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Original Article

Sleep Specialists' Opinion on Sleep Disorders and Fitness to Drive a Car: The Necessity of Continued Education

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Abstract: Whether patients with sleep disorders are fit to drive, and who should determine this, is a matter of debate. However, scientific literature is available on these topics to aid clinicians making these decisions. A survey was conducted to assess sleep specialists' views on fitness to drive for patients suffering from apnea, insomnia, and narcolepsy. Most of the 112 respondents (66%, 95%CI: 57–74%) indicated that insomnia patients would be fit to drive within days or weeks after initiating treatment, but 44% (95%CI: 35–53%) felt that, depending on the amount of excessive daytime sleepiness (EDS), they should not drive if untreated. Around half of respondents (49%, 95%CI: 40–58%) indicated that untreated patients with apnea should not drive, but the majority (66%, 95%CI: 57–74%) felt they could drive after Continuous Positive Airway Pressure treatment was established, though EDS was a significant factor. For untreated narcoleptic patients 77% (95%CI: 68–84%) indicated they should not drive, and similarly, that treated patients could drive, although EDS levels were again seen as important. It is concluded that patient education remains the most practical approach to improve compliance and reduce accidents associated with EDS. Sleep specialists should remain up-to-date of relevant scientific literature to achieve this goal.

Key words: Driving, Fitness to drive, Insomnia, Narcolepsy, Sleep apnea, Excessive daytime sleepiness

Introduction

Driver sleepiness and reduced alertness are the most common causes of traffic accidents, accounting for 10–30% of all traffic accidents[1–3]. Data from the 2009 Sleep in America poll show that 28% of respondents reported that they had been driving when drowsy at least once per month during the past year, and for 11% this happened at least once a week[4]. About a quarter of respondents (28%) reported that they had nodded off or fallen asleep while driving during the past year, and 1% reported having had an accident or near accident due to drowsiness. The number of near misses is also associated with the frequency of actual accidents[5].

The most common causes of drowsy driving are lack of sleep or poor sleep quality, prolonged driving, a monotonous driving environment (e.g., a highway with low traffic density), and circadian factors, most notably driving during the night, after a night shift, or in the early afternoon[6]. Also, individual differences, medical condition and pharmacological treatment may cause driver sleepiness[6].

Driver sleepiness and lapses of attention play an important role in highway accidents[7–9]. A recent comparison of

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on-the-road driving data showed that driving impairment after 2 h of nocturnal driving in healthy volunteers equaled impairment seen with a blood alcohol concentration of 0.05%, i.e. the legal limit for driving in many countries[10]. As drivers reported higher levels of sleepiness and drove a longer distance without having a break, driving impairment was more pronounced.

Sleep disorders may contribute to drowsy driving, since patients with sleep disorders such as insomnia, sleep apnea, and narcolepsy often experience daytime sleepiness. Although the prevalence is often underestimated, sleep disorders are very common with chronic insomnia the most prevalent at around 10% of the population[11]. Surveys show that the prevalence of sleep apnea in the driving population lies around 6%; for narcolepsy the prevalence is less than 1%[5, 12]. Although patients in some European countries who suffer from sleep apnea or narcolepsy are not allowed to drive a car, most European driving laws do not include specific statements on sleep disorders or excessive daytime sleepiness (EDS)[13].

There is an ongoing debate about whether patients with sleep disorders are fit to drive. Also, it is unclear how fitness to drive should be established, by whom, and whether one should differentiate between private citizens and professional drivers. The current survey among sleep specialists was undertaken to investigate the opinion of sleep specialists regarding the fitness to drive of patients with sleep disorders, and how this should be assessed.

