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1. Recommendations:

- Every anaesthetist carries a personal obligation to provide a safe and effective service and should be aware of the problem of fatigue.

- Departments must have a plan to manage staff at all grades who have undertaken an onerous duty period and consider themselves unfit to continue work.

- Job plans should be constructed that are not likely to lead to predictable fatigue.

- Job plans of career grade staff should include flexibly worked fixed theatre sessions without named lists in order to provide regular relief for colleagues.

- Routine rest breaks should be implemented.

- A ‘Handover Protocol’ should be used before every rest break, even short ones.

- Equipment checking protocols should be instituted with regular, repeated use for long cases and before each out of hours case.

- All hospitals should ensure the availability of ‘on-call’ rooms for those doctors working night shifts, to enable rest breaks.

- Management should provide accommodation adjacent to the theatre suite for napping and ‘post-call’ sleeping facilities.

- Good quality accommodation should be available for resident on-call staff.

- All staff should have access to good quality refreshments at all times.
There should be a review of on-call responsibilities for anaesthetists over 55 years of age (in conjunction with advice from an accredited specialist in occupational medicine)

Private practitioners must ensure that a combination of NHS and Private work does not lead them to practice when compromised by fatigue
2. Introduction

2.1. Physiological factors cause fatigue. Neither pride nor professionalism can overcome them.

2.2. The consequences of fatigue have been recognised for many years as a problem in transport. All anaesthetists are aware of instances where tiredness may have had an adverse effect either on themselves or a patient.

2.3. The Working Time Regulations are directed toward limiting the number of working hours for employees for health and safety reasons.

2.4. Workload pressures, insufficient numbers of personnel and increasing complexity of procedures all magnify the problem of fatigue in medicine. This has been recognised in publications by anaesthetic bodies in America\textsuperscript{i} and Australia and New Zealand\textsuperscript{ii}.

2.5. This document will explore the problem of fatigue in anaesthesia and makes proposals that will reduce the risks for both patient and practitioner. The background and further information supporting this document and its recommendations are available on the Association of Anaesthetists of Great Britain and Ireland’s web site (www.aagbi.org).
3. Fatigue and Medical Practice

3.1. Many studies have shown that fatigue reduces medical task performance. ECG interpretation accuracy is reduced\textsuperscript{iii}, and intubation skill diminished in emergency room physicians working the night shift compared with similar staff during the day\textsuperscript{iv}.

3.2. 2.7\% of all reports in the Australian Incident Monitoring Scheme (AIMS) listed fatigue as a factor contributing to the incident\textsuperscript{v}. These included: pharmacological incidents (eg: syringe swaps, wrong drug), haste, distraction, inattention and failure to check equipment.

3.3. Decreased performance due to fatigue may be increased in older physicians who are less tolerant of night and shift working. This may have great significance in view of the increasing demand being placed on Senior Career Grade Staff for night, weekend and resident on-call cover.

3.4. Two studies of “anaesthesia providers” report that more than 50\% admit that they had made errors in medical judgement attributable to fatigue\textsuperscript{vi, vii}.

3.5. The overall welfare of patients is the responsibility of the Chief Executive of the Trust or Hospital (or the licence holder in the independent sector) who, through the process of clinical governance, ensures that appropriate systems are in place to ensure delivery of a service that is both safe and effective. This places an onus on trust managers to ensure that working practices and duties are formulated to avoid fatigue in their staff.
4. Definitions and Physiology

4.1. **Fatigue**: a subjective feeling of the need to sleep, an increased physiological drive to fall asleep and a state of decreased alertness. Fatigue is the inability to continue effective performance of a mental or physical task. Fatigue is personal, hard to identify unequivocally and, consequently, difficult to measure and / or regulate. It should not be confused with habituation, lack of motivation or boredom, although these may contribute to fatigue.

4.2. **Sleep** is a state of reversible unconsciousness in which the brain is less responsive to external stimuli. Sleep is distinguished from unconsciousness and anaesthesia by a characteristic cycle of sleep phases associated with specific EEG patterns and physiological changes.

