Driving and Medical Aspects of Excessive Daytime Sleepiness: A consensus workshop
Road Safety Research Report No. 45
Driving and Medical Aspects of Excessive Daytime Sleepiness: A consensus workshop

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QinetiQ

March 2004
Department for Transport: London
Although this report was commissioned by the Department, the findings and recommendations are those of the authors and do not necessarily represent the views of the DfT.
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1 Background

The importance of driver fatigue and sleepiness to road safety has received considerable coverage in the past few years, with fatigue being a factor in one in five motorway accidents. At least some of these accidents are likely to be due to the medical causes of excessive daytime sleepiness.

During July 2002, an expert workshop was held to consider the implications of the medical aspects of Excessive Daytime Sleepiness (EDA) to driving. This report is an account of the workshop and has been prepared in close consultation with all participants. It includes a collection of position papers that reflect participants’ views prior to the workshop, as well as the group’s views and recommendations at the end of the workshop and a list of proposed revisions to the relevant Driver and Vehicle Licensing Agency documentation. The position papers submitted prior to the beginning of the workshop have not been edited.

1.1 List of participants

The following experts were present:

Dr TC Britton  
Department of Neurology  
King’s College  
University of London

Dr ARC Cummin  
Department of Respiratory Medicine  
Charing Cross Hospital  
London

Professor NJ Douglas  
Department of Medical and Radiological Sciences  
University of Edinburgh  
Edinburgh

Professor J Horne  
Department of Human Sciences  
University of Loughborough  
Loughborough

Dr JM Shneerson  
Respiratory Support and Sleep Centre  
Papworth Hospital  
Cambridge
Professor J Stradling  
The Osler Chest Unit  
Churchill Hospital  
Oxford

Dr AJ Williams  
Lane-Fox Respiratory Unit  
St Thomas’ Hospital  
London

Dr T Carter  
Chief Medical Adviser  
Department for Transport  
London

Dr H Major  
Senior Medical Adviser (Acting)  
Driver and Vehicle Licensing Agency  
Department for Transport  
Swansea

Professor AN Nicholson  
Programme Manager  
Medical Aspects of Fitness to Drive  
Department for Transport  
London

Dr GL Wetherall  
Medical Adviser  
Driver and Vehicle Licensing Agency  
Department for Transport  
Swansea
2 Points of discussion

2.1 The contribution of medical causes of daytime sleepiness to accident involvement

The participants considered that driver sleepiness was an important factor in driving safety. Some modern lifestyles (particularly shift work) are a common cause of sleepiness in drivers, and sleep loss in general is of concern. There is an inadequate appreciation among drivers of the potential critical contribution of sleep loss to accidents. Drivers frequently claimed that they were not aware of having fallen asleep before an accident. This is supported by observations from simulator studies that after having fallen asleep, few individuals remembered having been asleep unless they had slept for at least 2 minutes. However, though individuals may not have remembered the moment they fell asleep and poorly recalled the degree of sleepiness prior to falling asleep, most would have been aware, at the time, that they were fighting sleep and could have taken appropriate action.

It is widely accepted that impaired cognition, poor attention and excessive risk taking affected driving behaviour. However, the interactions between disturbed sleep, daytime sleepiness and safe driving involved unresolved issues. Disturbed sleep was not necessarily associated with excessive daytime sleepiness. Nevertheless, the workshop participants considered that excessive sleepiness during the day with narcolepsy and sleep apnoea presented significant issues for road safety.

Many physicians believed, from talking to patients with sleep disorders, that some patients posed a high road safety risk. Further, they considered that drivers with sleep disorders were less able to cope with the sleep loss inherent in a lifestyle that involved sleep disturbance. It was also considered that sleep disorders may make a significant contribution to accidents in the elderly. The exact contribution was not known, though it was felt that sleepiness in the elderly tended to be multi-factorial with sleep disordered breathing a common event. The potential contribution of sleep disorders to impaired safety on the road was a particularly important issue, as such disorders were readily diagnosable and amenable to treatment.

There are limited data available on the relevance of medical causes of poor sleep to road safety. Nevertheless, the workshop participants concluded that sleep disorders of medical origin were a significant cause of Sleep Related Accidents (SRAs), though their exact contribution to the incidence of accidents needed to be established.

2.2 Narcolepsy and other neurological causes of excessive daytime sleepiness

The narcoleptic syndrome is a chronic neurological disorder characterised by excessive daytime sleepiness (narcolepsy) and usually associated with cataplexy and other symptoms related to rapid eye movement (REM) sleep intruding into wakefulness. Dysfunction of the hypothalamus and brainstem (possibly related to alteration in hypocretin/orexin levels) is believed to be the cause of the excessive daytime sleepiness, although poor quality of sleep
at night, frequently associated with the narcoleptic syndrome, may also contribute. Naps
during the day usually occur in situations where sleep might be anticipated (sitting as a
passenger in a car), but can occur more suddenly and in inappropriate situations (talking to
someone). The onset of sleep in patients with the narcoleptic syndrome may be more sudden
than that in some patients with obstructive sleep apnoea. The Workshop considered that
excessive daytime sleepiness, low alertness (possibly as a result of poor nocturnal sleep) and
cataplexy may all contribute to the increased risk of motor vehicle accidents in patients with
the narcoleptic syndrome.

Parkinson’s disease is associated with a variety of sleep disorders (REM sleep behaviour
disorder, periodic limb movements in sleep) that may result in excessive daytime sleepiness.
In addition, patients with Parkinson’s disease have been reported to have sleep attacks
(unpredictable sleep episodes) while driving, possibly related to their medication. The
Workshop considered that, irrespective of whether excessive daytime sleepiness is due to the
condition itself or to its treatment, all patients with Parkinson’s disease should be asked
about the quality and duration of their nocturnal sleep. Further, enquiries should be made
about the occurrence of inappropriate or unexpected sleep during the day. Similar enquiries
should be made of all patients with neuro-degenerative diseases (multiple system atrophy,
progressive supranuclear palsy, dementia), as sleep disturbance may be a common feature.

Patients at risk of developing chronic respiratory failure as a result of neuromuscular and
skeletal disorders (for example patients with myotonic dystrophy) may also develop
excessive daytime sleepiness. The Workshop considered that an adequate sleep history and
an appreciation of the implications of the diagnosis were important aspects in the
assessment of drivers.

2.3 Sleep apnoea/hypopnoea syndrome

The diagnosis of sleep apnoea is based on excessive daytime sleepiness together with direct
or indirect evidence of frequent, obstructed breathing events during sleep. The diagnosis
requires an assessment of respiration during sleep with evidence of repetitive desaturations
or reductions in airflow. The frequency of apnoeas or related events provides an indication
of the severity of the condition.

Treatment with Continuous Positive Airway Pressure (CPAP) is effective. It reduces both
apnoeas during the night and daytime sleepiness, even though a minority of patients using
CPAP still feels sleepy. There is a reduction in road traffic accidents with the use of CPAP.
In the management of sleep apnoea there could be the need to reassess the value of CPAP
by sleep studies, although this is only likely to be necessary in a few cases. Relief of the
symptoms of sleep apnoea correlates with CPAP compliance. A confident assessment of the
effectiveness of CPAP needs sleep studies, together with objective evidence of the use of
CPAP and improved symptoms.

In general, patients tend to overestimate their use of CPAP, but machines are available that
record nightly usage. Such a machine records the time the mask was worn. The Workshop
considered that Group 2 drivers requiring CPAP should use a CPAP machine that records
'mask on' time. Medico-legal issues could arise with respect to the extent of the use required to have a satisfactory clinical effect.

The Workshop observed that impairment to driving in some patients with sleep apnoea could be similar to that of a driver with a blood alcohol concentration above the legal limit. Accidents could be caused by inattention or by falling asleep at the wheel. Patients with sleep apnoea often had an increased rate of accidents though, after an event, they may not necessarily have appreciated that sleepiness was the cause. There was no validated procedure for the assessment of daytime sleepiness in a driver that can predict with sufficient precision the individual risk – but this was common to many other medical disorders such as diabetes and epilepsy.

Clinical severity is correlated to a limited extent with the frequency of apnoeas during sleep, but the relationship is not robust. Patients may have lost their perception or judgement of sleepiness. Most knew they were sleepy, but may not have realised that they were unusually sleepy prior to the accident. Long-term problems with daytime sleepiness could lead to loss of the sense of what was an acceptable level of daytime alertness. However, many patients were aware of the problem and had devised strategies to reduce their exposure to risk.

The Workshop considered that treatments such as weight reduction, mandibular advancement devices, tonsillectomy and uvulo-palato-pharyngoplasty (UPPP) were of limited value in sleep apnoea. The usefulness of UPPP surgery had not been clearly established. Most participants were of the opinion that, in general, the effectiveness of UPPP surgery was limited, even though occasional patients were helped. UPPP surgery may only be effective in the short term and in those with the mildest sleep apnoea. Mandibular advancement could be of benefit to some. Drugs that promote wakefulness can alleviate daytime sleepiness. The use of such drugs in drivers with excessive daytime sleepiness due to sleep apnoea and not relieved by CPAP was problematical. Careful supervision would need to be exercised.

### 2.4 Clinical responsibility and health education

In focusing on the risk of sleepiness to road safety the Workshop was concerned with excessive daytime sleepiness due to a medical condition. It was considered that the perceived risk with sleep disorders of medical origin appeared to be translated to an increased risk of accidents. Clearly, there were some individuals with sleep disorders that were not at increased risk. Further, some may have adopted tactics such as rests, naps and short journeys and so may not have been at any greater risk than the population at large.

Nevertheless, the Workshop concluded that there was an increased risk of accidents with some sleep disorders, especially narcolepsy and sleep apnoea. Further, that particular attention should be paid to those drivers with these disorders who have a relatively higher exposure to the risk of an accident. Group 2 drivers tended to spend much longer hours on the road, had a tendency for shift work and may have felt under pressure to drive if they were not fit. Accidents involving these drivers could be of a serious nature. The key issue was how to address the undiagnosed, but potentially high risk, driver with a sleep disorder.
In this context the Workshop considered that the practicalities of improving the recognition and management of the complaint of excessive daytime sleepiness needed to be explored. This would involve increasing the awareness of drivers, their employers and health professionals. The provision of literature to sleep centres directed toward drivers, campaigns involving employers, revision of current regulatory documentation, recording of notifications, and the use of the web site were suggested. Increased awareness on the part of the driver brought about by such information would prove useful in the long run. The Group 2 driver would, from their initial licence, be aware of the potential problem of excessive daytime sleepiness and, therefore, be less of a hazard if they later developed a sleep disorder. The Workshop considered that improvements in the education of health professionals with respect to the implications of sleep disorders to road safety would also lead to more efficient referral procedures.

The Workshop emphasised that it was important for the medical practitioner and the regulatory authority to create a supportive environment in which the health and safety of drivers were improved, and avoid being perceived as trying to prevent drivers earning their living. In this context the regulatory authority could, with benefit to the patient, be concerned with the provision of literature. However, the regulatory process depended on the honesty of the driver, and it had to be accepted that questionnaires (even with carefully directed questions related to excessive daytime sleepiness) would have limitations. Drivers may not choose to reveal their symptoms. It was essential that the nature of the licence (private or commercial) being considered by the practitioner was abundantly clear, so that the clinical assessment was well directed. A supportive approach improved the likelihood of formal counselling and increased the likelihood of effective treatment.

It was the firm conclusion of the Workshop that it was the responsibility of the clinician to advise the driver of the implications to road safety of the complaint of excessive daytime sleepiness and/or the diagnosis of a sleep disorder. The driver should be clearly aware that they had a sleep disorder that made them more liable to sleepiness, and that they must be especially careful not to drive when sleepy. Essentially, the advice from the clinician to the driver must be ‘do not drive when sleepy’ and ‘inform the regulatory authority if they experience sleepiness while driving’. Patients, not the medical practitioner, were responsible for informing the regulatory authority of the diagnosis of a symptomatic sleep disorder. The Workshop discussed briefly the circumstances under which a medical practitioner should consider making a direct approach to the regulatory authority on behalf of the driver. The workshop noted the procedure agreed between the Driver and Vehicle Licensing Authority and the General Medical Council. It is recorded in the ‘At a glance Guide to the current Medical Standards of Fitness to Drive’ issued by the Drivers Medical Unit.
3 Consensus observations and recommendations

The invited participants observed that:

- Disorders of sleep of medical origin are a significant factor in Sleep Related Accidents (SRAs). Medical Practitioners should be encouraged to ensure prompt investigation of drivers with Excessive Daytime Sleepiness.

- It is the responsibility of the driver not to drive when sleepy, to take appropriate action should they become sleepy and to inform the regulatory authority if their sleepiness is due to a medical condition. It is not the responsibility of the physician to inform the regulatory authority of the diagnosis, except in exceptional circumstances.

- The investigation of neuro-degenerative (including Parkinson’s disease) and neuro-muscular disorders should include an adequate sleep history. Sleep difficulties in these disorders require further attention.

The recommendations of the workshop participants are:

- Group 2 drivers should be provided with information on sleepiness and the risk of accidents. This could be provided at the time of initial applications for a licence and on renewals.

- The medical status of individuals involved in Sleep Related Accidents should be established.

- The contribution of medical causes of Excessive Daytime Sleepiness to Sleep Related Accidents needs further study.

- The prognosis and accident record of drivers with the complaint of Excessive Daytime Sleepiness (but who are presently considered safe to drive) should be studied.

- Cataplexy should be assessed as a potential risk factor in accidents. A follow up of patients with narcolepsy with respect to safe driving should be carried out.

- The prevalence and significance of symptomatic and asymptomatic sleep apnoea in Group 2 drivers should be determined.

- Support is needed from the regulatory authority for the use of smart CPAP machines (that provide checks on compliance by recording ‘mask on’ time) in appropriate circumstances.

- Drivers and medical practitioners should be made aware that it is current medical opinion that surgical procedures are unlikely to be of wide benefit in the management of sleep apnoea, and that the use of drugs that promote wakefulness needs careful supervision.

- The regulatory authority should consider how appropriate literature for patients attending sleep centres can be provided.
4 Position papers

The following sections contain the position papers prepared by the workshop participants prior to the workshop. Although following attendance some views stated in this position papers may have altered, the papers have not been changed.

4.1 DVLA position paper: Medical aspects of excessive daytime sleepiness

Dr H Major
Acting Senior Medical Adviser
Drivers Medical Group

Background

Sleepiness is increasingly recognised as a potentially preventable cause of road traffic accidents.

Pathological sleep disorders, carrying an increased liability to excessive daytime sleepiness, are also increasingly diagnosed. It is unclear whether this represents a true increased prevalence of these conditions or represents a greater awareness of the conditions and availability of effective treatment.

Research information

A 1994 study in Edinburgh (N Douglas et al) showed that more than 2 per cent of women and 4 per cent of men are affected by sleep apnoea in middle age. As many as 80 per cent of symptomatic cases of OSA may remain undiagnosed.