Subjects and Methods

A survey was send by email to N=1,015 sleep specialists who attended the WorldSleep 2007 conference in Cairns, Australia. They were contacted once, and no follow up was done. Questions asked included whether and when they regarded it safe to drive a car in case of treated and untreated insomnia, narcolepsy, and sleep apnea (appendix). In addition, they were asked who should determine if a patient is fit for driving, and how this should be determined. Questions were open ended, and space was provided to comment on each question, or explain their views. No ethical approval was needed to conduct this survey, and respondents were not compensated for their participation. The survey took about 10 min to complete.

Results

N=1,015 attendants of WorldSleep were invited by email to complete a survey about sleep disorders and driving. N=112 sleep experts completed the survey, which is equal to a response rate of approximately 11%. Respondents were 24 women and 88 men. Half of them (56) classified themselves as sleep specialists and/or researchers, about 20% were physicians, and about 10% were psychologists. Almost all of the respondents who see patients (69.4%) acknowledged informing patients about the possible effects of sleep apnea, narcolepsy or insomnia, and their respective treatments, on driving ability. 1.8% stated they did not inform their patients, and 28.8% reported not seeing patients. Their views are summarized below.

Insomnia and Driving

About half of respondents (56%, 95% Confidence Interval (CI): 46–64%) indicated that people with untreated insomnia should be allowed to drive a car. 17% (95%CI: 20–37%) stated they should not drive, and 27% (95%CI: 11–25%) answered that their fitness to drive depends on the amount of EDS. Regarding pharmacologically treated patients, sleep specialists had a diverse opinion (Fig. 1).

Most sleep specialists indicated that it would take days or weeks after treatment initiation with hypnotic drugs before driving was considered safe (66%, 95%CI: 57–74%). 18.6% (95%CI: 13–27%) reported that it is never safe to drive when treated with benzodiazepine hypnotics, whereas about one third of respondents (33%, 95%CI: 25–42%) stated that patients can drive safely a couple of days after treatment initiation. About 14% (95%CI: 9–22%) of respondents report that patients can drive immediately after treatment initiation with zolpidem, whereas another 14% (95%CI: 9–22%) answered that they should never be allowed to drive. A similar variety of answers was found for zopiclone. From Fig. 1, it can also be concluded that sleep specialists do not differentiate significantly between the effects on driving ability of treatment with benzodiazepine hypnotics and the newer benzodiazepine receptor agonists (BzRA's) zopiclone, and zolpidem.

Sleep Apnea and Driving

19% (95%CI: 13–27%) considered that untreated patients with sleep apnea should be allowed to drive a car, yet 32% of the respondents stated this depends on the amount of EDS. About half (49%, 95%CI: 40–58%) indicated they should not drive when untreated. Two third of the respondents (66%, 95%CI: 57–74%) agreed that successfully treated patients with sleep apnea should be allowed to drive a car. In this questionnaire, successful

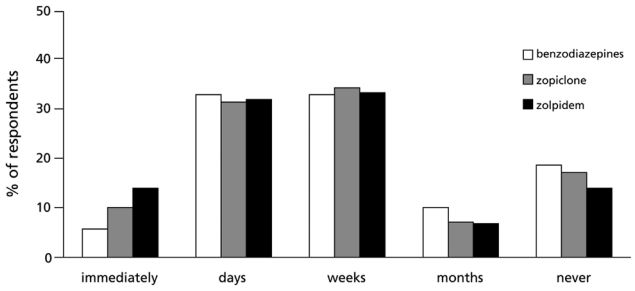

Fig. 1. Answers to the question when after treatment initiation with benzodiazepine hypnotics, zopiclone and zolpidem sleep specialists regard it safe to drive a car.

treatment was defined as Continuous Positive Airway Pressure (CPAP) treatment for more than 4 h per night and compliance for at least one month. One in five respondents (22%, 95%CI: 16–31%) answered this depends on the amount of EDS, whereas 11%, 95%CI: 6–18%) felt apnea patients should not drive even when treated with CPAP.