4.2.1. It takes two consecutive nights of **optimal** sleep at the correct time to recover from significant sleep loss.

4.2.2. Sleep requirements do NOT lessen with age; this is a commonly held misconception. Over the age of 45 years:
- The number of awakenings increases with a deterioration in sleep quality
- Repaying sleep debt by extending sleep time is more difficult

4.3. A fatigued individual may suffer an episode during which they may be unresponsive to external stimuli. These spontaneous “microsleeps”, may last seconds, or even minutes, and the sufferer may be unaware of these. Extreme pressure for sleep can result in “shut down” regardless of the situation.

4.4. **Circadian Rhythm**: The natural body rhythm associated with sleep and wakefulness. The normal rhythm drives the 24-hour sleep-wake pattern, daily digestive activity, hormonal secretions, and mood as well as alertness and performance levels. Humans are programmed for increased sleepiness twice daily at approximately 3 – 7 am and 1 – 4 pm.
4.4.1. If the rhythm is disrupted, a reduction in performance and alertness results (e.g., jet lag and shift working). This may present as forgetfulness, increases in reaction time, lethargy, apathy, and reductions of vigilance, psychomotor coordination, information processing and decision-making ability.

The greatest risk of a reduction of alertness and performance occurs where significant sleep loss is combined with circadian rhythm disturbance.

4.4.2. Subjective feelings of fatigue are inaccurate and underestimated. A challenging situation can make an individual feel more awake, but does not overcome the pressure for sleep. Anaesthetists are most at risk of microsleeps and loss of vigilance during the maintenance period of an anaesthetic.

4.4.3. Night work creates its own challenge by its disruption of circadian pattern. Individuals working at night have circadian programming driving sleep and when they attempt to sleep during the day, their clock is programmed for wakefulness.

4.4.4. Studies have shown that, even with prolonged exposure to night work, adaptation does not occur. Many individuals cannot reset their body clock to allow effective daytime sleep after night duties. Daytime sleep is typically shorter and of inferior quality compared with sleep at night.

4.5. Stress: Mental emotional or physical strain or tension. Stress occurs when there is a perceived imbalance between demands being made and an individual’s ability to meet those demands.
5. Factors affecting Fatigue

5.1. General health
Studies of motor vehicle accidents identified untreated sleep apnoea as the only significant health factor responsible for an increased likelihood of accident. Sleep apnoea is estimated to affect 1% of the adult population and sufferers who continue to drive may be up to six times more likely to be involved in a road traffic accident.

5.2. Hypovolaemia and hypoglycaemia
Many resident staff find it increasingly difficult to obtain food and drink during long periods of duty during anti-social hours. As a result they may become hypovolaemic or hypoglycaemic, both conditions which may decrease reaction times or psychomotor performance.

5.3. Alcohol and drugs
5.3.1. Increased alcohol intake and the use of so-called recreational drugs impair performance when driving. Legislation limits the level of alcohol and drugs in the blood deemed safe for driving purposes. Clearly, use of alcohol and drugs will impair the performance of any task, be it manual or intellectual.

5.3.2. Alcohol is widely used to promote sleep; however, it has the potential to significantly disrupt it. It is a potent suppressor of Rapid Eye Movement (REM) sleep and, as the blood alcohol level declines, there is likely to be a rebound increase in REM sleep with the risk of increased awakening and hence a reduction in total sleep time. In addition, there may be changes in the tendency to fall asleep that are dependent upon the time the alcohol was taken.

5.3.3. Psychomotor performance impairment due to fatigue can be shown to correlate well with that produced by ingestion of alcohol. 17 hours of wakefulness results in a decrease in performance equal to that produced by a blood alcohol level of
50 mg% and, after 24 hour without sleep, this decrement was equal to that produced by 100 mg% of blood alcohol. (The blood alcohol level in the UK above which disqualification from driving is mandatory is 80 mg%)

5.4. Other Factors
Medication may worsen fatigue. The BMA Board of Science and Education’s paper ‘Driving under the influence of drugs; an internet resource’ refers to the danger of drowsiness caused by simple over-the-counter medications such as ‘cold cures’ or antihistamines.
6. Work Patterns

6.1. Workload and patterns of work have a major effect on fatigue. Volume and complexity of work may both contribute. Paradoxically, monotony can be equally tiring. In each instance, there is a requirement to maintain concentration and vigilance.