Data from Haraldsson in the early 1990’s suggested that between 22 and 57 per cent of patients with obstructive sleep apnoea had habitual sleepy spells when driving. Such patients may have up to a twelve-fold increase in motor vehicle accidents compared with asymptomatic controls.

UK Police statistics suggest that sleepiness (all causes) accounts for between 15 and 20 per cent of accidents on ‘monotonous roads’.

A study by the Department of Transport into Driver Sleepiness, August 1998 – July 2000, (Road Safety Research Report No. 21) shows:

- An increased likelihood of serious injury from sleep related vehicle accident, the peak risk periods for such accidents are between 2 a.m. and 7 a.m. and 2 p.m. and 4 p.m.
• 40 per cent of sleep related vehicle accidents involve commercial vehicles.

• That young men under 30 years of age are more likely to have a sleep related vehicle accident than other drivers.

In addition drivers whose ‘Epworth score’ is towards the top of the normal range have an increased rate of motor vehicle accident. Causation was not established.

**The Law – Road Traffic Act 1988**

*The Road Traffic Act 1988* empowers the Secretary of State (in effect DVLA) to undertake medical enquiry providing there are ‘reasonable grounds’ to suppose that the licence holder/applicant suffers from a **relevant or a prospective disability**.

A **relevant disability** is:

• any of the prescribed disabilities (epilepsy, inability to read the number plate etc.);

• or ‘any other disability likely to cause the driving of a vehicle by him in pursuance of a licence to be a source of danger to the public’.

A **prospective disability** is:

• any disability which by virtue of its progressive or intermittent nature or otherwise may become a relevant disability in the course of time.

If it appears from the applicant’s declaration or if on enquiry the Secretary of State is satisfied that the applicant is suffering from a relevant disability the Secretary of State **must** refuse to grant the licence.

**Licence holder’s duty**

‘If at any time during the period for which his licence remains in force, a licence holder becomes aware ... that he has a relevant or prospective disability ... the licence holder **must** notify the Secretary of State of the nature and extent of the disability.’

**Licensing categories**

<table>
<thead>
<tr>
<th>Pre 1/1/97</th>
<th>Post 1/1/97</th>
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<tbody>
<tr>
<td>GROUP 1 (ordinary)</td>
<td>GROUP 1 (ordinary)</td>
</tr>
</tbody>
</table>
vehicles <7.5 tonnes | vehicles <3.5 tonnes |
cars, m/cycles, vans/small lorries, minibuses (<16 seats) |
GROUP 2 (vocational, LGV/PCV)  
vehicles >7.5 tonnes  
buses, lorries etc  

GROUP 2 (vocational, LGV/PCV)  
vehicles >3.5 tonnes  
includes categories:  
c/c1/c+e (LGV)  
d/d1/d+e (PCV)  

DVLA procedures  

*Drivers Medical Group (DMG) caseload*

Drivers Medical Group at DVLA assesses some 350,000 medical cases annually.

During the year January – December 2000, fewer than 1000 cases of pathological sleep disorder were notified, of which 866 were cases of symptomatic obstructive sleep apnoea (OSA). More than 60 per cent of these were Group 2 (LGV/PCV) drivers; all were men. The majority of the OSA cases fell within the age groups 41 to 60, with overall peak incidence in the 51 to 60 group (copies of recent DVLA statistics attached).

DVLA’s medical advisers are familiar with the symptoms of sleep apnoea syndrome and of narcolepsy, which represent the two sleep disorders most frequently notified to the Department. However, different licensing standards pertain.

Drivers Medical Group is also broadly aware of the types of clinical assessment undertaken in such patients, including the use of the ‘Epworth score’, sleep diaries, overnight polysomnography studies. DMG also has some understanding of the various treatments (CPAP, jaw advancement) for OSA and of the available treatments for narcolepsy/cataplexy.

*Medical Assessment Process*

Drivers have a legal obligation to notify DVLA of the fact of their diagnosis of pathological sleep disorder. It is however a doctor’s duty of care to advise patients of the need to notify the Licensing Authority.

On notification, a licence holder is asked to complete a medical enquiry form SL1 (copy attached) and to provide consent for medical enquiry to be undertaken.

Enquiry is normally made of the consultant or specialist involved, but for Group 1 drivers, GP enquiry may be undertaken if the patient does not provide consultant details. The form SL2 (copy enclosed) is used for this process.

On receipt of the information, DMG staff follow defined operating instructions to assess whether or not there is adequate control of the sleep disorder, depending on the index diagnosis. If the condition is not sufficiently controlled, the licence will be refused/revoked. Those refused a licence or whose licence is revoked are advised accordingly and their GP also informed. Such patients have the right of appeal to the local Magistrates’/Sheriff’s Court against such decisions.
In all cases where a licence is issued/retained, of whatever duration, an information letter is sent both to the licence holder and to the GP to advise that the licence has been issued and of the need to notify should there be progression of symptoms (sample letters attached).

**Licensing standards**

**Narcolepsy/cataplexy:**

<table>
<thead>
<tr>
<th>Group 1 (ordinary driving licence)</th>
<th>Group 2 (LGV/PCV)</th>
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</thead>
<tbody>
<tr>
<td>Licence holders must notify DVLA</td>
<td>Licence holders must notify DVLA</td>
</tr>
<tr>
<td>Driving should cease on diagnosis and will be permitted only when satisfactory control of symptoms has been achieved</td>
<td>Patients suffering from narcolepsy/cataplexy are generally considered unfit to hold Group 2 entitlement on a permanent basis</td>
</tr>
<tr>
<td>Regular licensing review will be required, normally on a three yearly basis, until at least seven years of good control has been attained. A ‘till 70’ licence will be issued thereafter</td>
<td>Where, however, a long period of control has been established licensing may be considered on an individual basis</td>
</tr>
</tbody>
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**Obstructive Sleep Apnoea syndrome** (or other causes of excessive daytime sleepiness except narcolepsy)

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<thead>
<tr>
<th>Group 1 (ordinary driving licence)</th>
<th>Group 2 (LGV/PCV)</th>
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<tbody>
<tr>
<td>Licence holders must notify DVLA</td>
<td>Licence holders must notify DVLA</td>
</tr>
<tr>
<td>Driving should cease until there has been satisfactory control of symptoms confirmed by medical opinion</td>
<td>Driving should cease until there has been satisfactory control of symptoms with ongoing compliance with treatment, confirmed by specialist opinion</td>
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<tr>
<td>A ‘till 70’ licence is normally retained (but review may be required in individual cases)</td>
<td>Licensing is normally subject to annual review, with consultant reappraisal at each renewal</td>
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**General advice for drivers with symptomatic sleep disorders**

DVLA's view is that drivers (patients) need to recognise the benefit of, and necessity for, effective treatment and should be encouraged to continue with this to maintain licensing fitness.
Drivers should also be warned (by their doctors) about the dangers of driving when sleepy and must heed that warning.

Drivers with symptomatic sleep disorders should not recommence driving until treatment has been established and symptoms successfully controlled.

Treatment must continue in line with medical advice to maintain control of symptoms (and thus on-going driving fitness).

The forms included with this portion paper (pages 17–29) are those used by DVLA at the time of the workshop.
Medical Fitness to Drive

We need the following information to enquire into your fitness to hold a driving licence.

Please answer all the questions and sign and date the declaration and consent at the end.

Use black ink only.

1. Your details:
   Full Name
   Address
   Postcode
   Daytime or home telephone number
   Driver Number (if known)
   Date of Birth

2. Your Doctor's details:
   Name of family Doctor (or Group Practice)
   Address
   Postcode
   Telephone number (if known)

3. Details of your Specialist Clinic(s)
   (Note: If this section does not apply to you, go to question 4)

3a. SLEEP DISORDER / NEUROLOGY CLINIC
   Consultant
   Hospital
   Address
   Tel No
   Give dates (approx) of attendance within last 12 months:
   Hospital record number

3b. RESPIRATORY CLINIC
   Consultant
   Hospital
   Address
   Tel No
   Give dates (approx) of attendance within last 12 months:
   Hospital record number

4. Other Hospital/clinic attendance(s) within the past 3 years
   Consultant
   Hospital address
   Reason for attendance

   Consultant
   Hospital address
   Reason for attendance

Rev. July 2000

M0 1/3
Consent and Declaration.
This section MUST be completed and must NOT be altered in any way.

Please sign the statements below

I authorise my Doctor(s) and Specialist(s) to release reports to the Secretary of State’s Medical Adviser about my medical condition.

I authorise the Secretary of State to disclose relevant medical information about me to Doctors or Paramedical staff as necessary in the course of medical enquiry into my fitness to drive.

I declare that I have checked the details I have given on the enclosed questionnaire and that to the best of my knowledge they are correct.

Signature

Date

I authorise the Secretary of State’s Medical Adviser to release medical information to my Doctors and/or Specialists about the outcome of my case. (This is to enable your Doctor to advise you about fitness to drive).

Signature

Date

NOTE ABOUT CONSENT

You will see that we have asked for your consent, not only for the release of medical reports from your doctors, but also that we might in our turn very occasionally release medical information to Doctors or Paramedical staff, either because we wish you to be examined, and the doctor needs to know the medical details, or because we require further information. You need to understand quite clearly how we define Paramedical staff. Many patients need to be assessed in Driving Assessment Centres who employ Occupational Therapists, Physiotherapists, Orthoptists and experienced driving instructors, all of whom need to understand about a patient’s medical condition in order to be able to produce a helpful report. Only occasionally do we need to do this and it may well not apply in your case. We never under any circumstances release information which is not relevant to fitness to drive, nor would we expect to receive this from your Doctors.

We hope you will find this helpful and reassuring and will return the signed consent so that we might proceed with our investigations.
1. Please confirm the diagnosis: [tick ✓ appropriate box(es)]

(a) Narcolepsy ☐ (b) Sleep Apnoea Syndrome ☐
(c) Other ☐ details: __________________________________________
__________________________________________________________

2. Date of diagnosis: [ ] [ ] [ ]

3. Is the condition now controlled? YES ☐ NO ☐

4. Are you now free of excessive drowsiness occurring in inappropriate situations? YES ☐ NO ☐

5. Please give details of your treatment: __________________________________________
________________________________________

6. Has the condition ever caused a driving accident? NO ☐ YES ☐

If "YES", please give approximate date: ________________________________
Dear Doctor

I am considering the fitness of one of your patients to hold a driving licence. The information that has been provided indicates a medical condition of and I would be most grateful if you would complete the enclosed questionnaire. The decision about the patient's licence and fitness to drive cannot be made until I have this information. On receipt of your report a fee of £ will be paid.

Patient's Details
Name:
Address:
Date of birth:

A prompt reply would be appreciated so that the licence can be processed quickly. For many patients a driving licence has importance for employment, but delay causes anxiety for everyone. If you would like to fax your reply the number is above.

Please would you note that the patient is entitled on request to copies of any medical documents (after 1 November 1991) which are held by the DVLA unless it is specified in writing, that doing so could cause serious harm to the patient.

The patient's written consent, and a stamped addressed envelope is enclosed.

Yours sincerely

[Signature]

Senior Medical Adviser
D.V.L.A.
1. (a) Does the patient suffer with narcolepsy?

   IF NO, go to Q2
   IF YES, please answer the following:

   (b) Date of diagnosis: ________________________________

   (c) Is the patient receiving medication for the condition?

   (d) Is the patient free of easily provoked attacks of cataplexy?

2. (a) Is there a history of sleep apnoea syndrome?

   IF NO, go to Q3
   IF YES, please indicate the treatment (tick ✓ appropriate box(es))

   (b) CPAP ☐

   (c) Surgery ☐

   (d) None ☐

   (e) Other ☐ please specify: ________________________________

   (f) Is the patient compliant with treatment (if appropriate)?

3. Is there any other condition causing excessive sleepiness?

   If "YES", diagnosis & treatment ________________________________

4. Does the patient continue to experience irresistible drowsiness in inappropriate situations?

5. Is there any other medical condition which may affect fitness to drive?

   If "YES", please specify ________________________________

   Name of other relevant doctors/specialists involved in treatment.

   Signature ________________________________________________

   Name (CAPITAL LETTERS) __________________________________

   Date ________________________________

   Telephone No. ________________________________

   Fee Payable to (Enter Account Name) ________________________________

   ADDRESS STAMP

SL2 (Rev. July 2000)

M0 2/2
Medical Examination Report
To be completed by the Doctor (please use black ink)
Please answer all questions

Please give patient’s weight (kg/st) _____________________ height (cms/ft) _____________________

Please give details of smoking habits, if any
_________________________________________________________________________________

Please give number of alcohol units taken each week
_________________________________________________________________________________

Details of specialist(s)/consultants

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Speciality
_________________________________________________________________________________

Date last seen
_________________________________________________________________________________

Current medication
_________________________________________________________________________________

Date when first licensed to drive a lorry _____________________ and/or bus _____________________

1 Vision

Please tick ✔ the appropriate box(es)

YES  NO

1. Is the visual acuity at least 6/9 in the better eye and at least 6/12 in the other?
   (corrective lenses may be worn) as measured with the full size 6m Snellen Chart

2. Do corrective lenses have to be worn to achieve this standard?

   If YES, is the:
   (a) uncorrected acuity at least 3/60 in the right eye?

   (b) uncorrected acuity at least 3/60 in the left eye?
   (3/60 being the ability to read the 6/60 line of the full size 6m Snellen Chart at 3 metres)

   (c) correction well tolerated?

3. Please state the visual acuities of each eye in terms of the 6m Snellen chart.
   Please convert any 3 metre readings to the 6 metre equivalent.

   Uncorrected Corrected (if applicable)
   Right _____________________ Left _____________________ Right _____________________ Left _____________________

4. Is there a defect in his/her binocular field of vision (central and peripheral)?

5. Is there diplopia (controlled or uncontrolled)?

6. Does the applicant have any other ophthalmic condition?

   If YES to 4, 5 or 6, please give details in Section 7 and enclose any relevant visual field charts or hospital letters.

Applicant’s name _____________________ DOB _____________________
## Nervous System

1. Has the applicant had any form of epileptic attack?  
   (a) If **YES**, please give date of last attack **DD MM YYYY**  
   (b) If treated, please give date when treatment ceased **DD MM YYYY**

2. Is there a history of blackout or impaired consciousness within the last 5 years?  
   If **YES**, please give date(s) and details in **Section 7**

3. Does the applicant suffer from narcolepsy/cataplexy?  
   If **YES**, please give details in **Section 7**

4. Is there a history of, or evidence of any of the conditions listed at a-h below?  
   If **NO**, go to **Section 3**.  
   If **YES**, please tick the relevant box(es) and give dates and full details at **Section 7**.  
   (a) Stroke/TIA please delete as appropriate  
   (b) Sudden and disabling dizziness/vertigo within the last 1 year with a liability to recur  
   (c) Subarachnoid haemorrhage  
   (d) Serious head injury within the last 10 years  
   (e) Brain tumour, either benign or malignant, primary or secondary  
   (f) Other brain surgery  
   (g) Chronic neurological disorders e.g. Parkinson’s disease, Multiple Sclerosis  
   (h) Dementia or cognitive impairment

## Diabetes Mellitus

1. Does the applicant have diabetes mellitus?  
   If **NO**, please proceed to **Section 4**  
   If **YES**, please answer the following questions.