Narcolepsy and Driving

Whereas most respondents indicated that untreated patients with narcolepsy should not drive a car (77%, 95%CI: 68–84%), they also felt that after successful treatment driving should be allowed (71%, 95%CI: 62–79%). A minority (11%, 95%CI: 6–18%) disagreed with the statement that untreated narcolepsy patients should not drive, and a further 7% (95%CI: 4–13%) disagreed that successfully treated patients should be authorized to drive. Relative minorities of specialists indicated that whether untreated patients should drive (12%, 95%CI: 7–19%), and whether successfully treated patients should be authorized to drive (21%, 95%CI: 15–30%) would depend on the level of EDS.

Who Should Judge Fitness to Drive a Car?

Most respondents stated that physicians (30%, 95%CI: 23–39%), researchers (26%, 95%CI: 19–35%), or a combination of both (28%, 95%CI: 21–38%) should determine fitness for driving. To a lesser extent, driver license authorities (12%, 95%CI: 7–19) and patients (5%, 95%CI: 2–11%) were mentioned as those who should judge fitness to drive. Most respondents accepted the view that "driving is a privilege and not a human right". Others, however, indicated that "It is ultimately an individual's responsibility and should not be delegated to anybody else, including the physician". The most important reason given for this was that in the end the autonomy of the patient in making their own decisions is more important than the views of other people or legislation. Patients, however, may not be objective in judging their own fitness for driving. Patients may have various reasons why they should drive (e.g., to go to work, visit friends)[14], and therefore perceive driving a car as a right[15]. A patient's view on fitness for driving is therefore likely to be very biased. Most respondents agreed that the patient's opinion was the least credible when determining fitness for driving. However, information about the patient that can be verified, such as their history for type and number of traffic accidents, may be usefully taken into account when determining fitness to drive.

The Role of Driver License Authorities

About 80% (95%CI: 72–87%) of sleep specialists indicated that all drivers should be questioned regarding sleep apnea, narcolepsy or insomnia when applying for a driver license. About 15% (95%CI: 10–23%) felt this was only necessary for professional drivers. As sleep disorders may develop after the driver's license has been obtained, about half (53%, 95%CI: 44–61) considered all drivers should be questioned on a regular basis, whilst 37% (95%CI: 28–46) felt this should only apply to professional drivers. The most preferred frequencies for questioning professional drivers was every year (33%, 95%CI: 25–42%) and every 5 yr (35%, 95%CI: 27–45%). More respondents (39%, 95%CI: 31–49%) believed this should be done independent of age, whereas 20% (95%CI: 13–28%) indicated that drivers above the age of 40 should be questioned. 13% (95%CI: 8–21%) argued that this should be done/performed at the renewal of the drivers' license. Many specialists acknowledge that simply asking the patient if he is diagnosed for having a sleep disorder is not sufficient. In fact, most people are not diagnosed or may be unaware of having a sleep disorder. Patients may not report insomnia complaints to healthcare providers, and consequently the condition may go unrecognized and untreated. Sateia et al. indicated that 70% of patients do not discuss their sleep complaints, and Kagayema et al. suggested that 80% of Japanese insomniacs were untreated[16, 17]. Also, just being diagnosed does not provide sufficient information about fitness for driving. Most important in this regard is whether patients are successfully treated, and if they experience EDS or not. In addition, according to sleep specialists the decision of whether a patient is fit to drive should not be made by licensing authorities themselves.

How Should Drivers Be Tested?

Sleep specialists were asked what they regard as the highest form of evidence that driving is safe. Most often, respondents answered that the on-the-road driving test provides the best evidence to determine if a patient is fit for driving (38%, 95%CI: 30–48%). For example, the 100-km driving test is performed on a public highway in normal traffic. The Standard Deviation of Lateral Position (SDLP), i.e. the weaving of the car, is the primary parameter of vehicle control[18]. Driving simulator tests were selected by 19% of the respondents (95%CI: 13–27%), 11% (95%CI: 6–18%) preferred cognitive and psychomotor tests, and 24% (95%CI: 17–33%) stated that a combination of tests is the best way to determine fitness for driving. Physical and psychiatric examination (5%, 95%CI: 2–11%) and questionnaires completed by patients (3%, 95%CI: 1–8%) were the least popular methods, emphasizing the importance of a direct measure of driving competence (Fig. 2).