6.2. The risk of error due to fatigue during long, boring or repetitive activities is considerable. An individual must at all times maintain a level of concentration which enables them to assimilate information and to respond rapidly and appropriately.

6.3. Disruption of normal circadian rhythms increases the likelihood of fatigue. The advent of shift work may pose risks to performance. (see Section 7) Even if not working shifts, efficiency will deteriorate during the hours normally spent asleep.

6.4. The wide range of activity that anaesthetists undertake can be arduous and will contribute to fatigue and impair function. Protocols and strategies for fatigue prevention must be identified that will be equally effective in these varied situations. These should include clearly defined controls on the duration both of high intensity and of tedious activities. There must also be realistic and effective provision for support and/or relief. This will take a variety of forms to suit individual situations. It is particularly important that standardised handover procedures are established and adhered to with every change of anaesthetic personnel (See Appendix 1).

6.5. The subspecialties of Intensive Therapy (ITU) and Obstetrics pose special problems because of their truly ’24-hour’ activity. Within the theatre environment, with the exception of rare emergency operations for life or limb threatening conditions, activity is controllable, or should be. Within the Delivery Suite and ITU, workload is not controllable. The anaesthetist must remain present and available to respond to emergencies.
6.6. Changes in professional and social values have led to pressure for the same regulations already applied in other walks of life to be applied to the medical profession, as well as the application of statutory instruments to control working hours. The BMA has responded in a cautious manner to these moves, aware of the difficulties of reducing working hours but at the same time maintaining quality training and high standards of patient care. One such alternative mechanism proposed to provide this continuity of care is the concept of ‘team working’.

6.7. Trainees
With the implementation of the "New Deal" working pattern and the proposed implementation of the EWTD in August 2004 the number of continuous hours worked by trainees has, and is being, significantly reduced, with many trainees moving toward a shift pattern. Although there is no doubt that there has been a reduction in hours worked it is not yet clear whether this equates to a decrease in fatigue levels.

6.8. Staff and Associate Specialist (SAS) career grades
6.8.1. SAS grade posts were intended originally to improve service provision during ‘normal’ working hours and the Staff Grade post, particularly, was not intended to address deficiencies in out of hours cover. That principle has been slowly eroded due to manpower shortages and regularisation of trainees’ hours of work. This change in work pattern for SAS career grades will be exacerbated by the introduction of the EWTD regulations.

6.8.2. Surveys of work-load since 2000 show that SAS doctors are being expected to accommodate more of their fixed sessions outside normal working hours. This group already has existing problems of isolation, poor support structures, absent lines of communication and low morale. All these factors contribute to fatigue and are likely to deteriorate further for SAS doctors as a consequence of changes in work patterns affecting both consultant and trainee colleagues.
7. Shift Work and Health

7.1. Over the past 30 years, several reviews \(^{xvii,xviii}\) have identified gastro-intestinal dysfunction and chronic sleep deprivation as the principal concerns of shift workers.

7.1.1. The former presents as vague, non-specific abdominal symptoms, elevated by many into a clinical entity “shift work maladaptation syndrome”. Peptic ulceration is more common in shift workers, often attributed to such factors as poor catering facilities, increased consumption of cigarettes and caffeine, reliance on alcohol to promote sleep etc.

7.1.2. There is no conclusive evidence however that sleep deprivation in shift work results in chronic ill-health. The incidence of cardiovascular disorders is increased in shift workers and this appears to be related to the number of years of exposure.

7.2. Essentially four patterns of shift work are usually considered.

7.2.1. The commonest is the weekly rotation. It is the most socially acceptable and the easiest to integrate into lifestyle but has the major disadvantage that physiological adjustment is neither complete nor totally lacking. The result is often a difficult compromise.

7.2.2. Rapid rotation systems require one or two days at each level before rotation to the next in sequence. Physiological adjustment becomes impossible and management is aimed at reducing the sleep debt, fatigue and poor performance as well as the chances of disorientation.

7.2.3. The third pattern is permanent night work, which shares certain functional characteristics with a slowly rotating shift pattern.
7.2.4. With slow rotation, there is a minimum of ten consecutive shifts before a move to the next one in the sequence. Physiological adjustment is possible here despite significant personal costs. Problems will develop when the adjustment is lost during days off. Readjustment needs to take place when there is a return to work. Physiological adjustment is difficult to achieve with irregular shifts and requires maintenance of some form of 24-hour activity and significant self-discipline.