2. Is the diabetes managed by:  
   (a) Insulin?  
   If **YES**, please give date started on insulin **DD MM YYYY**  
   (b) Oral hypoglycaemic agents and diet?  
   (c) Diet only?

3. Does the patient test blood glucose at least twice every day?  

4. Is there evidence of:  
   (a) Loss of visual field?  
   (b) Severe peripheral neuropathy, sufficient to impair limb function for safe driving?  
   (c) Diminished/Absent awareness of hypoglycaemia?  

5. Has there been laser treatment for retinopathy?  
   If **YES**, please give date(s) of treatment

6. Is there a history of hypoglycaemia during waking hours in the last 12 months requiring assistance from a third party?  
   If **YES** to any of 4-6 above, please give details in **Section 7**

### Applicant’s name

### DOB
Psychiatric Illness

Is there a history of, or evidence of any of the conditions listed at 1-6 below?  

If NO, please go to Section 5

If YES, please tick the relevant box(es) below and give date(s), prognosis, periods of stability and details of medication, dosage and any side effects in Section 7

NB. If applicant remains under specialist clinic(s) ensure details are completed at Section 1.

1. Significant psychiatric disorder within the past 6 months e.g. depression  
2. A psychotic illness within the past 3 years e.g. schizophrenia  
3. Persistent alcohol misuse in the past 12 months  
4. Alcohol dependency in the past 3 years  
5. Persistent drug misuse in the past 12 months  
6. Drug dependency in the past 3 years

Cardiac

Please follow the instructions in all Section (5A-5G) giving details as required in Section 7

5A Coronary Artery Disease

Is there a history of, or evidence of, coronary artery disease?  

If NO, proceed to Section 5B

If YES, please answer all questions below and give details at Section 7 of the form.

1. Myocardial Infarction?  
   If YES, please give date(s)

2. Coronary artery by-pass graft?  
   If YES, please give date(s)

3. Coronary Angioplasty (with or without stent)?  
   If YES, please give date(s)

4. Has the applicant suffered from Angina?  
   If YES, please give the date of the last attack DD MMM YYYY

Please proceed to next Section 5B

Applicant’s name

DOB
Cardiac Arrhythmia

Is there a history of, or evidence of cardiac arrhythmia?  
If NO, proceed to Section 5C

If YES please answer all questions below and give details at Section 7 of the form

1. Has the applicant had a significant documented disturbance of cardiac rhythm within the past 5 years?

2. Has the arrhythmia been controlled satisfactorily for at least 3 months?

3. Has a cardiac defibrillator device been implanted?

4. Has a pacemaker been implanted?
   If YES:  
   (a) Has the pacemaker been implanted for at least 6 weeks?
   (b) Since implantation, is the patient now symptom free from this condition?
   (c) Does the applicant attend a pacemaker clinic regularly?

Please proceed to next Section 5C

Peripheral Arterial Disease

1. Is there a history or evidence of, ANY of the following:  
   If YES please tick ✔ ALL relevant boxes below, and give details at Section 7 of the form

   YES NO

   PERIPHERAL ARTERIAL DISEASE

   AORTIC ANEURYSM, IF YES:
   a. Site of Aneurysm:  
      Thoracic  
      Abdominal
   b. Has it been repaired successfully:
   c. Is the transverse diameter more than 5cms:

   DISSECTION OF THE AORTA, IF YES:
   a. Has it been repaired successfully:

Please proceed to next Section 5D

Valvular/Congenital Heart Disease

Is there a history of, or evidence of valvular/congenital heart disease?  
If NO, proceed to Section 5E
If YES, please answer all questions below and give details at Section 7 of the form

1. Is there a history of congenital heart disorder?

2. Is there a history of heart valve disease?

3. Is there any history of embolism? (not pulmonary embolism)

4. Does the applicant currently have significant symptoms?

5. Has there been any progression since the last licence application? (if relevant)

Please proceed next Section 5E

Applicant’s name

DOB
Does the applicant have a history of ANY of the following conditions:

(a) a history of, or evidence of heart failure?
(b) established cardiomyopathy?
(c) a heart or heart/lung transplant?

If YES, to any part of the above, give full details in Section 7 of the form. If no proceed to next section 5F.

---

**Cardiac Investigations**

This section must be completed for all applicants

1. Has a resting ECG been undertaken?
   - If YES, does it show:
     (a) pathological Q waves?
     (b) left bundle branch block?

2. Has an exercise ECG been undertaken (or planned)?
   - If YES, please give date and give details in Section 7
     Sight/copy of the exercise test result/report (if done in the last 3 years) would be useful

3. Has an echocardiogram been undertaken (or planned)?
   - If YES, please give date and give details in Section 7
     Sight/copy of the echocardiogram result/report would be useful

4. Has a coronary angiogram been undertaken (or planned)?
   - If YES, please give date and give details in Section 7
     Sight/copy of the angiogram result/report would be useful

5. Has a 24 hour ECG tape been undertaken (or planned)?
   - If YES, please give date and give details in Section 7
     Sight/copy of the 24 hour tape result/report would be useful

6. Has a myocardial perfusion imaging scan been undertaken (or planned)?
   - If YES, please give date and give details in Section 7
     Sight/copy of the scan result/report would be useful

Please proceed to Section 5G

---

**Blood Pressure**

This section must be completed for all applicants

1. Is today's systolic pressure greater than 180?
2. Is today's diastolic pressure greater than 100?
3. Is the applicant on anti-hypertensive treatment?
   - If YES, to any of the above, please supply today's reading

---

Applicant’s name

DOB
Please answer all questions, in this section. If your answer is YES, please give full details in Section 7.

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<tr>
<th>Question</th>
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<td>1. Is there <strong>currently</strong> a disability of the spine or limbs, likely to impair control of the vehicle?</td>
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<td>2. Is there a history of bronchogenic carcinoma or other malignant tumour, for example, malignant melanoma, with a significant liability to metastasise cerebrally?</td>
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<td>If YES, please give dates and diagnosis and state whether there is current evidence of dissemination</td>
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<td>3. Is the applicant profoundly deaf?</td>
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<td>If YES, is he/she able to communicate in the event of an emergency by speech or by using a device, e.g. a MINICOM/text phone?</td>
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<td>4. Is there a history of either renal or hepatic failure?</td>
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<td>5. Does the applicant have sleep apnoea syndrome?</td>
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<td>If YES, has it been controlled successfully?</td>
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<td>6. Is there any other <strong>Medical Condition</strong>, causing excessive daytime sleepiness?</td>
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<td>6a If YES, please give full details below.</td>
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<td>7. Does the applicant have severe symptomatic respiratory disease causing chronic hypoxia?</td>
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<td>8. Does any medication currently taken cause the applicant side effects which impair his/her safe driving?</td>
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Applicant's name

DOB
Consent and Declaration
This section MUST be completed and must NOT be altered in any way.
Please read the following important information carefully and then sign the statements below.

Important information about Consent
On occasion, as part of the investigation into your fitness to drive, DVLA may require you to undergo a medical examination or some form of practical assessment. In these circumstances, those personnel involved will require your background medical details to undertake an appropriate and adequate assessment. Such personnel might include doctors, orthoptists at eye clinics or paramedical staff at a driving assessment centre. Only information relevant to the assessment of your fitness to drive will be released. In addition, where the circumstances of your case appear exceptional, the relevant medical information would need to be considered by one or more members of the Secretary of State’s Honorary Medical Advisory Panels. The membership of these Panels conforms strictly to the principle of confidentiality.

Consent and Declaration
I authorise my Doctor(s) and Specialist(s) to release reports to the Secretary of State’s medical adviser about my condition.

I authorise the Secretary of State to disclose such relevant medical information as may be necessary to the investigation of my fitness to drive, to doctors, paramedical staff and Panel members, and to release to my doctor(s) details of the outcome of my case and any relevant medical information.

I declare that I have checked the details I have given on the enclosed questionnaire and that, to the best of my knowledge and belief, they are correct.

Signature  Date
### Applicant’s Details

*To be completed in the presence of the Medical Practitioner carrying out the examination*

Please make sure that you have printed your name and date of birth on each page before sending this form with your application.

#### 9 Your details

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### Medical Practitioner Details

*To be completed by Doctor carrying out the examination*

#### 10 Doctor’s details

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4.2 Invited position papers

The papers in this section have been submitted prior to the beginning of the Workshop. They may not represent the current view of the participants, but they formed the basis for the discussions held during the Workshop.

4.2.1 How would I approach the issue of whether an individual with excessive daytime sleepiness can drive safely?

Dr TC Britton
Department of Neurology
King’s College Hospital
London

Abstract

Sleepy or drowsy drivers are at increased risk of accidents. Several neurological conditions are associated with excessive daytime sleepiness (EDS), although many of these neurological conditions are already subject to driving restrictions for other reasons (for example, tumours, shunts). This paper will argue that any patient with EDS associated with unpredictable sleep episodes should be considered unfit to hold a driving licence until such time as the condition has been treated or the episodes have stopped. Patients with EDS but no unpredictable sleep episodes (and normal alertness and responsiveness when awake) should be assessed for their fitness to hold a driving licence based upon (a) their compliance with treatment, (b) evidence of on-going monitoring of EDS and (c) absence of adverse psychological factors. If a patient with EDS were granted a driving licence, it would be on the understanding that the individual only drove (a) after adequate sleep and rest, (b) when feeling normally alert and (c) so long as he or she continues to feel normally alert while driving. No one (patient or normal individual) should drive when feeling sleepy or drowsy.

Introduction

This paper will primarily discuss the neurological conditions that are associated with excessive daytime sleepiness (EDS), although many of the considerations with regard to driving will be relevant to other causes of EDS.

Neurological conditions causing excessive daytime sleepiness

Several neurological conditions (and/or their treatments) are associated with the complaint of EDS, including narcolepsy, idiopathic hypersomnia, neurodegenerative diseases (for example, Parkinson’s disease, dementia of Alzheimer’s type), neuromuscular diseases, head injuries, restless legs syndrome (periodic limb movements in sleep), raised intracranial pressure and hypothalamic tumours.

Many of the neurological conditions associated with EDS are, however, already subject to certain driving restrictions (for example, tumours, shunts for raised intracranial pressure; see
Furthermore, in such patients, EDS is rarely the most significant factor in considering their fitness to drive.

EDS may be a more significant factor in patients with narcolepsy, idiopathic hypersomnia, neuromuscular disease, Parkinson’s disease and restless legs syndrome/periodic limb movements in sleep. Various mechanisms may be responsible for the daytime sleepiness associated with these conditions including central causes (narcolepsy; idiopathic hypersomnia), peripheral causes (respiratory failure and obstructive sleep apnoea (OSA) of myotonic dystrophy or motor neurone disease), fragmented nocturnal sleep (periodic limb movements in sleep) or drugs (dopaminergic drugs in Parkinson’s disease). More than one mechanism may be responsible for EDS in any individual patient.

Whatever the underlying mechanism(s), the physician must ensure that all treatable factors have been dealt with as far as possible. Patients with respiratory failure as a result of neuromuscular weakness may benefit from (non-invasive) ventilatory support; the need for medication should be reviewed, especially sedative and dopaminergic drugs; the causes of fragmented sleep should be treated where possible; the narcoleptic syndrome should be managed appropriately (with, if necessary, investigation for possible associated OSA).

Despite the above measures, there will still be a number of patients with neurological conditions associated with EDS in whom the question of their fitness to hold a driving licence will arise.

Safe driving, sleep and sleepiness

In order to drive safely, an individual needs to be alert and responsive: that is the individual needs to be aware of his or her environment and any risks in it; the individual also needs to be able to react appropriately to the risks that actually do arise.

Sleep and sleepiness (drowsiness) describe states of reduced alertness and responsiveness. As a consequence, sleepy individuals are unlikely to be sufficiently aware of their surroundings to drive safely. In addition, sleepy drivers are unlikely to react appropriately to any risks that do arise (Reyner and Horne, 1998).

All drivers should therefore ensure that they have had adequate rest before commencing any journey. I would suggest that society cannot permit nor condone any driver knowingly starting his or her journey in a sleepy or drowsy state, irrespective of whether there is a medical cause for the sleepy state.

The situation will inevitably arise where an individual becomes aware of sleepiness or drowsiness while driving. Most drivers are able to recognise when they are sleepy or drowsy and stop driving before they actually fall asleep (Reyner and Horne, 1998). However, even the normal individual’s ability to recognise sleepiness and its affect on driving ability is not always reliable. An excess of road traffic accidents between 2 am and 6 am has been attributed to drivers falling asleep (Connor et al, 2002). Furthermore, in confidential surveys around 10 per cent of licence holders report that they have fallen asleep while driving (Sagberg, 1999).
Whether (or when) a sleepy driver stops driving will depend on that individual recognising that his or her level of awareness and responsiveness is insufficient to continue to drive safely. Many factors will play a part in allowing an individual to correctly recognise an insufficient level of awareness including past experience, personality, sex, ageing, illness and medication.

In the present context, it is the latter two factors that need further consideration. An excess of road traffic accidents in patients with OSA has been attributed to sleepy or drowsy driving (Lloberes et al, 2000) and narcolepsy (Aldrich, 1989) but whether other causes of EDS are associated with an excess risk is unclear (Hanning and Welsh, 1996).

Neurological disease causing EDS and fitness to hold a driving licence

I would suggest that the issues that arise when considering fitness to hold a driving licence in a patient with EDS due to neurological disease are:

1. When awake, is the patient normally alert and responsive?

2. How sleepy is the patient during the day?

3. Is the patient able to recognise when they are sleepy?

4. If the patient is able to recognise that they are sleepy.
   a. Could they remain awake long enough to stop the vehicle in a safe place?
   b. Is there any reason why such a patient might not stop the car, even though they recognise that they are sleepy?

There is no single test or investigation that will answer these questions, so the physician will need to base his or her conclusions on a mixture of clinical and laboratory assessments.

Specific issues

When awake, is the patient normally alert and responsive?

In the majority of cases, clinical assessment in the outpatient clinic should be sufficient to decide whether a patient is normally alert and responsive when awake. A patient who appears drowsy in the clinic or who does not respond in a timely fashion should give cause for concern. At issue here is whether the patient is aware of his or her surroundings and reacts promptly. Impairment of memory (such as might be seen in dementia of Alzheimer's type) is not being tested, although significant amounts of memory or cognitive impairment would be a bar to driving in its own right (see http://www.dvla.gov.uk/at_a_glance/ch4_psychiatric.htm).

