Fatigue and Anaesthetists

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21 Portland Place, London, W1B 1PY
Tel: 020 7631 1650 Fax: 020 7631 4352
Email: info@aagbi.org
www.aagbi.org

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Membership of the working party
(details correct at the start of the working party process)

Dr Kathleen Ferguson	AAGBI, Chair of working party
Dr Felicity Howard	GAT
Dr Chris Idzikowski	Edinburgh University Sleep Centre
Dr Barry Nicholls	AAGBI
Dr Mike Peters	BMA
Dr Felicity Plaat	AAGBI

Contents

This is a consensus document produced by expert members of a Working Party established by the Association of Anaesthetists of Great Britain and Ireland (AAGBI). It updates and replaces previous guidance published in July 2004. It has been seen and approved by the AAGBI Board.

- **What other guideline statements are available on this topic?**

  There are several guideline statements published by other healthcare professional groups within the UK and overseas. Some high fidelity industries provide evidence-based guidance on fatigue management to their employees [1-4].

- **Why was this guideline developed?**

  The original guideline (2004) was developed as a reference document for individuals and departments when considering the effects of hours of work and type of work undertaken in anaesthesia on clinician's performance and wellbeing. The primary goal was to improve patient safety.

- **How and why does this statement differ from existing guidelines?**

  This new guidance is an update on the previous document. Additional research on the impact of the European Working Time Directive on clinician performance and fatigue provides new evidence to support the recommendations.

Date of review: 2018

1. Preface

The first edition of the *Fatigue and Anaesthetists* guideline was published in 2004 in paper and extended web versions. The document provided recommendations on how to anticipate and mitigate the effects of fatigue for anaesthetists in the workplace. A major driver in producing the document was to reduce risk to patients by considering the impact of fatigue on anaesthetists' performance and wellbeing and thus, in turn, on the incidence of critical incidents in practice.

Since 2004, the effects of the New Deal agreement for junior doctors' working hours and the enforcement of the European Working Time Directive (EWTD) have taxed departments in their ability to deliver service and training. Hours of work were cut drastically; previously rotas often covered over 80 hours per week. Acute care specialities have been adversely affected and anaesthesia, in particular, due to the intensity of out-of-hours work and the number of rotas to be covered by single departments.

Nine years on, 48 hours are the suggested contractual maximum for job plans. Out-of-hours rotas have survived the move by variable means: introduction of hybrid rotas, complex on-call arrangements and full and partial shift patterns. The resulting squeeze on training time has produced a knock-on effect on consultant working patterns: many departments have consultants first or second on-call in theatre, labour ward and intensive care medicine.

Evidence is growing of new working patterns, shift types and their effects in the healthcare setting. There is also increasing evidence of the detrimental effects of extended working hours and shift patterns on individual wellbeing [5, 6].

The *Fatigue and Anaesthetists* publication is being refreshed, adding current evidence to support the recommendations. Changing service and training demands plus increased requirement for professional accountability all add to the pressure of a high-intensity time-pressured job. This AAGBI resource hopes to serve as an aid to managing fatigue in individuals and departments.

2. Recommendations

- In keeping with the General Medical Council (GMC) guidance in *Good Medical Practice* [7], every doctor is required to provide safe and effective care and therefore should be aware of the issues of fatigue. (2004)
- Departments must have a plan to manage staff of all grades who have undertaken an onerous duty period and consider themselves unfit to continue work. (2004)
- Job plans should be constructed such that they are not likely to lead to predictable fatigue. (2004)
- Routine rest breaks should be implemented [8]. (2004)
- Handover protocols should be used before and after every rest break. (2004)
- Rest facilities and on-call rooms should be available for staff to nap during shifts or sleep post-call. (Updated 2013)
- Resident on-call staff should have suitable accommodation. (2004)
- Refreshments should be available at all times. (2004)
- On-call responsibilities should be reviewed regularly and, particularly in the older anaesthetist, take into consideration subjective assessment of fatigue (consider seeking advice from an accredited specialist in occupational medicine). (Updated 2013)
- Education on fatigue, its causes, mitigating factors, and its impact on healthcare should be a priority for anaesthesia departments. (New 2013)

3. Introduction

What is fatigue?

Fatigue is a subjective feeling of the need to sleep, an increased physiological drive to fall asleep and a state of decreased alertness [9]. Its consequences include a decreased capacity to perform mental or physical tasks and are manifest in reduced physiological performance and cognitive impairment [3]. Inadequate sleep is the most important single factor impacting on fatigue. Common scenarios leading to sleep-related fatigue include insufficient sleep, prolonged wakefulness and being awake when normally one would be asleep [10].