7.3. Shift systems develop according to local need and are often characterised by the number of hours worked per shift, the speed of rotation and its direction. Normal shift length is eight hours but increasingly 12 hours is becoming common, permitting longer time off. In the military context, six hours on and 12 hours off are more normal. Long shifts result in fatigue, loss of sleep and performance decrement.

7.3.1. Shorter shifts are therefore popular when highly sophisticated equipment is used. Vague feelings of discomfort and disorientation similar to jet lag occur with rapid rotation and irregular shift patterns as well as those based on non-24 hour cycles. This is due to disruption of the 24-hour cycle and the emergence of a more natural 25-hour one.

7.3.2. The long-term health effects of this “shift maladaptation syndrome” are unknown. The direction of the rotation should be in the phase delay direction, morning-afternoon-night-rest days. For practical reasons, the reverse, afternoon-morning-night-rest days, is often preferred. However, physiological adjustment is less easy to achieve.
8. Shift Patterns

8.1. The introduction of shift working has been proposed as one way of reducing hours worked; however, unless this can be combined with a total reorganisation of theatre and ward working patterns this cannot result in any effective increase in work done\textsuperscript{xxix}.

8.2. To achieve this, all necessary support services (anaesthetic technicians and nurses, laboratory, porters and ward staff) must have an integrated work pattern.

8.3. Similar qualifications (and other concerns) also apply to the introduction of ‘long days’. This implies the utilisation for elective work of lists lasting up to 12 hours. Without the commensurate infrastructure throughout the hospital to support such lists, patients will be put at risk.

8.4. This Working Party believes that a 12-hour list is not an acceptable working practice for an individual anaesthetist of any grade without proper relief periods for refreshment and rest during the 12 hours. The EWTD requires that a rest period of 20 minutes is taken after a six-hour work session. A possible structure could be as follows:

\begin{center}
During the 12-hour period
Meal Breaks – minimum one hour
Rest period – 3 x 20 minutes
\end{center}

8.5. Surgery which is expected to be very prolonged requires special provision and is probably best dealt with by the allocation of two anaesthetists who jointly undertake the case in its entirety. Departments should have systems to address this problem when it arises unexpectedly.

8.6. Planned naps can improve subsequent alertness and performance. They provide one of the most direct and basic interventions to counter sleep deprivation and require no training or technology for effective use\textsuperscript{1}.  

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9. Independent Practice Considerations

9.1. Fatigue occurs in whatever setting the anaesthetist chooses to work. Practitioners undertaking a full day’s work in the NHS followed by a twilight shift in independent practice are at particular risk of exceeding the 13-hour maximum shift length defined in the Working Time Regulations.

9.2. The attitude taken by the courts or insurers to medical accidents occurring when either the maximum daily shift length or the 48-hour week length has been exceeded is unknown, but likely to be punitive.

9.3. There is little doubt that if anaesthetists form group practices the ability to minimise the length of the working day is facilitated.

9.4. The obligation to control workload in the independent practice environment currently rests upon the doctor acting as an independent contractor.
10. Fatigue Reduction

10.1. The AIMS Study\(^6\) suggests a number of factors that can minimise fatigue related incidents: These include relief strategies, regular and rehearsed equipment checking routines, improved workplace design (including drug ampoule and syringe labelling protocols) and regulation of working hours.

10.2. Educational programmes about sleep medicine are already in use in other non-medical areas\(^1\). Their introduction into basic medical training would lead to a better understanding of fatigue and its effect upon the individual.