Laboratory investigations are, in my opinion, unlikely to provide much help in deciding whether a patient is normally alert and responsive when awake, although in selected cases there may be a role for clinical neuro-psychometry.
Clinical neuro-psychometry would provide a global assessment of cognitive function (in case there was significant dementia) as well as information on alertness and responsiveness (for example, from timed tests such as digits-symbols test from the WAIS III). An advantage of clinical neuro-psychometry would be that patients are observed over a longer period of time than is usual in the outpatient clinic. However, it is unlikely that the few clinical neuropsychology departments in the UK could see more than a fraction of the total number of patients with EDS.

Reaction time studies have shown that responses are slower when individuals are sleepy, compared with when they are alert (Powell et al, 2001). However, such tests do not appear to have a useful role in assessing driver sleepiness (Baulk et al, 2001).

*How sleepy is the patient during the day?*

Patients with EDS have, by definition, an abnormal pressure to sleep during the day. This abnormal pressure to sleep can be assessed using the Epworth Sleepiness Score (see appendix A). Although the Epworth Sleepiness Score has been validated for patients with OSA and maybe useful for monitoring treatment of EDS, there have been recent concerns about its objectivity (Chervin and Aldrich, 1999).

The multiple sleep latency test (MSLT) provides a more objective measure of daytime sleepiness and is most often used in the assessment of patients with narcolepsy. However, the test is not specific or diagnostic and is unlikely to be of help in assessing fitness to hold a driving licence in a patient with EDS.

The maintenance of wakefulness test (MWT) assesses the ability of a patient to remain awake in a non-stimulating environment for 20 to 40 minutes. The onset of sleep (judged by EEG criteria) is normally greater than 18 minutes, but the role of the test in assessing EDS remains unclear (Shneerson, 2000). A modified MWT that does not rely on EEG recording may be more useful (Priest et al, 2001).

Patients who have an abnormal pressure to sleep are more likely to fall asleep in inappropriate circumstances and such patients are presumably more likely to develop sleepiness while driving. When considering a patient’s fitness to hold a driving licence, one might therefore wish to consider some (arbitrary) cut-off for the Epworth Sleepiness Score or even MWT.

*Is the patient able to recognise when they are sleepy?*

Patients who have unpredictable sleep episodes, as may occur in some patients with Parkinson’s disease (Hobson et al, 2002) or narcolepsy will clearly be considered unfit to drive, much as patients who have loss of awareness for other reasons (for example, seizures or unexplained blackouts) would be considered unfit to hold a driving licence.

For patients who report that they are able to recognise that they are sleepy, it would be useful to have some evidence that such patients would take appropriate action if they were driving. A sleep diary may help in assessing whether the patient’s EDS is controlled. One
might take the view that a patient who had irregular naps during the day (or who was unable or unwilling to complete a diary) was less likely to be in a position to recognise the severity of their daytime sleepiness.

If the patient is able to recognise when they are sleepy, could they remain awake long enough to stop the vehicle in a safe place?

A driver who develops sleepiness (drowsiness) while driving needs to be able to continue driving until such time as it is safe to stop. In many instances, the assessment may be easy, especially where the EDS is under good control and the patient has produced a sleep diary which shows a regular sleep-wake cycle with planned naps during the day if required. In other instances, the assessment may be more difficult. One might consider applying some type of MWT but such tests would need validation in a patient group.

Is there any reason why such a patient might not stop the car, even though they recognise that they are sleepy?

Some patients with EDS clearly have additional psychological difficulties that might lead one to wonder whether they would take appropriate action should they become sleepy (drowsy) while driving. A psychological or psychiatric assessment may be required in some cases.

Specific conditions

Narcoleptic syndrome

Patients with narcolepsy are at greater risk of sleep-related vehicle accidents (Aldrich, 1989; Broughton et al, 1981). Sixty six per cent of narcoleptics versus 6 per cent of control subjects admit to falling asleep at the wheel, with resultant accidents being reported by 37 per cent of narcoleptics versus 5 per cent of control subjects (Broughton et al, 1981).

Despite the evidence that patients with the narcoleptic syndrome are at increased risk, there are few objective data upon which to base advice about driving (Douglas, 1998).

The current advice from the DVLA is ‘Driving will be permitted when satisfactory control of symptoms achieved’ (see http://www.dvla.gov.uk/at_a_glance/ch1_neurological.htm). The main issues with regard to narcolepsy will be the unpredictability and lack of warning of sleep attacks. Patients will also need to satisfy the authorities that they are compliant with treatment and try to maintain as regular a sleep-wake cycle as possible.

At present, narcolepsy remains a clinical diagnosis but it is possible that a specific test (CSF hypocretin-1 levels) may become available.

Parkinson’s disease

Over the past 10 years there has been increasing interest in the sleep disorders associated with Parkinson’s disease, including the REM sleep behaviour disorder, periodic limb movements in sleep and daytime sleep attacks (Ondo et al, 2001). Patients with Parkinson’s
disease have been found to have a significantly higher ‘narcolepsy’ score on a standardised Sleep Disorder Questionnaire compared with age-matched healthy controls (Happe et al, 2001), the score correlating with the dose of Levodopa. A substantial proportion (50 per cent) of patients with Parkinson’s disease report EDS (Hobson et al, 2002; Ondo et al, 2001), although such studies have not included an age-matched control group.

Frucht et al (1999) first drew attention to sleep attacks (unpredictable sleep episodes) while driving in Parkinson’s disease. The frequency of unpredictable sleep episodes in patients with Parkinson’s disease is, however, probably low (less than 1 per cent of patients; see Hobson et al, 2002). A high ESS (>7) or Inappropriate Sleep Composite score may identify patients at risk of unpredictable sleep episodes (Hobson et al, 2002). The role of drugs and in particular dopamine agonists in unpredictable sleep episodes remains uncertain, but probably limited (Comella 2002; Homann et al, 2002; Olanow et al, 2000).

Irrespective of whether daytime sleepiness is due to the condition itself or to the treatment, all patients with Parkinson’s disease should be asked about the quality and duration of their nocturnal sleep as well as about the occurrence of inappropriate or unexpected daytime sleep. Similar enquiries should probably be made of all patients with neurodegenerative diseases (for example, multiple system atrophy, progressive supranuclear palsy, dementia) as sleep disturbance may be a common feature (Boeve et al, 2001).

**Restless legs syndrome/periodic limb movements in sleep**

Restless legs syndrome/periodic limb movements in sleep probably cause EDS by fragmentation of nocturnal sleep. Treatment with dopamine agonists and/or clonazepam is generally very effective and should lessen EDS (Comella, 2002).

**Conclusions**

Patients who complain of EDS should be fully evaluated for the underlying cause of the condition and should be treated where possible.

Any patient with a recognised neurological sleep disorder who has unpredictable sleep episodes should be considered unfit to hold a driving licence until the condition has been satisfactorily treated or the unpredictable sleep episodes have stopped.

A patient who has EDS that is controlled to the point that he or she is normally awake and alert for a predictable part of the day could be considered for a driving licence.

Factors that would need to be taken into account when considering whether a patient could hold a driving licence would include:

- compliance with treatment;
- on-going monitoring of EDS (probably by Epworth Sleepiness Scale);
- psychological factors.
If a patient with EDS were granted a driving licence, it would be recommended that the individual only drove:

- after adequate sleep and rest;
- when feeling normally alert;
- and so long as he or she continues to feel normally alert;
- no one should drive when feeling sleepy or drowsy.

References


Appendix A

Epworth Sleepiness Scale

How likely are you to fall asleep in the following situations?

0 = would never doze; 1 = light chance; 2 = moderate chance; 3 = high chance

1. Sitting and reading
2. Watching TV
3. Sitting inactive in a public place, for example, a theatre or meeting
4. As a passenger in a car for an hour without a break
5. Lying down to rest in the afternoon
6. Sitting and talking to someone
7. Sitting quietly after lunch (when you’ve had no alcohol)
8. In a car, while stopped in traffic

Appendix B

Modified Epworth Sleepiness Score and Inappropriate Sleep Composite Score

Hobson et al, 2002

The modified score is the standard Epworth score plus four questions designed to detect falling asleep in inappropriate situations. Patients were asked to complete each of three versions of the questionnaire.

Version 1: Dozing off

Patients were given the question, ‘How likely are you to doze or fall asleep in the following situations (in contrast to just feeling tired)? This refers to your usual present way of life. Even if you have not done some of these things recently, try to recall whether they may have occurred previously.’ Patients were instructed to use the following scale to choose the most appropriate number for each situation: 0 = would never doze; 1 = slight chance of dozing; 2 = moderate chance of dozing; 3 = high chance of dozing.
Version 2: Sudden onset of sleep

Patients were given the question, ‘If you were likely to doze or fall asleep in any of the following situations, was the episode ever sudden or unpredictable?’ Patients were instructed to use the following scale to choose the most appropriate number for each situation:
0 = never; 1 = occasional but usually gradual or with warning; 2 = often unpredictable; 3 = always sudden and unpredictable.

Version 3: Blank spells

Patients were given the question, ‘Have you ever had any episodes of sudden ‘blank spells’ occurring without warning, during which you were unaware of your surroundings in any of the following situations? By sudden blank spells we mean sudden unexpected episodes during which you have had a loss of awareness of what was going on around you without being asleep.’ Patients were instructed to use the following scale to choose the most appropriate number for each situation: 0 = never; 1 = infrequently (once a month or less); 2 = occasionally (up to once a week); 3 = frequently (more than once a week).

Situation

Epworth Sleepiness Scale

1. Sitting and reading
2. Watching television
3. Sitting, inactive, in a public place (for example, theatre or a meeting)
4. As a passenger in a car for 1 hour without a break
5. Lying down to rest in afternoon when circumstances permit
6. Sitting and talking to someone
7. Sitting quietly after lunch without alcohol
8. In car, when stopped for a few minutes in traffic

Modified Epworth Sleepiness Scale/additional situations

9. While driving
10. While eating a meal
11. While attending to work
12. While attending to routine household activities
*Questions 1-8 of version 1 of the questionnaire comprise the full original Epworth Sleepiness Scale and were self-administered by the patient (as per the validation of the Epworth Scale17) while all other questions in version 1 and all questions in versions 2 and 3 of the questionnaire were administered by clinic staff.
4.2.2. Patients with obstructive sleep apnoea and excessive daytime sleepiness

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Abstract

This document gives a personal view, based largely on clinical experience, on how the question of fitness to drive should be addressed in the patient with obstructive sleep apnoea and excessive daytime sleepiness. The importance of the clinical history in the assessment of daytime sleepiness and fitness to drive is considered paramount. The accuracy of this history depends on the patient trusting the doctor and for this patient confidentiality is essential. Special tests to show the severity of the sleep apnoea or to measure sleepiness or ability to stay awake are considered to be of very limited value in deciding whether or not a patient is fit to drive. Safe driving is clearly not a problem for patients who respond well to treatment but unfortunately a proportion of patients remain sleepy. Currently, clinical judgement taking into account the nature of the driving and evidence of appropriate and prompt action by the patient when somnolent at the wheel seems the best way of determining a patient’s suitability to continue driving.

Introduction

This paper was prepared in advance of the Workshop on Driving and Medical Aspects of Excessive Daytime Sleepiness held at Langrish House in July 2002. The Workshop addressed all medical aspects of excessive daytime sleepiness (EDS) but the scope of this document is limited to the problem of EDS in the patient with obstructive sleep apnoea. There are a number of reasons for this. First, my experience as a respiratory physician is greatest with this group of patients. Second, the prevalence of obstructive sleep apnoea is likely to be greater than that of other diseases causing sleepiness. Some of these other diseases causing EDS, such as narcolepsy, may be very different from obstructive sleep apnoea and any conclusions that may be drawn about how to manage driving and sleepiness in the patient with OSA are not necessarily applicable to other patient groups.

Although there is evidence that groups of patients with OSA are more likely to have road crashes than controls (George, 1987), this may not apply to individuals. In any case the increased crash rate is relatively modest and not great compared with that of some healthy groups such as young males. Falling asleep at the wheel tends to cause major and characteristic crashes and may not be the cause of most crashes associated with OSA. Poor attentiveness and reaction times are also factors. Neurocognitive impairment is a feature of OSA and structural changes in the brains of patients with OSA have recently been reported (Morrell, 2003).
Recognising the patient with obstructive sleep apnoea

Many patients with OSA are living in the community unaware that they have a problem. Even if they go to a doctor, the problem may not be diagnosed. Few doctors have been trained in sleep medicine or routinely take a sleep history and sleep apnoea has only recently reached the core curriculum of at least one large medical school (Imperial College, 2001/2). Feeling tired all the time is a common symptom but guidance for GPs on how to address this problem often fails to mention OSA (Doctor Update, 2002). It is not uncommon for a patient to be referred because the patient’s bed partner makes the diagnosis having read of the condition in a women’s magazine. It is important to recognise this because it may be that the major focus should be on identifying and treating unrecognised patients rather than just addressing the issue of driving in those already known to have OSA.

Once the possibility of OSA has been considered, the history may make the diagnosis very obvious. Typically the patient is a middle-aged male and obese but this is by no means always the case. Sometimes recent weight increase may have precipitated a worsening of the symptoms. Snoring is usually extremely loud. Often it can be heard in the next room and sometimes in the next house. It may cause embarrassment in hotels or hospitals. The bed partner may have witnessed apnoeas, sometimes terminated by a loud snort, and occasionally the patient may be aware of some of these. Sleep may be unrefreshing and there may be excessive daytime sleepiness. A number of other symptoms are recognised.

Diagnosis

In general diagnosis is straightforward. A wide variety of sleep study techniques are available. Mostly these will give an estimate of the severity of the condition as far as the frequency of the respiratory disturbances and the associated arousals is concerned. However, patients with very abnormal sleep studies are not necessarily sleepy in the day whereas some with troublesome sleepiness have relatively mild disturbances at night. It follows that the degree of abnormality of the sleep study has only a limited bearing on the issue of fitness to drive (George, 2002).

Excessive daytime sleepiness

Estimating the degree of daytime sleepiness (EDS) is important in the assessment of the patient with sleep apnoea. As well as being important for those who drive or who are in safety-critical jobs, the degree of EDS may influence the need for and the success of treatment with nasal CPAP. Occasionally, observing the patient may provide some information as they may fall asleep in the waiting room but usually the history is the key. Many patients appear initially unaware of the potential effect that their sleepiness may have on their driving licence. When questioning them I am careful not to mention driving until the end. My own feeling is that careful questioning at presentation gives a reasonable impression of the degree of EDS though it is difficult to quantify with any precision. A small number of patients may admit to falling asleep while waiting at traffic lights. I tend to find a disparity between measures based on questionnaires such as the Epworth Sleepiness Scale (Epworth) and my own estimate of the patients’ sleepiness from routine history taking.
done first. It is possible that by the time the Epworth is administered some patients, alerted to the possible effects on their driving, answer the questions less than honestly.

Ideally, what is required is a simple laboratory test to measure daytime sleepiness and fitness to drive. There would be some cut-off on this test: above a certain level of sleepiness the patient would be unable to drive and below it the patient would be deemed safe to drive. A number of tests are currently available to measure sleepiness. Simple questionnaires have already been mentioned but have obvious limitations. Other tests include the multiple sleep latency test and the maintenance of wakefulness test and its behavioural counterpart, the Oxford Sleep Resistance Test (OSLER) test (Priest, 2001).