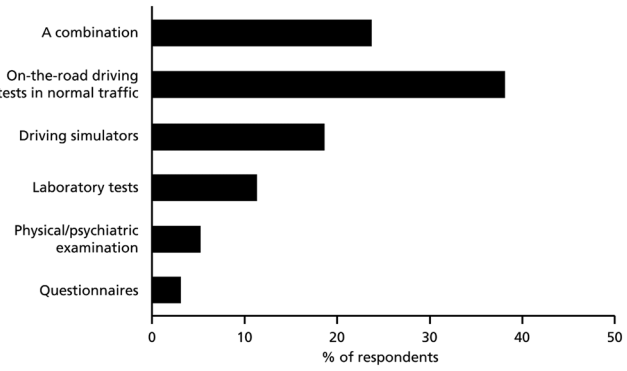

Fig. 2. Overview of sleep specialists' opinion on what they regard as the best method to determine if driving is safe.

Should Drivers Be Tested for Sleep Problems on a Regular Basis?

About half of the respondents indicated that professional drivers should be tested for sleep problems on a regular basis. Most sleep specialists stated that testing should be done every 5 yr (46%, 95%CI:36–55%). The preferred age for testing professional drivers was above 40 yr (32%, 95%CI: 23–41%), followed by any age (27%, 95%CI: 19–35%). Only 10% (95%CI: 4–16%) reported that testing should apply to all drivers, whereas 40% (95%CI: 31–49%) felt testing was not necessary. Those opposed to testing considered that it was very time consuming and too expensive to test all drivers.

Discussion

The results of the 2007 World Sleep Survey showed that amongst the sleep specialists who responded (around 11%), there was agreement on certain subjects related to sleep and driving, but great variation on others. These results reflect an overall lack of consensus regarding fitness to drive in patients with sleep disorders. The detailed comments given by respondents emphasized that information on EDS for patients with sleep disorders is vital in order to judge their fitness to drive. Importantly, the amount of EDS may differ significantly between patients or can be absent. For example, a substantial number of patients with insomnia may not experience EDS. It also has to be noted that sleepiness behind the wheel represents a specific type of daytime sleepiness, which may occur in individuals who do not experience high levels of sleepiness during other types of activities[19]. Hence, legislation that simply determines a patient's fitness to drive based on having a diagnosis of a sleep disorder per se will not be effective. Such laws would infringe upon a great number of drivers that are not at a higher risk of impaired driving and becoming involved in traffic accidents. Moreover, sleepiness is also commonly experienced in drivers without sleep disorders, due to sleep loss, poor sleep quality, or other medical conditions[20].

No direct on-the-road driving studies have been performed to compare untreated with treated patients. The fact that some sleep specialists report that successfully treated patients are fit for driving and untreated patients are not seems wishful thinking, as it may not be sufficiently supported by scientific evidence. For example, CPAP treatment was found to reduce crash risk[21], which suggests that the treatment leads to an improvement in driving performance. Not withstanding that this may indeed be the case, crash rate constitutes an indirect measure that is potentially subjected to bias and depends on exposure. An individual diagnosed with a sleep disorder may be more careful, or limit driving to essential trips. Furthermore, when driving simulators are used to assess driving performance in sleep disorder patients, the tests being used are often very simple. When looking at narcoleptic patients, the only treatment that was assessed was methamphetamine, and then tested in a relatively simple reaction time driving task (Steer Clear)[22], whereas information on the effects of commonly used narcolepsy treatments on actual driving is absent (e.g. sodium oxybate, modafinil). Finally, although it is believed that driving is impaired in insomnia

patients, there is no scientific proof that this actually is the case.