Fatigue may manifest itself in characteristic behaviour patterns that vary between individuals: yawning and difficulty staying awake, poor concentration and co-ordination, head drooping, eye rubbing or heavy eyelids, general feelings of lethargy, lacking motivation, error events and lapses in attention [4]. As an alternative to self- or colleague-assessment of observed behaviours, the risk of fatigue may be quantified subjectively using tools such as the Samn Perelli checklist (Appendix 1) [11]. Objective assessment is out of the individual's capability but subjective assessment along with a sleep diary (Appendix 2) and good practices can be used to demonstrate appropriate rest during and between periods of work.

What is sleep and how much of it is optimum?

Sleep is a complex physiological process during which the brain remains active but is less responsive to external stimuli, while undertaking tissue healing and repair and consolidation of learning and memory. Normal sleep consists of several phases and is associated with specific EEG patterns and physiological changes. Sleep follows a diurnal rhythm sleep-wake cycle and is controlled by a circadian pacemaker in the suprachiasmatic nucleus in the hypothalamus. Research has demonstrated that the circadian pacemaker would naturally function within a 25-hour cycle. Light input via the retina and other external stimuli called zeitgebers act to maintain the sleep-wake cycle within the 24-hour day/night cycle [12, 13]. Sleepiness peaks twice in any 24-hour period: 02.00-04.00 and 13.00-15.00. The circadian rhythm ensures that the best sleep is achieved when going to bed between 22.00 and 02.00 and that there is difficulty in sleeping during 08.00-12.00 and 17.00-21.00. The potential adverse impact upon shift workers is obvious.

Most adults require eight hours of restorative sleep each night. This varies between individuals. Restorative sleep may be inadequate due to reduced quality (awakenings during sleep periods) or insufficient time afforded to sleep. When sleep is restricted for two or more consecutive nights, a sleep debt accumulates. Two consecutive nights of restorative sleep is required to recover from significant sleep loss [14]. Evidence shows that moderate sleep restriction to six hours per night for two weeks leads to performance reduction equivalent to one night with total sleep deprivation [15].

When wakefulness is extended beyond what is normal (16-18 hours), cognitive function is impaired [15, 16]. This may manifest as slow response time, increase in attention lapse frequency and impaired memory functions, addition and subtraction ability, and decision-making. Periods of extended wakefulness may be quantified in terms of the effects of an equivalent blood alcohol level [17]: after 20 hours of wakefulness (coincident with a circadian low point) performance is impaired equivalent to that with a blood alcohol of 0.1% (100 mg.100 ml^{-1} blood). The legal limit for driving in the UK is 80 mg.100 ml-1 blood. Night workers have been shown to be at increased risk of vehicle accidents in association with sleep-related fatigue [18, 19].

Sleep patterns change with age. The requirement for eight hours sleep remains but the periods of REM sleep are reduced, leading to sleep fragmentation [20]. There is a reduction in the depth and consolidation of sleep. Older people suffer from frequent and early awakenings with an exaggerated dip in arousal mid afternoon. The ability to recover from a sleep debt is decreased and so the older anaesthetist may be less able to cope with night shift work [21, 22]. Although those over 55 years are considered aged persons in terms of work physiology, intolerance to night shift and shift work may begin as early as 45-50 years of age. There is considerable individual variation in susceptibility and physical, psychological and social factors all play a role [23].

Fatigued individuals may suffer from sleep lapses or ‘microsleeps’ where they remain unresponsive to external stimuli for very short periods of time (seconds to minutes). These episodes of sleep are spontaneous, brief and uncontrolled [24]. Sleep inertia is characterised by a temporary disturbance in performance on awakening. Its duration depends on the depth of sleep at the time of wakening and sleep deprivation enhances its appearance [25, 26].

4. Why are anaesthetists at risk of fatigue?

Intensity and type of working

Fatigue is a function of time on task; the longer the hours of working, the greater the risk of fatigue developing [27]. It is also important to recognise that time spent awake may be substantial given the other demands when balancing daily living and working. This may be particularly relevant to staff with young families and those with other responsibilities. There is a near exponential rise in errors associated with increased time on task. Long shifts (12 hours) lead to a doubling of risk compared with an eight-hour shift [27]. This must be taken into consideration when planning for long surgical procedures. The previous working party concluded that "*a 12-hour working day is not acceptable working practice for an individual anaesthetist of any grade*". Current evidence would agree with this statement.