The multiple sleep latency test (MSLT) is a measure of the ease with which a patient falls asleep. The patient is not trying to stay awake. Since it is not a measure of ability to maintain wakefulness, it may not be very relevant to driving.

The maintenance of wakefulness test (MWT), as its name suggests, was designed as a measure of a subject’s ability to stay awake. The test is terminated after 40 minutes if the patient stays awake. It could be argued that falling asleep at 41 minutes would be serious if driving. It could also be argued that falling asleep at 39 minutes in circumstances of the test (a comfortable chair in a quiet darkened room) may not be relevant to staying awake when driving.

Both the MWT and the MSLT are time consuming and require special equipment and skilled technical staff. The MWT may take 40 minutes and is usually repeated four times. MSLT may take 20 minutes and is repeated at 2 hourly intervals four or five times depending on the indication. A normal sleep wake routine must be followed for two weeks before the tests and full polysomnography is carried out the night before to ensure that sleep has been adequate. Few hospitals in the UK have the resources to carry out these tests and, even in major centres, they are not part of routine investigations for most patients with OSA.

The OSLER test is a much simpler test of a patient’s ability to stay awake in a dark quiet environment. A small light is illuminated for one second in every three and the subject is required to respond. Failure to respond is assumed to be because the subject has fallen asleep. The technician is alerted automatically. How relevant performance on this test is to safe driving is unclear.

In general there are significant but low correlations between the MWT and the MSLT (Sangal, 1992). Individuals may have sleepiness according to the MSLT but fail to fall asleep during the MWT. A large proportion of patients with OSA may perform as well as controls. Improvements in the MSLT following treatment of OSA may be only modest despite dramatic symptomatic improvement.

There are no set criteria for performance in any of these tests to determine whether or not a patient is fit to drive. For the time being at least, the simple test of fitness to drive for the patient with OSA and daytime somnolence is illusory. It is doubtful if we will ever have such
a test. Sleepiness can be normal and tends to vary: a single test at one time point is unlikely to be of much help in measuring the risk of EDS in an individual over a period of time.

**Neurocognitive function**

The description of tests of sleepiness above presupposes that it is falling asleep at the wheel that is the main concern. However, there may be other elements of neurocognitive function that are impaired in the patient with sleep apnoea. Various tests of performance could be applied to the patient with OSA. Performance on a driving simulator might be considered most relevant but whether the results would really reflect the safety of the individual patient on the road is doubtful. For example, a young man used to video games might perform well whereas an older man with sleep apnoea might have demonstrable deficits. The older man drives his car to the shops in daylight when the roads are quiet and only if the weather is good but the young man is regularly out at night in all weather with his friends. Does performance on the simulator reflect risk on the road? I doubt it does and for this reason these tests are currently only generally useful in the research setting.

**Patient confidentiality**

If there are no simple tests that can be relied upon to measure sleepiness of relevance to driving what else is there? The answer is the history. As outlined above, it is generally reasonably easy to obtain an honest history of sleepiness as, in general, patients are not initially concerned about their licence. This may reflect a general lack of awareness in the community of the risk of driving when sleepy. Nevertheless, many sleep apnoea patients (along with many of the rest of us) have experienced somnolence while at the wheel and will admit to this. Often they have devised strategies to deal with it. Quite often they will say that they just pull off the road and nap. Others find that their problem occurs only on long journeys when they avoid driving. Many of these patients appear to be highly responsible as drivers. They are aware that they have a problem but they have developed a strategy for dealing with it. Assuming that they are aware of when they are sleepy and take prompt action to get off the road, could these patients be safe enough to drive?

In obtaining an honest description of the sleep problem as it relates to driving, patient confidentiality is extremely important. If at any stage a patient becomes aware of the possibility that his doctor is appraising his sleepiness with a view to reporting him to the licensing authorities then a reliable history becomes unlikely. But this history is vital as it may well be the best estimate we have of a patient’s fitness to drive. For this reason, as far as possible, the responsibility towards informing the DVLA should rest with the patient. If it is transferred to the doctor in a major way and this becomes widely known, then the doctor will not be in a position to appraise the driving risk because the patient is unlikely to give an honest history. And this may be the best measure of the risk that we have.

Patients with sleep apnoea fearful of losing their licence would be reluctant to attend a sleep clinic if they thought that they would be reported to the DVLA. According to one study, the threat of mandatory reporting would result in 70 per cent of sleepy drivers avoiding medical evaluation (Findley, 2002). The figure for those found to have OSA is closer to 90 per cent.
(Findley – personal communication). The result would be that these patients would not get the treatment they need, they would carry on driving and the public would be at greater risk.

In my view, it is essential that the obligation to inform the DVLA should be firmly with the driver and not the doctor. This is not to say that, in exceptional circumstances, when a patient refuses to take the appropriate action, the doctor should remain silent but reporting a patient to the DVLA should only occur when there is major clinical concern. Unfortunately, especially when this results in loss of livelihood, a severe breakdown in the doctor-patient relationship generally results and subsequent effective treatment becomes difficult.

**Treatment of OSA**

Most textbooks would say that the first priority in the obese patient with OSA is weight reduction but, despite recent advances, this is difficult to achieve in practice, takes time and, even if achieved, may not have the desired effect. For this reason most practitioners will admit to resorting to early treatment with nocturnal nasal continuous positive airway pressure (CPAP) or other measures such as a mandibular advancement splint. Strapping a mask to the nose attached to a machine with elephant tubing does not fill the average patient with enthusiasm. Many encounter problems, sometimes nasal, and some can only tolerate the mask for part of the night. The effects on daytime somnolence can be very variable. Some patients report that their lives have been transformed from the very first night but many are persistently somewhat sleepy. It is not always clear why this should be but the problem is widespread enough for studies to have been carried out with a wakefulness drug, Modafinil, which is soon likely to be licensed for use in this setting. Whether the use of such a drug will make driving any safer is currently unclear.

Plainly a patient with OSA who can comply with treatment and is restored to normal as a result is fit to drive (George, 1997; Cassel 1996). Unfortunately something less than this is not unusual and the issue, once again, is whether such patients are safe to drive.

**Conclusion**

Being allowed to drive is extremely important to many patients with OSA. For some their livelihood depends on it. It is quite possible that many of these drivers with OSA are as safe as other road users even though, as a group, they have a somewhat higher accident rate than controls. At least some of those who have been demonstrably sleepy in the day may be safe to drive if they feel awake and their journey is very short. What may matter is that the individual is aware of the risk and acts responsibly.

Sleepiness in all of us is something that comes and goes. Even if we had a good measure of it, a single snapshot of sleepiness is unlikely to help much in determining fitness to drive. Since sleepiness varies, it is generally unrealistic to expect a doctor to determine that a patient is safe to drive on a day-to-day basis. Patients may have good nights or bad nights; sometimes they may be unable to use their CPAP because of a cold. They must decide if they are fit to drive the next day; the doctor cannot. The doctor has an important role in educating the patient on the risks of driving when sleepy and advising on countermeasures.
In appraising the risk of driving in an individual patient clinical judgement is paramount. For the doctor to be able to make this difficult judgement there has to be trust between patient and doctor. Confidentiality is essential. For this reason, with rare exceptions, the patient should inform the DVLA not the doctor. Otherwise patients will not attend and will continue driving without the treatment they need (George, 2002).

References


2. Findley LJ, (2002). The threat of mandatory reporting to a driver’s license agency discourages sleepy drivers from being evaluated for sleep apnea. Sleep, 25, A222 Abstract supplement.


http://www.doctorupdate.net/du_toolkit/s_sorters/s74.html


Other relevant documents:


4.2.3 Obstructive sleep apnoea/hypopnoea syndrome and driving

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Background

The obstructive sleep apnoea/hypopnoea syndrome (OSAHS) is characterised by sleepiness, impaired concentration and unrefreshing sleep in patients with upper airways obstruction during sleep\(^1\). OSAHS has a prevalence of around 1-2 per cent (range 0.3-4 per cent)\(^2\)-\(^4\) in the middle aged population but occurs at all ages.

The diagnosis of OSAHS requires the combination of appropriate symptoms, especially sleepiness, with the demonstration of breathing pauses during sleep, or their direct sequelae such as intermittent oxygen desaturation. A confident diagnosis cannot be made from clinical features alone. The threshold frequency of respiratory events during sleep for diagnosing OSAHS in the appropriate clinical context is at least 5/hr\(^5\) although many physicians require at least 15\(^6\) or even 30\(^7\) events/hr before instituting treatment.

Sleepiness and cognition

There is evidence from epidemiological\(^8\)-\(^9\) and case-control\(^1\)-\(^12\) studies that attention, executive function and memory are impaired in OSAHS. Treatment with CPAP therapy significantly improves objective sleepiness\(^6\)-\(^13\) and cognitive function\(^6\) in patients with >15 respiratory events/hr. However there is no clear evidence of improvement in objective measures of sleepiness or cognition in patients with 5-15 events/hr\(^1\)-\(^14\)-\(^17\).

Road accidents

The first objective evidence of an increased road accident rate was published in 1987\(^18\), and has since been confirmed\(^19\)-\(^24\) in many studies. Patients with OSAHS have impaired performance on divided function tasks designed to simulate the processes used in driving\(^25\)-\(^26\) and their performance improves following treatment with CPAP\(^27\)-\(^28\). Performance on such tasks is similar in OSAHS patients and narcoleptics\(^25\), and patients with moderately severe OSAHS steer more erratically when sober than age, gender and driving matched normal subjects when drunk\(^26\).

How big is the risk?

The extent of the increase in risk varies markedly ranging from 1.29\(^23\) to 12\(^21\) times the risk of other drivers. Some of this disparity may be linked to severity of the irregular breathing\(^23\).
to small sample sizes and to the disparity between studying sleepy patients with OSAHS or populations which include many with irregular breathing but no sleepiness. More data are required to accurately quantify the accident risk.

**Does accident risk relate to severity?**

George and Smiley who found the smallest increase in accident frequency also reported that there was no significant increase in accident rates in patients with AHIs<40/hr, with a 1.57 fold increase in accident rate in those with an AHII>40/hr. However, this study was relatively small with only 460 patients studied and furthermore the accident rates analysed spread back over five years before diagnosis and many patients might not have been affected for the whole of this period. In contrast epidemiological data indicates that accident rates are increased at a very low frequency of irregular breathing, but this is probably spurious.

**Are the accidents due to falling asleep or concentration lapses?**

Studies using driving ‘simulators’ have suggested that patients with OSAHS drive progressively more erratically with time on task and that their errors occur during EEG defined attention lapses – periods of alpha or theta activity lasting 3 seconds or longer. Thus, contrary to a widely held opinion, OSAHS patients do not need to fall asleep to be poor and dangerous drivers.

**How big is the problem?**

There are wide confidence limits on the frequency of OSAH in the community. At the conservative end if one includes only those with symptoms of sleepiness who have more than the 20 respiratory events per hour of sleep then 0.3 per cent of drivers may be at increased risk. At the liberal end, if the epidemiological data were correct, and symptoms of sleepiness are not required then 24 per cent of male and 9 per cent of women may pose increased risk. In all probability the number at and creating risk lies closer to 0.3 than 9 per cent.

**LGV drivers**

A questionnaire based study in the UK found that increased accident rates among lorry drivers were associated with snoring, obesity and large collar size, all markers of OSAHS. Commercial driving is a sedentary occupation and many drivers are obese thus increasing the risk for OSAHS. Such obesity in drivers is almost certainly greater in the USA where a study reported that 78 per cent of drivers had >5 respiratory events/hr of sleep with 10 per cent having more than 30/hr of sleep. OSAHS may interact with poor sleeping conditions and long hours to increase accident rates due to sleepiness.

**Bus drivers**

These are frequently found to have OSAHS, but there are no good epidemiological data on this group.
**Treatment for OSAHS**

*Continuous positive airways pressure* (CPAP) is the treatment of choice for OSAHS, with randomised controlled trial evidence of benefit in terms of symptoms, subjective and objective sleepiness and ‘driving’ performance\textsuperscript{13,27,28,35-37}. There is also evidence of decreased accident rate following OSAHS patients starting on CPAP\textsuperscript{38,39}, with a 12 fold cost saving on accident-related costs for each pound spent treating patients with CPAP\textsuperscript{40}.

**Other treatments**

Some patients are treated either with dental devices or with surgery.

There are no good data as yet indicating improvements in driving with dental devices which are generally less effective than CPAP\textsuperscript{41}. Another concern is that use on dental devices cannot be monitored objectively and has been reported to be <50 per cent in some series.

There is even less data on throat surgery which is generally regarded as being without any evidence of benefit\textsuperscript{41,42}. Mandibulomaxillary osteotomy is very rare in the UK for OSAHS but may be effective and may improve reaction time delays\textsuperscript{43}.

There is no evidence that the use of stimulant drugs or Modafinil is helpful for performance or driving in OSAHS\textsuperscript{44}.

**Some of the problems facing DVLA and Doctors**

1. **What is the definition of OSAHS?**

The most widely used definition of OSAHS internationally is that of the American Sleep Disorders Association\textsuperscript{5} which is based on the co-existence of appropriate symptoms with more than five breathing events an hour. There are many problems with this definition including:

i. if patients deny symptoms – truthfully or untruthfully – they cannot have the syndrome and thus might be adjudged as having no reason to report their condition to the DVLA

ii. five events/hr is almost certainly too low a threshold for a real increase in accident frequency\textsuperscript{23}

iii. despite the opinion of the American Sleep Disorders Association there is no good evidence that the more subtle respiratory events they would wish to count are of any importance\textsuperscript{45}

iv. there is no test available which has been shown to predict which individuals with possible OSAHS are safe to drive (see below). There is a need for research to rectify this situation
2. Under-reporting of driving problems

Patients with OSAHS under-report driving problems at the time of initial referral. The impression among sleep physicians is that this is commoner among professional drivers. It seems likely that many professional drivers do not present to their doctors for fear of losing their livelihood.

3. At what point should patients be told to stop driving?

When patients present with a story of severe sleepiness when driving they are usually asked to stop driving forthwith. Physicians often have a fair idea that some patients with significant sleepiness in other situations are sleepy when driving, even when this is vehemently denied by the patient and their partner. I suspect most such patients are allowed to drive at least until a diagnosis of OSAHS is proved. This is partly because waits to get a diagnostic test are often long, and this makes preventing such patients from driving for many months pending the result understandably unacceptable to many patients. There are still many patients on treatment for OSAHS who have not reported this to the DVLA, and in some cases this is because they have not been asked to make a report.

4. When to restart driving

It is our practice to allow patients to resume driving cars immediately they are started on CPAP, but to wait for evidence of good CPAP use in professional drivers. Is this a correct stance?