There is, however, abundant scientific literature reporting the effects of hypnotic drugs on driving ability[23, 24]. On-the-road driving tests show that benzodiazepine hypnotics may significantly impair driving performance next day after one or two nights of treatment. Epidemiological evidence shows that the use of benzodiazepine hypnotics is associated with an increased risk of having a traffic accident[25]. In particular, the use of benzodiazepines with a long half-life, the first weeks after treatment initiation and higher dosages appear to be associated with the highest accident risk. Also, a 4-fold increase in traffic accident risk has been reported for zopiclone[26]. Tolerance develops slowly, and increased accident risks have been reported after months of treatment initiation[23]. Zolpidem, when used as recommended, seems relatively safe[27]. Nevertheless, sleep specialists disagree about whether and when it is safe to drive or not. Moreover, they do not differentiate between the magnitude and duration of impairment. This is in contrast to the scientific evidence available, and the drug list of the International Council on Alcohol, Drugs and Traffic Safety, that categorizes zolpidem as different from benzodiazepines and zopiclone[28].

Asking patients whether they feel they are fit for driving is likely to yield biased answers. For example, it has been shown that 80% of drivers judge their driving skills as above average[29]. Although most individuals are aware of increased sleepiness levels some time before they would actually fall asleep, this is not the case for all drivers, and some drivers are unaware of falling asleep behind the wheel[30]. Also, they may not be aware that their driving is impaired, nor may they all recognize or acknowledge signs of sleepiness and reduced alertness[31]. In addition, patients often have reasons why they feel driving is important in their lives and therefore may not report the complete truth when asked about their driving and daytime sleepiness. They may also be reluctant to acknowledge sleepiness as a factor after an accident for legal reasons[32].

Objective tests of excessive daytime sleepiness such as the Multiple Sleep Latency Test (MSLT), Maintenance of Wakefulness Test (MWT), and the Oxford Sleep Resistance (OSLER) test can indicate whether people suffer from EDS. This gives rise to the question whether these tests can be used as an indication of driving performance in patients with sleep disorders. Philip *et al.* demonstrated a correlation between MWT scores and actual driving ability in untreated apnea patients[33]. In addition, Drake *et al.* showed that MSLT scores predict motor vehicle crashes in the general population[34]. However, in an earlier study MSLT scores did not indicate that narcoleptics or apnea patients who had more accidents were also sleepier[35]. Also, relying solely on these tests to judge an individual's driving ability is insufficient, as the conditions under which these tests take place differ greatly from driving conditions. Furthermore, the available information does not prove that an improvement in EDS after treatment of any given sleep disorder means that driving is also improved because it is possible that mechanisms other than sleepiness are involved.

Psychomotor and cognitive tests can show the impact of sleepiness and reduced alertness on performance. Unfortunately, psychomotor and cognitive tests poorly predict actual driving[36]. Driving simulators can also give insight into people's ability to drive a car. Some studies suggest that driving simulators may be useful in determining daytime sleepiness levels in sleep apnea patients and, as a result, fitness for driving[37]. However, standardization of driving tests and their outcome measures is necessary before general statements can be made about their usefulness in predicting actual driving performance. Most sleep specialists acknowledge that the on-the-road driving test provides the most reliable evidence whether driving is safe or not. Scientific literature confirms that SDLP is sensitive to differentiate between dose-dependent impairment of alcohol and psychoactive drugs[18], including hypnotic drugs[23, 24]. Because of the monotonous character and its long duration (approximately 1 h), the on-the-road driving test is very suitable for measuring the impact of driver sleepiness on vigilance performance. Sleep specialists state that testing all drivers for driver sleepiness would be best, but acknowledge that it would be cumbersome and costly to do so. Testing professional drivers only is considered as a suitable compromise. Most sleep specialists note this should be done every 5 yr.