10.3. Recognised techniques to minimise sleep disturbance include:

   i) Regular bedtime and wake-up time
   ii) Sustained adequate sleep
   iii) Two nights of good sleep before work period
   iv) Bedroom associated with sleep (No work done there)
   v) Bedroom quiet, dark and cool
   vi) Avoid heavy eating and drinking before bedtime
   vii) No alcohol, caffeine, nicotine close to bedtime
   viii) No exercise < 3 hours before sleep time
   ix) If not asleep within 30 mins, get up and do some relaxing activity

10.4. Napping has been shown to be of positive benefit in improving subsequent alertness and performance. In a study of pilots\(^\text{x}\) a 40-minute nap increased performance by 34% and physiologic alertness by 54% compared with the no-nap condition. If a longer nap is possible, two hours is beneficial as it permits one cycle of deep Non-REM sleep. Facilities to permit napping should be readily available.
10.5. Caffeine is probably the stimulant most widely used to maintain wakefulness. Its onset of action occurs 10-15 minutes after ingestion and lasts about 3-4 hours, although this is reduced by tolerance. Its adverse effects include tremors and palpitations and these may reduce its usefulness in susceptible individuals. Caffeine ingestion should be stopped at least one hour before a sleep period.

10.6. Regular rest breaks may be helpful to allow a reactivation of interest. A protocol must be developed and used before and after each break to allow proper handover to occur to the relieving anaesthetist and to ensure that errors of omission or commission do not occur. (see Appendix 1)

10.7. Refreshments must be provided for staff who cannot leave the theatre environment to ensure the avoidance of hypoglycaemia or dehydration. Snacks or meals must be nourishing and appetising to allow a period of relief from case-side care to be complete and sustaining.

10.8. Bright lighting can increase alertness and move the circadian clock. Physical activity can be used to reduce fatigue and counter sleepiness. Conversation may be beneficial to prevent sleepiness but the benefit must be balanced against the danger of distraction.

10.9. Following a period of out-of-hours work with significant disturbance to normal sleep, an anaesthetist should be able to divest him/herself of clinical commitments on the subsequent day or until there has been an opportunity to take an adequate rest period.

10.10. It is recommended that hospitals continue the provision of “on call” rooms for doctors working night shifts.
10.11. All staff have a professional duty to behave responsibly before work. No conscientious anaesthetist would indulge in excessive alcohol consumption prior to a period of duty. After a demanding period of duty is complete, full recovery should be possible before the anaesthetist is expected to drive a motor vehicle to return home. The employer must make such recovery facilities available, or arrange suitable transport home. (See Appendix 2)

10.12. Sensible use of holiday and break periods is important. The anaesthetist who enters into a contract to provide services as a locum to his own or another Trust during annual leave periods from his base is not likely to be adequately refreshed on his return.
11. Effects of Proposals

11.1. A decrease in fatigue and all its associated consequences must result in an increase in patient safety and quality of care. The Working Party believes that rapid adoption of the measures proposed would be in the best interests of the Service.

11.2. The beneficial effects of these proposals on the quality of life for the anaesthetist also seem to be self-evident. The working party believes that minor restrictions on leisure activities will be of positive value to the anaesthetist as well as the patient.

11.3. One consequence of these proposals would be to transfer as much work as possible to the day-time. That would also be in accordance with the wishes of the National Confidential Enquiry into Perioperative Deaths (NCEPOD).

11.4. The Association of Anaesthetists of Great Britain and Ireland has published the results of a Working Party into Theatre Efficiency. We also believe that our recommendations fit well with their conclusions, particularly with the proposal to move more work from the night to the day.
Appendix 1

Handover information

- Names of Anaesthetists and time of handover should be entered on the chart
- Name, age, ASA grade
- Procedure, surgeon
- LA/GA
- Regional technique details
- Pre-existing conditions
- Method of airway maintenance (+ difficulty)
- Dentition
- Type of ventilation
- Gas/ volatile agent flow rates
- Use/ time of opioids
- Use/time of neuromuscular blocking agent
- Antibiotics/ anti-emetic use
- Fluid balance/blood loss
- Patient positioning
- General condition
- Adverse events
- Plan for reversal of anaesthesia
- Postoperative analgesia/fluid plan
Appendix 2

Management of Alertness

• Minimise Sleep Debt by maximising sleep prior to on-call
• Nap whenever possible for 45 minutes or >2 hours
• Overcome sleep inertia by increasing light levels, stretching, walking briskly, being relieved and taking refreshment
• Alert colleagues if microsleeps/nodding off occurs and ask for relief
• Whenever relief is available, take a break
• Caffeinated drinks
• If working next day, nap rather than working through
• Nap before driving home
• Post-call, sleep rather than party to pay off sleep debt. Go to bed earlier than normal
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