5. Monitoring CPAP use

Use of CPAP is, perhaps surprisingly, similar to that of drug treatments in other chronic conditions with at least 80 per cent of patients with severe OSAHS using their CPAP regularly at 5 years. However, that means that there are those who do not use the treatment. Because use of CPAP is readily monitored, I believe it should be mandatory that any professional driver whose licence depends on continuing use of CPAP must be treated with a CPAP machine which records the time when the patient is breathing on it. The recorded use must not be the time when the machine is switched on – it may be left to run in a corner. Similar sophistication of compliance recording should be applied ideally to all drivers, and certainly for any severely sleepy car driver.

6. What is enough CPAP use?

There is no threshold number of hours of CPAP use/night above which patients are safe to drive. This is not unique to OSAHS. There is a dearth of studies on compliance with treatment and driver safety in many other conditions. However, patients who have been shown to have OSAHS with significant sleepiness at diagnosis who are no longer using CPAP or using it very little (<2 hrs a night) should presumably be told once more not to drive. However, remarkably low levels of average CPAP use of 2.5 – 3 hours/night have been shown in some series to be associated with improvements in symptoms and function. There is no such thing as a threshold use above which normalisation in function occurs.
Should there be a threshold of use of CPAP required to keep a LGV/PCV licence?

7. *Is there a test to predict driving safety?*

The short answer is no. Various tests probably predict that an individual is likely to be too sleepy to be a safe driver including the Maintenance of Wakefulness Test\(^\text{50}\) and possibly the Osler Test\(^\text{51}\). However, these tests are performed by asking the subject to stay awake for 20 to 40 minutes, on up to five occasions, on one day. Thus an individual who is motivated to keep his licence may be able to force himself to stay awake for the test. There is no evidence of correlation between the results of these tests and accident rates and the same applies to other tests of objective sleepiness including the Multiple Sleep Latency Test\(^\text{52}\). All these tests also suffer from normal ranges which are wide and often poorly documented. The same criticisms can be applied to vigilance tasks\(^\text{53}\) and divided function tests\(^\text{25;26}\).

In practice one is guided by the patient’s symptoms and sleep study results, but we sometimes use an abnormally short MWT (<30 minutes) as a further reason for concern as to whether a professional driver should hold a licence. This is not evidence based!

*Do we need a different DVLA medical form for drivers with OSAHS?*

Yes. Needs information on severity, level of concern about driving and about objective CPAP use.

**References**


4.2.4 *Excessive daytime sleepiness, sleep disorders and fitness to drive*

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**Summary**

Healthy individuals who fall asleep at the wheel usually do so because they are sleep deprived. To the extent that this sleep loss is similar to that of the patient with a sleep disorder, the manifestation and onset of sleepiness may well be similar for both people. Even healthy young people who fall asleep at the wheel will deny feelings of sleepiness beforehand, and in effect, may claim that the episode was a ‘sleep attack’. With the exception of certain forms of narcolepsy, spontaneous sleep attacks for healthy or sleep disordered persons are unlikely. Although these people may not acknowledge having fallen asleep at the wheel, following a vehicle crash, it is very likely that they were aware of the precursory feeling of sleepiness, even though they may not remember it.

A physician treating a patient having a disorder leading to, or having the potential for excessive daytime sleepiness, should advise him/her that following ‘successful’ treatment, driving may remain compromised by sleepiness, even though the physician may feel that this patient is generally ‘fit to drive’. The latter does not absolve the patient of the responsibility to ensure that they are fit to drive on a particular occasion. That the patient was given this cautionary information ought to be entered in the patient’s notes. A physician who advises such a patient about an increased risk of sleepiness is both safeguarding the health and life of that patient, as well as the safety and lives of other road users. Given that drivers who fall asleep at the wheel have adequate warning, then they should stop driving as soon as possible. This particularly applies to patients with sleep disruption, and they should be strongly advised accordingly.

Chronic sleep disturbances in other medical disorders often go unnoticed among the more obvious symptoms of the disorder. Unless patients are asked about sleep problems they are unlikely to bring this to the attention of the physician, with both being more concerned about other prevailing symptoms.

Notwithstanding the above, obese LGV drivers are at risk for obstructive sleep apnoea (OSA), and because of their high exposure to driving, require special attention. Many are undiagnosed as they claim to sleep well. A screening programme ought to be instituted for such drivers, but undertaken in a positive manner, beneficial to the driver and whereby the driver’s job is not compromised.

**Background**

Undemanding and monotonous driving, typified by motorways, facilitates sleepiness. Although many sleep-related vehicle crashes (SRVCs) are attributed to ‘driver inattention’,
they probably account for 15-20 per cent of crashes on these roads (Horne & Reyner, 1995; Maycock, 1996). SRVCs are more liable to result in death and serious injury owing to the relatively higher speed of the vehicles on impact (Horne & Reyner, 1995; Connor et al., 2002). Few SRVCs occur on urban roads as the latter are relatively stimulating and, usually, there is much for the sleepy driver to attend to. Apart from the human misery, the financial cost of SRVCs can be considerable (Leger, 1988). In SRVCs the driver typically runs off the road and/or collides with another vehicle or object. Although the response time in applying the brakes in an emergency is commonly thought to be impaired by sleepiness, this may not be the case as laboratory studies indicate that the driver will either respond almost normally or not at all (hence a collision). That is, response time becomes disrupted rather than shows a gradual decline. Thus a key sign of a SRVC is the absence of skid marks or other signs of hard braking beforehand. Also, it has to be established that for several seconds (about 7-10 seconds) immediately prior to the crash the driver could have clearly seen the point of run-off or the object hit (implying prolonged inattention rather than momentary distraction). Other causes have to be eliminated, such as: mechanical defect in the vehicle, bad weather, poor road conditions, speeding, driving too close, the driver having excess alcohol or a medical disorder causing unconsciousness (for example, epilepsy), sometimes, even the possibility of the driver attempting suicide. Drivers who are able to respond immediately after SRVCs seldom acknowledge having fallen asleep (see below).

There are clear time-of-day effects with SRVCs (Horne & Reyner, 1995; Langois et al., 1990; Lyznicki et al., 1998; Pack et al., 1995), with peaks around 02:00-06:00h and 14:00-16:00h. If one takes into consideration the variations of traffic density over the day, then the incidence of SRVCs in the early morning is even greater. These periods are distinct from the peak times for all road crashes that occur during the commuting periods. Sleepiness produced by prescribed drugs, alcohol and other substances is influenced by the circadian changes in sleepiness. Alcohol consumed early afternoon is about twice as potent in producing sleepiness and driving impairment compared with the same dose taken early evening (Horne & Baumber, 1991). In both situations, blood alcohol concentrations (BACs) were similar. More recently we (Horne et al, 2003) have shown that low BACs under half the legal limit and within the ‘pass’ region of police roadside breathalysers, lead to marked driving impairment when combined with afternoon sleepiness following disturbed night-time sleep (which has ramifications for those people with sleep apnoea – see below). Healthy, older people are more likely to experience afternoon sleepiness, particularly if night-time sleep is disturbed.

**Sleep disorders**

Sleep-related vehicle crashes are not usually associated with sleep disorders, but are found typically in healthy people having had insufficient sleep and/or driving at their circadian nadir. Despite what is often assumed, there is no sound evidence to show that people with one of the commonest sleep disorders, chronic insomnia, have an increased risk of having a SRVC due to sleep loss **per se**. In fact, such patients tend to be particularly alert during wakefulness (Stepanski et al., 1988).
In the UK, sufferers from narcolepsy are usually not permitted to drive. The sleep disorder presently receiving much attention with regard to driver sleepiness, is sleep apnoea. However, with the exception of obese LGV drivers who are at risk for obstructive sleep apnoea (OSA), combined with their high exposure to driving, there is little evidence to show that it makes a significant contribution to SRVCs. Compared with age-related norms, estimates of the increased risk of the OSA sufferers having a SRVC vary from no difference (Hanning & Welsh, 1996) to around twice as likely (Aldrich, 1989; Maycock, 1996), and even up to four times greater (Young et al. 1997). Although they may be at a higher risk, they may well compensate by reducing or otherwise modifying their driving habits (Hanning & Welsh, 1996). In contrast, Engleman et al. (1997) argue that driving impairments and accidents are under-reported by these sufferers. A recent study (George & Smiley, 1999) of 460 OSA patients is particularly enlightening. The investigators found that 155 had SRVCs, but compared with age-related controls the only patients at risk were those with a severe form of the syndrome; that is, those having an apnoea-hyponoeea index >40. Such people are usually very sleepy during the daytime, and must realise the risk they take with driving.

As an aside – In working with the police, I have had personal experience with too many cases involving obese LGV drivers with undiagnosed sleep apnoea who have fallen asleep at the wheel and have caused a fatal crash. I believe that a screening programme ought to be instituted for such drivers, but undertaken in a positive manner, beneficial to the driver and whereby the driver’s job is not compromised.

Medico-legal issues concerning accidents caused by drivers with sleep disorders are complex (O’Keefe, 1996). In the UK, drivers have a duty of care to other road users and must ensure that they are fit to drive. Someone who drives in a sleepy state, whether they be suffering from a diagnosed medical disorder or is otherwise healthy, should not drive on that occasion. A physician treating a patient having a disorder leading to, or having the potential for excessive daytime sleepiness, should advise him/her that following ‘successful’ treatment, driving may remain compromised by sleepiness, even though the physician may feel that this patient is generally ‘fit to drive’. The latter does not absolve the patient of the responsibility to ensure that they are fit to drive on a particular occasion. That the patient was given this cautionary information ought to be entered in the patient’s notes. If a patient with OSA, for example, is apparently successfully treated, but subsequently causes a fatal SRVC, then in the UK it is still possible that he or she could be prosecuted for death by dangerous driving, as mens rea can be established. A physician who advises a patient about an increased risk of sleepiness is both safeguarding the health and life of that patient, as well as the safety and lives of other road users.

Other medical disorders causing sleepiness

*Parkinson’s disease (PD)* as an example of other issues concerning driving ability

Parkinson’s disease is currently causing concern with regard to daytime sleepiness and falling asleep at the wheel. This has largely been at the behest of a recent report by Frucht et al. (1999) identifying eight cases of PD (average age 65) who apparently experienced sudden ‘sleep attacks’ when driving. It was claimed that in five cases there was no
forewarning of increased sleepiness, and that the event was a ‘sleep attack’. However, even healthy young people who fall asleep at the wheel will deny feelings of sleepiness beforehand, and in effect, may claim that the episode was a ‘sleep attack’. They do have adequate forewarning of sleepiness at the time, but can not recall it afterwards (see below). Similarly, these five patients may well have been mistaken. Fortunately, none of the ‘sleep attacks’ reported by Frucht et al resulted in any injury. Had these attacks occurred spontaneously while driving, then more cases of injury might have been expected, which suggests that the circumstances of such sleep attacks need to be investigated further.

Frucht et al. made no comparisons with age-related healthy controls, to determine the extent that falling asleep at the wheel could have been due to normal ageing. Also, they provided no information about their many other PD patients who drive, but had no such attacks. The authors attributed the presumed sleep attacks to the fact that all the patients were taking dopamine agonists, and that withdrawal of these drugs alleviated such attacks. Of course, drivers who have had the misfortune to fall asleep at the wheel usually are more careful not to allow this to happen again. So it is possible that in these patients the likelihood of a further ‘sleep attack’ while driving would have diminished anyway, with or without this medication being continued. Although Frucht et al. reported that none of these patients had any history of sleep disturbance, none was actually examined for this, and the evidence is only based on the patients’ own opinions. This is most unreliable, and, for example, there are many cases with OSA, where the sleep disturbance can be debilitating, quite unbeknown to the patient who may claim to sleep well.

Sleep disturbance in PD patients has been the subject of various surveys. For example, Goetz et al. (1986) attributed this disturbance largely to pain and depression, whereas for Lees et al. (1988) it was largely due to an inability to turn over and nocturia. Unfortunately neither study had healthy age-related control groups for comparison. Factor et al. (1990), in their survey of the incidence of night-time awakening in PD patients, did incorporate a control group, and found that compared with age-related healthy controls, PD patients reported more night-time awakenings and were twice as likely to report daytime dozing. A later report by Tandberg et al. (1999) comparing PD patients with control groups of healthy elderly and other patients with diabetes mellitus, found the incidences of excessive daytime sleepiness to be 15 per cent, 1 per cent and 4 per cent respectively. However, these particular PD patients were likely to have an advanced stage of the disease. A comprehensive review by Partinen (1997) concluded that 74-98 per cent of PD patients appear to suffer from sleep disorders, and that these often go unnoticed among the more obvious symptoms of the disorder. He pointed out that unless patients are asked about sleep problems they are unlikely to bring this to the attention of the physician; with both being more concerned about other prevailing symptoms. In addition to PD patients experiencing night-time physical discomfort and arousals caused by rigidity, pain, nocturia and parasomnias, Partinen also pointed to undiagnosed co-morbid depression, and the fact that some of these symptoms can be produced or exacerbated by medication, including long-term laevodopa therapy. More recently, Pal et al. (1999) described these sleep problems in more detail, concluding that frequent awakenings are a common manifestation of PD that leads to sleep fragmentation and excessive daytime sleepiness. But these authors emphasised that as PD patients tend to be elderly, it is important for comparisons to be made with age-related
healthy control subjects, and that at least to some extent, some of these disturbances to sleep are simply a consequence of ageing.

Most of the above observations on sleep disturbance and daytime sleepiness in PD patients are based on subjective and clinical assessments without recourse to night-time polysomnographic recordings. A very recent study by Rye et al. (2000) points to the link between sleep disturbance and daytime sleepiness in PD patients being less straightforward than has been assumed. They studied 27 patients who varied in the severity of the disease, and reported on night-time sleep EEG characteristics and a variant of the multiple sleep latency test (MSLT), used to quantify daytime sleepiness. Data were compared with age-related healthy subjects. In the patients, both sleep disturbance and daytime sleepiness were prevalent but, unexpectedly, the two factors showed a negative correlation, inasmuch that those patients having more daytime sleepiness tended to be less sleep disturbed. Furthermore, neither variable showed any clear relationship with level of disability (Hoehn-Yahr score) and medication (n.b. – no patient was on dopamine agonists). Patients also had a higher than expected incidence of early REM sleep onset during MSLTs. Those that did so tended to exhibit more sleepiness and a greater likelihood of hypnagogic hallucinations. Rye et al. concluded that PD might be associated with primary impairments of waking arousal and REM sleep organisation. In some cases this is similar to that manifested in narcolepsy, but not necessarily symptomatic of narcolepsy.

In sum, the situation concerning the fitness to drive with respect to sleepiness in PD patients is unclear, complex and has yet to be resolved. A similar situation may apply to patients with MS, arthritis and other disorders liable to cause grossly disturbed sleep.