The complexity of tasks affects the state of fatigue. Regular activity serves to reduce fatigue while mundane and lengthy tasks increase the likelihood of fatigue developing [28].

Sleep disturbance – on-call

On-call patterns of work predispose to poor quality sleep for several possible reasons: unplanned interruptions move sleep opportunities out of sync with circadian rhythm and poor timing of zeitgeber stimuli adversely affect the circadian sleep/wake cycle. In a recent online survey of AAGBI members (Appendix 3), > 60% of respondents reported working out-of-hours as an on-call pattern. This activity was associated with post-call tiredness and sleep debt.

Sleep deprivation – shift patterns

Individuals who work shift patterns are at risk of developing poor sleep patterns due to circadian rhythm disruption. The relative risk of adverse incidents increases as shifts move from morning to afternoon to night. Risk is greatest at the beginning of a night shift, and increases over successive night shifts from 17% on the first night to 36% on the fourth [29].

5. What are the risks?

Performance and safety

With adverse effects of fatigue on performance and safety accepted, work should be organised to take place in daytime hours, making use of increased alertness and peak performance [29, 30]. Regular breaks should be incorporated into the working day [31] with comprehensive handover protocols used in support [32].

Wellbeing

Evidence is accruing to support claims of an association between impaired health and sleep disturbance/deprivation. Shift workers may experience poor dietary habits, peptic ulceration, increased prevalence of obesity and the development of the diabetic state. Other conditions associated with fatigued shift workers include hypertension, transient ischaemic attacks and cerebrovascular accidents. Further research is required to prove causation following a report on an increased breast cancer risk in Scandinavian nurses working night shifts [33]. Disturbed circadian homeostasis is implicated in the pathophysiology of these conditions [34]. Individuals should be encouraged to follow good sleep hygiene practices and to prepare for periods of duty by ensuring adequate restorative sleep before and after rostered duties.

Service provision

Restricted hours of work, in conjunction with reducing trainee numbers and central control of career grade expansion, creates a staffing void for service delivery. Career grade staff cannot fill this gap without appropriate consideration of the consultant and staff and associate specialist doctor role in job planning and the effects of fatigue [35].

All grades of anaesthetist perform out-of-hours work either in an on-call capacity or in shift patterns. The provision of rest breaks within and at the end of periods of work must be catered for within department rostering [34]. Planning of shifts must take into account lengths of shift, numbers of nights worked consecutively and periods of rest before return to work. Rotas should not consist of more than four nights in a row. Rotas of nine hours provide the minimum effect on cognitive function but are difficult and costly (staffing) to organise. Rotas in a forward rolling pattern (day-evening-night) provide the least adverse effects on sleep patterns [18]. The effects of ageing on sleep and fatigue mean that specific consideration must be made when allocating of out-of-hours duties to the older anaesthetist.

6. How can fatigue be avoided, modified, or managed?

Strategies to reduce and mitigate the effects of fatigue include: good sleep hygiene, techniques to minimise sleep disturbance (Appendix 4), napping, caffeine ingestion, bright light exposure, regular rest breaks and exercise, avoiding hunger and dehydration, maintaining alertness and avoiding alcohol ingestion before a period of duty [2, 3, 36].

Several industries and organisations such as aviation, transport services, the oil industry and the Queensland Government Health Department [4] have introduced fatigue management systems into their practices. This proactive approach to managing fatigue in the workplace is based on education for all levels of the team. Diary evidence of sleep patterns and hours of work are kept and assessed to determine the risk to the individual and the service caused by fatigue. The initiative in Queensland Health is supported by Government legislation [37] and departments are required to have contingency plans to support staff when fatigue raises the risk level unacceptably high. Monitoring is routine.

Electronic devices and apps are available, both to facilitate maintaining a diary of activity and sleep (Appendix 2), and also for self-assessment of mental performance [38].

Less is known of the effects that non-technical skill development in individuals and teams may have on the monitoring, reporting and management of fatigue in medical practice. The recent GMC review of the effects of the EWTD alludes to this point and highlights this as an area for research in the future [4, 6].

