, and that participation in recreational activities improves clinicians' quality of life and motivation.<sup>26</sup>

Working environments that do not allow adequate time to rest and to prepare for a change in shift are considered hazardous.<sup>25</sup> Rotas that do not consider or take into account the effects of fatigue can put the health of their doctors at risk and reduce the level of care that they provide for their patients. Goldstein and Walker reported that a loss of sleep for one night resulted in an increase in anger and impulsiveness, even in low-stress situations,<sup>7</sup> and there are strong correlations between impulsive and suicidal thoughts, both of which are linked to sleep deprivation.<sup>7,27</sup> The aviation industry noticed that attitudes and behaviours such as impulsiveness, deviation from authority, and invulnerability, correlated with an increased incidence of accidents.<sup>27</sup> The response, which was to acknowledge and discourage them, has resulted in zero tolerance by most airlines.<sup>27</sup> Ensuring that sleep and rest are adequate can minimise the negative behaviours and attitudes that are heightened when people are tired.

It has been suggested that certain personality traits (aggression, independence, and self-sufficiency) can be found in people with high-level academic degrees. These traits, which are thought to contribute to an increased incidence of avoidable errors, can be exacerbated by sleep deprivation.<sup>27</sup>

### Persistent sleep deprivation impinges on life outside the hospital

The effects of inadequate sleep (both quality and quantity) have an impact on the performance of doctors at work and at home. This is particularly true for surgeons in whom burnout rates are high.<sup>14</sup>

Doctors who are deprived of sleep are more likely to be involved in road traffic accidents because they may be driving whilst drowsy.<sup>1,15,24</sup> Chronic sleep deprivation has deleterious effects such as increased waking during the night, insomnia, and sleepiness during the daytime,<sup>6,10,28</sup> and a cumulative loss of sleep is related to increased irritability.<sup>7</sup> In the short term these may be manageable, but chronic cases can lead to habitual problems such as substance and alcohol abuse.<sup>6,13,21,28</sup> Doctors who are tired after a busy night shift should try to get some sleep before driving home, but many Trusts do not provide facilities to do this.

Shift work affects both health and productivity,<sup>5</sup> and sustained levels of insufficient sleep pose a risk to health. Some

doctors develop coping mechanisms, but we suggest that these are not satisfactory solutions, as chronic inadequate sleep is an important risk factor for the development of obesity, diabetes, hypertension, and cardiovascular disease. St-Onge et al found that people who slept for shorter periods consumed more calories, which generally came from snacks and fatty food.<sup>9</sup> Chronic short durations of sleep also increase mortality.<sup>8,24,28,29</sup>

We have recently promoted the importance of adequate nutrition for a clinician's health and work.<sup>2,3</sup> The tendency to eat poor quality food (which is encouraged by inadequate sleep), and over eating, do not support a surgeon's health and their ability to care for their patients.

In conclusion, the effects of sleep deprivation are quick and marked, with a resultant fall in performance<sup>3</sup> and an increased risk of error. Clinicians, however, often neglect their own health in favour of their clinical duties.<sup>2</sup> To work to the best of our ability as surgeons, it is imperative that we have enough sleep and rest both during and after disruptive working rotas (particularly night shifts), and Trusts and managers must respect this. As requirements for sleep vary, it is important that we recognise the signs of fatigue in ourselves and other members of our teams, and feel able to seek help and support where necessary. Like so many other human factors that affect performance, the need for sleep and rest, and the potential for adverse consequences in the high-stakes environment in which we work, should be taken seriously.

### Conflict of interest

We have no conflicts of interest.

### Ethics statement/confirmation of patients' permission

Not required.

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