**Forewarning of sleepiness before falling asleep**

Most healthy drivers causing SRVCs usually deny having fallen asleep, and the evidence pointing to the accident being sleep-related has to come from other sources. There are possible reasons for this denial, such as fear of prosecution and loss of insurance indemnity. But it is more likely that the driver genuinely had no recollection of actually having fallen asleep. Sleep laboratory studies show that people who fall asleep typically deny having been asleep if awoken within a minute or two. For example, Bonnet and Moore, (1982) reported that 2-4 minutes of sleep have to elapse before more than 50 per cent of people acknowledged that they were asleep. These investigators noted that, ‘subjective sleep onset appears to be a relatively lengthy period during which perception of state is blurred and uncertain’ (p267). As a driver cannot remain asleep for more than a few seconds without having a SRVC, this may account for why such recollection is poor in drivers having had these SRVCs.

This is no excuse for drivers falling asleep at the wheel. While they may not acknowledge having fallen asleep, it is very likely that they were aware of the precursory feeling of sleepiness, even though they may also not remember this after the crash. In the only published study to monitor subjective sleepiness in healthy, sleepy drivers while they were driving, Lisper et al. (1986) noted that all their drivers were aware of their lowered arousal, and those who fell asleep had to fight sleep beforehand and in doing so knew the risk of
falling asleep. These findings, obtained from drivers while they were driving, contrast with those of two other related studies (Tilley et al., 1973; Jones et al., 1979) that asked drivers to think back often weeks, months, and even years after a SRVC. Both studies claimed that drivers who fall asleep at the wheel can have no foreknowledge of sleepiness beforehand, and that for them the sleep episode was a surprise (for example, presumably a ‘sleep attack’). Such claims have influenced medico-legal arguments relating to driver culpability. However, analysis of both reports (Reyner & Horne, 1998a) shows that these conclusions are misguided and based on the same misleading questions incorporated into identical questionnaires.

There are few, if any, other relevant reports apart from our own (Reyner & Horne, 1998a) recent study assessing the association between subjective sleepiness and driving impairment in sleepy drivers. We used a ‘real car’ simulator to examine the progress of sleepiness prior to falling asleep and the possibility that drivers who feel very sleepy misperceive or disassociate this from the perceived likelihood of actually falling asleep. Healthy experienced drivers, sleep restricted to five hours the night before, drove for two hours in the afternoon. Lane drifting, typifying sleepy driving, was subdivided into minor incidents (one wheel out of lane) and major incidents (all wheels out of lane), where the latter was indicative of actually falling asleep. A distinction was made between the subjective perceptions of sleepiness and the likelihood of falling asleep, with drivers reporting these separately. Increasing sleepiness was closely associated with rising driving incidents. Major incidents (for example, potential accidents) were preceded by self-awareness of increasing levels of sleepiness, commencing about 40 minutes before the major incident. Typically, subjects had reached the stage of fighting sleep when these major incidents happened. While the perceived likelihood of falling asleep was highly correlated with increasing sleepiness, some subjects failed to appreciate that extreme sleepiness is accompanied by a high likelihood of falling asleep. Nevertheless, it was not possible for our subjects to fall asleep at the wheel and have a major incident without experiencing a sustained period of increasing sleepiness, of which they were quite aware.

These findings come from a laboratory simulation and there is the problem of the extent to which these can be generalised to the real world. However, we (Baulk et al., 1998) have also undertaken a similar study, using similar subjects and under same sleep restrictions driving at the same time of day, but in a real car on a driving track. The findings were the same: drivers were quite aware of increasing sleepiness.

Many drivers (and probably sufferers from sleep disorders, PD, etc) fail to appreciate that sleepiness portends sleep, which can appear more rapidly than one realises, especially if the driver has reached the more profound stage of fighting off sleep. It is possible, of course, that patients with sleep disorders may experience a more rapid onset of sleepiness during driving. However, this would probably depend on the degree of sleep disturbance, and is a matter that remains to be established. Nevertheless, given that healthy individuals who fall asleep at the wheel usually do so because they are sleep deprived then, to the extent that this sleep loss is similar to that of the patient with a sleep disorder, the manifestation and onset of sleepiness may well be similar for both people. Thus the question remains, why do they persevere with their driving, beyond the point when they are fighting sleepiness and should stop driving? Do they not realise the risks involved? Sleepiness might cloud one’s
judgement about the extent of the driving impairment, although, recent laboratory findings unrelated to driving (Baranski et al., 1994) show that sleepy subjects are usually aware of the extent of their deteriorating performance. It is possible that sleepiness affects mood, making drivers more optimistic, less cautious and even more reckless with their driving. There is evidence from more extreme sleep loss studies that this can happen (Horne, 1988; 1993), but there is no such research relevant to sleepy driving.

**Countermeasures**

*Given that drivers who fall asleep at the wheel have adequate warning, then they should stop driving as soon as possible. This particularly applies to patients with sleep disruption, and they should be strongly advised accordingly.* Motoring organisations advocate various in-vehicle methods to counteract sleepiness, such as cold air to the face (opening the window) or turning up the car radio/tape player, but there is no sound evidence on which to base this. In fact we (Reyner & Horne, 1998b) have shown that both methods provide only temporary benefit, being only partially effective for a short period of time (about 15 minutes). That is, these techniques should not be used to prolong driving, but may provide enough time for the driver to locate and stop at a suitable place to park and rest. In some cases, listening to the radio distracts sleepy drivers from being so aware of their sleepiness and impaired driving.

Other advice is for the sleepy driver to take a walk or some exercise during a break from driving. But there is no strong evidence in support of this notion, and our research shows it to be a waste of time (Horne & Foster, 1995). Sleep is the cure for sleepiness, and so it is far better to take a short (10-15 minutes) nap if possible (Horne & Reyner, 1996; Reyner & Horne, 1997). However, naps beyond 20 minutes can be counterproductive as they develop into a full sleep, causing difficulty in arousing and ‘thick headedness’. Caffeine (as in coffee or a caffeinated drink) is probably the next best technique, with effective doses being about 150-200mg (Reyner & Horne, 1997; 2000), to be found in two to three average cups of coffee. Caffeine taken in this manner requires about 30 minutes to become effective, and the beneficial effect will last an hour or so, depending on the level of sleepiness. Combination of caffeine with a nap, whereby 150mg caffeine is taken immediately before a nap or doze of up to 15 minutes (for example, both within a 30 minute break), has a powerful and enduring effect in suppressing sleepiness – more potent than either method alone (Reyner & Horne, 1997). Drivers should not rely on higher (pharmacological) doses of caffeine, as this implies that they are too sleepy and, hence, should not be driving at all.

The advice given in this section forms the basis of the Department for Transport’s THINK campaign.
References


4.2.5 Driving and medical aspects of excessive daytime sleepiness

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Abstract

Sleep-related accidents are becoming increasingly frequent and the individual driver has a responsibility to remain alert while driving. Sleepiness sufficient to cause or contribute to an accident is often multifactorial. It may involve a combination of life style and medical factors. Sleepiness may be persistent or transient, but both may lead to serious accidents. There is no satisfactory measurement of the degree of sleepiness sufficient to pose a risk while driving and clinical assessments are frequently inaccurate. Nevertheless it is important to identify those who are likely to cause accidents on the road through sleepiness. Whichever process is evolved should assess life style as well as medical aspects and include an appeal mechanism for the driver and a review of the ability to drive after an identified interval.

Introduction

The increase in the number of motor vehicles has raised the importance of assessing the risks of accidents and of trying to prevent them. Excessive daytime sleepiness is recognised to be associated with an increased risk of being involved in a road traffic accident and it is now thought to be a more important factor in causing accidents than driving with more than the legal limit of alcohol in the blood. Sleepiness varies in its severity and if it is mild there is usually little difficulty in compensating so that a reasonable degree of alertness can be maintained. If it is more severe, however, concentration and awareness while driving and impairment of the ability to control the vehicle become apparent. It is very unusual for this to occur without the driver being aware of feeling sleepy and therefore having the opportunity to take action to prevent a sleep-related accident. Causing accidents due to sleepiness is recognised by law as being an offence and the driver has a legal duty to only drive while sufficiently alert.

The principle of the Department for Transport’s approach should therefore be to try to identify drivers at an increased risk of causing accidents and to reduce this risk either by education or by revoking the driving licence temporarily or permanently.

Individual causes of excessive daytime sleepiness

Excessive daytime sleepiness is usually multifactorial. It may be due to a sleep disorder such as sleep apnoeas or narcolepsy, or to life style factors such as sleep restriction. These individual factors are often additive or synergistic and in combination therefore pose a greatly increased risk of falling asleep while driving. In some disorders, such as narcolepsy, there may be a persistent risk of falling asleep, but in other situations this may only occur
occasionally and transiently, for instance after sleep loss during the previous night or after taking medication. The risk of a fatal accident may, however, be as great or greater with intermittent and brief episodes of sleepiness as with the more chronic disorders.

Some of the important causes of daytime sleepiness:

1. **Sleep restriction or sleep deprivation**

   This is probably the commonest cause of daytime sleepiness and is thought to be particularly prevalent among younger adults, although, through work and social commitments, it is probably frequent throughout society. It is becoming an increasing problem both in the UK and abroad with the importance attached to sleep being relegated below that given to other activities carried out during wakefulness. The Selby train crash was an extreme example of an accident caused by sleep deprivation, but this is often hard to document objectively.

2. **Drugs**

   These include hypnotics such as benzodiazepines, antidepressants, sedative analgesics, particularly of the opiate group and recreational drugs, such as cannabis. Alcohol intake and sleepiness following alcohol due to disruption of the overnight sleep is also an important factor. Blood levels of some of these drugs may be of help in quantifying the risk of an accident in the individual subject.

3. **Shift work**

   Approximately 25 per cent of those in employment work some form of shifts. This is well recognised to cause daytime sleepiness. The risk depends on the details of the shifts, age, coping strategies and other factors.

4. **Time of day**

   The circadian rhythms affect alertness and the degree of sleepiness and the impact of other factors, including sleep restriction and medication, are influenced by these circadian factors. The circadian rhythms promote sleep, particularly from 2-6 am and 2-4 pm.

5. **Obstructive sleep apnoeas**

   These are common but one of the difficulties is that they merge into normality. No satisfactory criterion has been identified for quantifying the number of sleep apnoeas or the physiological consequences of these in order to assess the risk of a road traffic accident, although in general the more frequent the apnoeas the more the sleep is fragmented and the greater the degree of daytime sleepiness. Mild sleep apnoeas combined with shift work or sedative medication may, however, be sufficient to pose a considerable risk to driving. Nasal continuous positive airway pressure (CPAP) treatment can be highly effective in relieving sleep apnoeas and the daytime sleepiness that they cause and may return the subject’s risk of a sleep-related accident virtually to normal. Weight loss and other treatments may occasionally have the same effect.
6. Narcolepsy

A diagnosis of narcolepsy can in most subjects be definitely established or excluded by a combination of clinical features, including daytime sleepiness and cataplexy, the presence of the appropriate HLA type and polysomnographic and multiple sleep latency test features. In this respect it differs from sleep apnoeas where there is a spectrum from severely affected to mildly affected subjects through to normality. The daytime sleepiness of narcolepsy rarely improves throughout life, but can be lessened with treatment including life style changes and medication. Amphetamines have been used for narcolepsy and are often effective, but can cause a psychosis, which could present a risk while driving. Modafinil, a new non-amphetamine wake-promoting drug, does not have this type of side effect and, like the amphetamines, is effective in around 75 per cent of those with narcolepsy.

Many subjects with narcolepsy are aware of their limitations and only drive, for instance, after a nap, which is usually refreshing, or taking an amphetamine or Modafinil. The risk of sleep-related accidents is probably only slightly greater than that of the normal population.

Size of the risk

It is important to establish what degree of risk of a sleep-related accident is worth identifying and what risk is acceptable. There may be data relating the risk of a sleep-related accident to age, sex and individual sleep disorders. It is thought that young males are worse at recognising when they are sleepy and taking appropriate action and thereby are more at risk of causing a sleep-related accident. Other subjects adopt coping strategies, which can reduce the risk of a sleep-related accident. These include only driving at times of day when alertness is maximum, taking a nap or a caffeine containing drink before driving or during driving if sleepiness develops, only driving short distances on familiar routes and in the daylight. These coping strategies may well outweigh the apparent risk of a sleep-related accident in an individual disorder and conversely the failure to adopt them may increase the risk substantially. It is nevertheless difficult to quantify these strategies.

The aims the Department for Transport could be not only to remove drivers at risk from driving, but also to educate drivers and their families about the risk of driving while sleepy, how to recognise sleepiness while driving and what appropriate action should be taken.

Assessment

Ideally there would be a road-side or police-station test similar to that used for measuring alcohol consumption which would assess whether or not a patient was excessively sleepy and whether this was likely to cause or may have contributed to an accident. Unfortunately no suitable test is available. All the investigations including those measuring reaction times, driving simulators, pupillometry, multiple sleep latency tests and maintenance of wakefulness tests are time consuming, costly, dependent on skilled technicians and only patchily available.
The alternative is to rely on reports of individual drivers with regard to either their sleep disorders or to other factors including medication that might be contributing to sleepiness. This could include self-reported estimates of daytime sleepiness such as the Epworth Sleepiness Scale. It is important that this initial assessment should not purely concentrate on sleep disorders such as narcolepsy, but should also take into account other sleep promoting situations, such as medication and sleep deprivation.

This initial assessment requires some form of identification of high risk drivers either by police at the roadside, by notification to the DVLA by the driver, or possibly by a third party, such as a doctor or other member of the family. There would then be a need to obtain more information. This could be from the patient, general practitioner or a sleep specialist. This information could be purely factual, but at some stage an opinion has to be made as to whether the risk of a sleep-related accident is greater than is acceptable. This is a most difficult issue since as described above none of the investigations are satisfactory and the risk of a sleep-related accident may vary from day to day, or moment to moment. A specialist clinical opinion may be of value but it is likely to be inaccurate on many occasions. If the decision to revoke a driver’s licence is made there should be an appropriate appeal mechanism since the decision may lead to substantial loss of earnings and employability. There should also be a mechanism for review of the decision after an appropriate time interval.
4.2.6 A clinician’s view of coping with sleepy patients

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The problem of sleepy drivers is clearly important, and a significant number of road traffic accidents are due to poor vigilance, consequent upon inadequate or fragmented sleep. In my sleep clinic I hear many stories of sleep-related vehicle accidents, some of which have led to fatalities. This assertion is supported by the increased accident rate in patients with obstructive sleep apnoea (OSA)\(^1\).

As a physician running a sleep clinic mainly dealing with patients who have OSA, one of the major problems is advising them over driving issues. To my mind there are four major areas of concern and what follows is a personal view of the problems.

The first is that sleepiness is not an all or none phenomenon, it ranges from none, to mild (experienced by anyone after a late night), through moderate, to severe. Any attempted cut-off between normality and abnormality would of necessity be arbitrary. In this respect it is unlike epilepsy, for example, where one either fits or does not.