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8. Appendix 1

Subjective assessment of fatigue – Samn Perelli checklist

(Accessed via http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA125319)

1. Fully alert, wide awake
2. Very lively, responsive, but not at peak
3. Ok, somewhat fresh
4. A little tired, less than fresh
5. Moderately tired, let down
6. Extremely tired, very difficult to concentrate
7. Completely exhausted, unable to function effectively

Appendix 2

Sample Sleep Diary

Date and Name	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
Time to bed							
Time to wake							
Hours of sleep							
No. of wakenings							
Total time awake							
How long to fall asleep							
How awake did I feel when I got up 1 = wide awake 2 = awake but a little tired 3 = sleepy							
Caffeinated drinks and times							
Alcoholic drinks and times							
Exercise and times							
How sleepy did I feel I during the day 1 = so sleepy I struggled to stay awake 2 = somewhat tired 3 = fairly alert 4 = wide awake							

Appendix 3
Membership Questionnaire 1 (Errors and Fatigue countermeasures)

Have you ever napped/fallen asleep/microslept whilst undertaking anaesthesia? Total number responding **178**								**Yes** **89**	**No** **89**
Do you have knowledge of a colleague who has napped/fallen asleep/microslept whilst undertaking anaesthesia?								**120**	**58**
How old are you in years?	24-29 **8**	30-34 **31**	35-39 **28**	40-44 **28**	45-49 **27**	50-54 **28**	55-59 **21**	60-64 **7**	65+ **0**
Which grade do you work in?			Training **45**			SAS **11**		Consultant **121**	
Which pattern of work do you undertake to provide out-of-hours service?			Shift **46**			Rostered extended hours **7**		On-call **109**	Other **13**
Have you made mistakes in your work which you relate to tiredness?								**127**	**49**
Have you experienced tiredness at your work which you relate to your work pattern?								**165**	**13**
Has fatigue affected your personal life outside the workplace?								**178**	**16**

How do you counteract fatigue related to your work?

% (n)	**Always**	**Usually**	**Sometimes**	**Never**	**Rating average**
Napping	2.9 (5)	15.6 (27)	59.0 (102)	22.5 (39)	3.01
Caffeine	31.3 (55)	30.1 (53)	28.4 (50)	10.2 (18)	2.18
Leave	5.3 (9)	9.9 (17)	41.6 (71)	43.3 (71)	3.23
Post-call sleep	15.8 (27)	36.3 (62)	32.7 (56)	16.2 (26)	2.47
Sleep debt	12.3 (20)	33.7 (55)	44.2 (72)	9.8 (16)	2.52
Early to bed	9.6 (17)	36.7 (65)	50.8 (90)	2.8 (5)	2.47
↑Activity level	0.6 (1)	19.0 (33)	50.6 (88)	29.9 (52)	3.10
Frequent breaks	1.2 (2)	17.3 (30)	52.6 (91)	28.9 (50)	3.09
Ask for help	0.6 (1)	4.6 (8)	51.4 (90)	43.4 (76)	3.38

Membership Questionnaire 2 (Health & Wellbeing)

Have you ever napped/fallen asleep/microslept whilst undertaking anaesthesia? Total number responding **187**								Yes **94**	No **93**
Do you have knowledge of a colleague who has napped/fallen asleep/microslept whilst undertaking anaesthesia?								Yes **125**	No **63**
How old are you in years?	24-29 **7**	30-34 **34**	35-39 **27**	40-44 **28**	45-49 **28**	50-54 **29**	55-59 **27**	60-64 **8**	65+ **0**
Which grade do you work in?		Training **48**				SAS **11**		Consultant **127**	
Which pattern of work do you undertake to provide out-of-hours service?		Shift **48**				Rostered extended hours **8**		On-call **113**	Other **15**
How many hours of sleep do you consider you need each night before work the following day?					0-5 **4**	5.5- 7.5 **114**	8-9 **65**	9.5-11 **5**	>11 **0**
How many hours on average do you actually get on nights before clinical work?					0-5 **15**	5.5- 7.5 **144**	8-9 **26**	9.5-11 **1**	>11 **2**
Do you think you get sufficient sleep to meet the demands of your job?								Yes **123**	No **61**
Do you regularly have to catch up on sleep following routine clinical duties?								Yes **55**	No **132**
Do you regularly have to catch up on sleep following out-of-hours clinical duties?								Yes **146**	No **38**

Appendix 4

Minimise sleep disturbance:

- Maintain a sleep diary alongside an hours-of-work record
- Regular bedtime and wake-up time
- Sustained adequate sleep
- Two nights of good sleep before work period
- Bedroom quiet, dark and cool
- Avoid heavy eating and drinking before bedtime
- No alcohol, caffeine, nicotine close to bedtime
- No exercise < 3 h before bedtime

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of Great Britain & Ireland

21 Portland Place, London, W1B 1PY
Tel: 020 7631 1650
Fax: 020 7631 4352
Email: info@aagbi.org
www.aagbi.org