Second, we do not know how to measure sleepiness (which fluctuates anyway) in a meaningful way that truly relates to the likelihood of a road traffic accident. Trying to measure instead the cause of the sleepiness, such as number of arousals an hour or overall sleep architecture, is even less predictive, due to the poor relationship between sleep fragmentation and daytime performance\(^2\). Much of this seems to be due to a large interindividual variation in susceptibility to poor sleep\(^3\).

Third, driving is very important to many people, as the right to drive is seen by most as a basic right. For a considerable number it is their means of earning a living. Thus some patients will deliberately underestimate their sleepiness, particularly whilst driving, to try to ensure that the doctor does not stop them driving. Conversely, if my clinic gets a reputation for stopping people driving, the patients will not present at all, the worst of both worlds.

Fourth, the DVLA classes drivers as fit or unfit to drive. This, although pragmatic, is unrealistic. We all become sleepy from time to time, and hopefully make responsible decisions as to whether to drive or not, and for how long. Responsible patients with abnormal sleepiness can do the same but, just as a normal person can be silly and try to drive too long without a break, so can patients. Most appear to be sensible and voluntarily cut their driving to short distances. These are often the journeys that would most upset their lives, such as taking their children to school etc., if they were prevented from doing them.

The recent high profile cases of sleepy drivers having accidents and being jailed have helped me as a clinician in the clinic. It allows me to graphically demonstrate to patients the consequence of driving while ‘under the influence of sleepiness’ and the severe view the law takes.
I firmly believe that sleepy patients know they are sleepy, just as do normal subjects who are currently having bad sleep know they are sleepy, and it remains the case that ultimately individuals are responsible for their own vigilance while driving, not doctors.

Given these four problem areas, what progress has, or could be, made in these four areas?

1) Sleepiness is a continuum, how do we define thresholds?

2) Measurement of sleepiness, what are the relevant tools?

3) Underestimation of sleepiness, improving honesty.

4) Should driving be divided into short and long journeys for licensing purposes?

1) **Sleepiness is a continuum, how do we define thresholds?**

In theory a sleepiness threshold could be set, above which driving is not allowed. This would have to apply across the board (for example, normal subjects and patients alike) and be easily testable. Unlike impaired eyesight, sleepiness fluctuates and may be better on some days, and indeed may be temporally improved for the purposes of a test. We are a long way from a ‘brain breathalyser’ that could be used at the roadside to define a certain degree of sleepiness. Various in-car devices have been tried as monitors of driver sleepiness, ranging from a hat incorporating a mercury tilt switch (!), to sophisticated eye-tracking technology to look for slow eye movements or eyelid closure. Again, defining a threshold is difficult, with either low sensitivity or specificity depending upon the particular level chosen.

2) **Measurement of sleepiness, what are the relevant tools?**

The pursuit of a gold standard to measure sleepiness has been intense, as the commercial rewards for success would be considerable. Wilkinson first championed the concept of measuring performance during long and boring tasks designed to challenge vigilance. Measures of actual ability to fall asleep (MSLT) or stay awake (MWT) have became popular, but doubt exists as to their relevance to real life. For driving purposes, simulators have also been employed, but it is likely that they offer little more than simpler tests of vigilance or sleepiness such as the MWT.

Ultimately one wants to assess the ability of a test to predict poor driving, or potential accident risk. Two studies have looked at this, and the relationship, not surprisingly, is poor. However, it may be no worse than the relationship, for example, between reduced visual acuity and accidents.

3) **Underestimation of sleepiness, improving honesty**

Clearly, having an objective test of sleepiness would get around some of the issues of dishonest reporting. However, I believe it is more important to make honesty pay, for
example, when patients complain of sleepiness they are rapidly investigated and treated. We try hard to treat sleepy OSA patients quickly and allow them to return to driving as soon as possible. Currently, resources in most areas do not allow this to happen even though there are excellent data from randomised placebo-controlled trials that treatment of OSA with nasal continuous positive airway pressure improves both sleepiness\(^7\), and performance on driving simulators\(^8\). In addition it has been shown that accident rates fall following treatment\(^9\). Major efforts to improve clinical resources would help, the alternatives to improved funding are to accept that patients will often have long periods off both work and driving, and/or pushing the whole problem underground.

4) Should driving be divided into short and long journeys for licensing purposes?

Since sleepiness cuts in after a certain length of time on a task, it could be argued strongly that it is quite safe for moderately sleepy drivers to do short journeys. Rather like certain vehicles have speed restrictions, there could be time restrictions on drivers. This is not too dissimilar to the general advice given about taking a break every one to two hours, and indeed the hours working directive for long-distance drivers. To some extent this is already how advice is couched in the clinic. Although this approach is radically different to anything to my knowledge done by the DVLA before, I think it should be considered as an option. The issue of compliance to any time restriction, without a break or nap, would need to be considered.

If major changes to the system are not envisaged then it would help in the clinic if the following were possible. 1) Improve the wording on SL1 and 2 to some agreed text, the same on both. 2) Agree on minimal requirements for adequate control of symptoms to retain/regain class 1/2 licences, likely to be different. 3) Issue DVLA guidance letter/information for patients that we can give out in the clinic, and possibly a guidance note for use by staff as well. These could perhaps include case examples/histories, photographs etc., to bring home to the patient the seriousness of the issue, and that it is not just the doctor who is saying this.

Thus in conclusion, there are several areas within sleep medicine and driving that cause considerable problems in the clinic. I have no simple answers, and we struggle with the advice we give to patients, when many of them are in the grey zone between clear normality and clear abnormality. At present there are no tests that reliably identify potentially dangerous drivers, and there are inadequate resources to rapidly treat those in need of help. However, greater awareness of the issues, helped by recent cases in the courts, has raised the profile of these problems.

References


**Recent reviews**


Medical aspects of excessive daytime sleepiness and driving

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Background

Driving and sleepiness

Sleep-Related Vehicle Accidents (SRVA) are more common than is generally realised. Maycock found that 29 per cent of 4600 respondents in a UK survey admitted to having felt close to falling asleep at the wheel in the previous year, while 18 per cent had had accidents in the past three years. The determination that sleeping at the wheel is the cause of an accident is based on well-defined criteria1. However, there is under-reporting of this. The rate of non-sleep ascribed accidents is closely related with sleep propensity (18.7 per cent) and there is a strong similarity with the pattern of sleep-ascribed accidents (3.2 per cent)2. This literature describes a particularly strong association between sleep apnoea and the risk traffic accidents3,4. A Spanish study5, found that 102 drivers receiving emergency treatment after RTA’s was more like, by a factor of 6, to have OSA. A French study6 suggests that approximately half of drivers involved in SRVA’s have sleep disorders with a third having clear indications of OSA. However, not all patients with OSA are at the same risk, in a larger study to date suggesting that increased RTA’s in OSA maybe restricted to cases with more severe OSA (AHI >40)7.

Information about other sleep disorders is less evident. Parsons8 from his own patient population found narcoleptics to be at increased risk of RTA’s. Similarly, Aldrich9 reviewed data on SRVA’s from 70 controls and 424 adults with four categories of sleep disorders: Sleep Apnoea, Narcolepsy, other causes of EDS and Non-EDS. In the EDS groups SRVA were 1.5-4 times greater with an incidence/year of 3-7 per cent. The proportion of patient with SRVA was highest in narcoleptics, though apnoeics were involved in more accidents because of their greater number. Apnoeics and narcoleptics accounted for 71 per cent of SRVA’s. The MSLT did not differ in patients with and without accidents.

Driver performance can be measured by simulators of various degrees of sophistication10. Some patients (with OSA) perform as poorly as subjects intoxicated with alcohol11. Beneficial effects of treatment including CPAP and surgery have also been shown using these simulators12.

Current guidelines (my understanding)

A duty of care exists for the practitioner to inform the patient of risks related to sleepiness and if severely affected (what is this?) to discourage driving until treatment. It is the licence holder’s duty to notify the DVLA of ‘any medical condition, which may now, or in future, affect their safety as driver’. If a patient refuses to accept diagnosis or the effect of a
condition on their ability to drive, the GMC suggests that the patient seek a second opinion and not to drive until the second opinion has been obtained. If they continue to drive when not fit to do so it may be necessary to inform next of kin and even the DVLA, informing the patient in writing on the decision to do so.

The current DVLA guidelines on medical standards on fitness to drive include reference to (respiratory) sleep disorders where for a Group 1 licence, driving must cease if the sleep disorder continues to cause sleepiness. Driving will be permitted when satisfactory control of symptoms is achieved (symptoms, for example, patient report). For a Group 2 licence specialist assessment is needed to confirm that the condition is adequately controlled (assessment of the condition or symptom or both?); also for neurological disorders – narcolepsy/cataplexy where a Group 1 licence requires ‘satisfactory control of symptoms’ (again), and Group 2 ‘generally considered unfit but may be considered.’

**Excessive daytime sleepiness**

This is defined as the abnormal propensity to fall asleep in passive or active situations. The differential diagnosis is straightforward:

- **Insufficient sleep**
  - the commonest, including circadian problems

- **Interrupted sleep**
  - any other medical disorder, for example, Parkinson’s disease
  - sleep apnoea
  - periodic limb movement disorder

- **Intrinsic sleepiness**
  - narcolepsy and variants
  - drug induced, either residue hypnotic effect or somnolent side effects of other medicines such as dopa agents

(Note variable individual response to all these which is indicated in italic by David Dinges.)

Measurement of sleepiness may be accomplished by a number of methods:

- **Subjective**
  - current level of sleepiness by the Karilinska Sleep Scale (KSS) or Stanford Sleep Scale (SSS) as well as general level of sleepiness by the Epworth Sleepiness Scale (ESS)

- **Objective**
  - MSLT and MWT (or Osler)

- **Surrogates**
  - reaction time and pupilometry
None of these are perfect. There is no/little correlation between the ESS and MSLT\textsuperscript{13} and the MSLT range for narcoleptic is quite wide\textsuperscript{14}. Concerns have been raised about the ESS as in terms of self-denial\textsuperscript{15}. The MSLT has a wide normal range and there are very important methodological issues\textsuperscript{16}. Maintenance of Wakefulness Test is also used, particularly for airline pilots, but is there sufficient data to allow this?

The future assessment of excessive daytime sleepiness may include cameras in vehicles recording eye closure\textsuperscript{17}.

**General approach to excessive daytime sleepiness**

The severity of EDS is assessed subjectively by the ESS supplemented with information from partners as noted in the previous background. Insufficient sleep is the commonest cause of EDS and any evaluation must begin with an appreciation of the adequacy of the patient’s sleep opportunity, both in terms of time and quality. A sleep log is invaluable and attention to sleep hygiene essential (even in the presence of another sleep disorder – sleep hygiene forms the back drop to the treatment of any sleep complaint).

Historical clues to the presence of the main sleep pathologies are sought:

- Time of onset, for example, OSA v Narcolepsy
- Snoring/witnessed apnoeas for OSA
- RLS for PLMD
- Cataplexy for narcolepsy

All this is supplemented by examination awake (of the upper airway) and, asleep. If OSA is strongly suspected I usually move to a two or three channel respiratory recording; if RLS is present with or without OSA I recommend polysomnography; if narcolepsy without cataplexy is suspected I recommend polysomnography with a subsequent MSLT. (Actigraphy is useful as an adjunct to the sleep log, and as a home diagnostic tool for PLMD, Parkinson’s, MS etc.).

Finally, a therapeutic trial may be needed to dissect out various issues. This might include increased sleep, hygiene, physical, surgical or pharmaceutical therapy. However, because of the common delays in instituting treatment or even achieving a diagnosis, I have on occasions considered someone’s sleepiness to be sufficiently intrusive to warrant stimulant therapy before the algorithm is complete.

**Approach to the individual driver**

It is my simple understanding that patients with sleep disorders present with one of only three complaints, about which I make every effort be specific. These are or course insomnia versus hypersomnia versus a parasomnia. However, with any sleep disorder the assessment
of sleepiness within the context of that complaint is essential and is accomplished by the ESS, with additional questions (for example, drowsy driving) about this as well as questions about past history of RTAs\(^{19}\) and family or partner reports (propensity for intrinsic sleepiness) and a list of drugs being used, recognising that patients (with OSA) underestimate their driving impairments\(^{18}\) and often fail to report serious crashes to their physician\(^{20}\) as well as the fact that the ESS does not correlate with standard objective measures of sleepiness. Nevertheless, this is the generally most used estimate of sleepiness in drivers and I do not see an alternative at present. Whether a simple performance test\(^{11}\) needs to be added is open to question and indeed has only been assessed for OSA. A normal Multiple Sleep Latency Test does not of course exclude narcolepsy.

I then advise the patient as a duty of care not to drive while sleepy and to inform the DVLA. I also take account of whether driving is recreational or professional and in the latter setting may, if the delays in diagnosis and treatment are going to be substantial and if the sleepiness is sufficient would consider introducing a stimulant until the diagnostic algorithm has been completed.

I will then establish diagnosis and severity of the condition, which may guide further advice. For example, OSA with an high apnoea/hypopnoea index may suggest a patient’s risk for accidents and, in narcolepsy, the MSLT although imperfect does usually indicate the degree of sleepiness.

I then introduce treatment with follow-up for compliance particularly as applied to CPAP. At each level attention to sleep hygiene is stressed which I think is under appreciated by physicians in general.

**Specific disorders**

*Insufficient sleep:*

Selby has done wonders! Again it is stressed that sleep hygiene is important enough for all of us to spend time discussing this with patients.

*Interrupted sleep:*

*OSA:* much has been written about this but it is still an under-appreciated disorder and under diagnosed. It is hard to identify patients at risk from driving accidents objectively and therefore rely on subjective accounts of the patients ESS and their previous history of drowsy driving and RTA’s. It is of course imperative that patients be reminded that it is their duty to drive safely and therefore not while sleepy.

*PLMD:* does this is ever occur independent to of RLS? It is my belief that RLS is the indicator that we use for the presence of important PLMD.
Others: this is a big area of concern; what about patients with COPD and Parkinson’s disease whose sleep is really quite disrupted and for who we do not usually ask these directed questions.

Narcolepsy: the question here would be as to whether sudden sleep attacks occur. I do not believe that this is the case. There is literature (*Encyclopaedia of Sleep and Dreaming*) but I believe that there is still a premonition of impending sleep.

Problems

- Mass of undiagnosed sleepiness. How do we cope?
- Lack of profession awareness (ref).
- Drug effects from hypnotic and dopa agents.
- How to measure sleepiness. There is always the potential for self-denial.
- How to follow-up, what do we measure?
- Variable response to the sleep disorder itself.
- Current guidelines are insufficient I think with licences being awarded based on patient report. For a Group 2 licence what assessment does the DVLA required? Is it an assessment of symptoms or disease or sleepiness.
- We cannot really study sleepiness in all patients as doing various testing procedures would be very time consuming. And I do not think it is our job. So I think we should rely on the driver who, as I said before, must have a duty to drive safely.
- What about other diseases producing sleep disruption? – a thoroughly under-researched area.
Driving and Medical Aspects of Excessive Daytime Sleepiness: A consensus workshop