A limitation of this study may be the relative low response rate (11%), which may be viewed as a potential bias of the results. An explanation for non-responding may be that sleep specialists are too busy. Also, no reminder e-mail was sent to complete the survey. Since the survey was conducted by email and thus not anonymous, we know however who responded. The latter assures us that major sleep specialists from around the world did complete the survey, and supports our confidence that the results obtained with the current response rate can be viewed as representative for the field. Because the attendants at a world conference are varied, it would be interesting also to examine opinions on a local level and compare the opinion

of sleep specialists with those of patients who actually suffer from sleep disorders, as well as with legislators and licensing authorities. Although this was a rather simple survey with a relative low response rate, it provided valuable responses, and especially given the open-ending character of the questions the survey yielded sufficient consistent data to draw the results presented in this paper.

Conclusions

Sleep disorders and excessive daytime sleepiness can affect driving performance significantly and increase the risk of becoming involved in traffic accidents. Determining whether patients are fit to drive is therefore of high importance but effective methods of assessment are resource intensive. Educating patients about the potential risks of sleepy driving and assurance of treatment compliance are of vital importance, and may result in more success than introducing unenforceable traffic laws. This survey shows that sleep specialists acknowledge the importance of this issue, but the range of preferences reported by them indicated only limited concordance with the available scientific evidence. Moreover, direct evidence may itself be lacking, including data on fitness to drive after treatment. It must therefore be concluded that regular continuing education remains necessary.

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Appendix - WorldSleep 2007 survey

Please answer the questions below and mark/highlight whether you agree/disagree with each proposition. Feel free to add comments and suggestions.

1). What is your profession?

□ Sleep specialist
□ Researcher
□ Physician
□ Psychiatrist
□ Psychologist
Other:…….

2). Do you inform your patients about the possible effects of sleep apnea, narcolepsy or insomnia (and their treatment) on driving ability?

□ Yes
□ No
□ Not applicable
If Yes, what is your advice? .....
.....

3). Should people be questioned on sleep apnea, narcolepsy or insomnia when applying for a driver's license?

□ Yes
□ Only professional drivers
□ No
Comments: .....
.....

4). Should drivers be questioned for sleep problems on a regular basis?

□ Yes, every ……..year
□ Yes, but only professional drivers, every …….. year
□ No
If Yes, after a certain age? ……(e.g., above 40).
Comments: .....
.....

5). Please indicate the issues that you would include in a questionnaire designed to check for sleep problems that may affect driving ability (i.e. insomnia, sleep apnea, and narcolepsy).

□ If they have been diagnosed with sleep apnea, narcolepsy or insomnia
□ Habitual irregular snoring
□ Witnessed breathing pauses
□ Difficulties staying awake in boring situations
□ Waking up chocking
□ List of medicines taken
□ Alcohol consumption
□ Irregular working hours or regular working at night
□ Daytime sleepiness

□ The Epworth Sleepiness Scale
□ Body mass index
Other: .....
.....

6). Should drivers be tested for sleep problems on a regular basis?

□ Yes, every …….year
□ Yes, but only professional drivers, every …….year
□ No
If yes, after a certain age? …….. (e.g., above 40)

7). What is the best way to judge fitness to drive a car?

□ Ask the patient
□ Clinical judgment of physician/psychiatrist
□ Driver's license authorities (based on questionnaires)
□ Researchers (based on outcome driving-related tests)
Other: .....
.....

8). What do you regard as highest form of evidence that driving is safe?

□ Questionnaires completed by patients
□ Physical/psychiatric examination
□ Laboratory tests (e.g., reaction speed, divided attention)
□ Driving simulators
□ On-the-road driving tests during normal traffic
Other: .....
.....

9). Drivers with confirmed (untreated) insomnia should not drive

□ Agree
□ Disagree
Comments: .....
.....

10). When after treatment initiation of insomnia with benzodiazepines do you regard it safe to drive a car?

□ Immediately after treatment initiation
□ After a couple of days
□ After a couple of weeks
□ After a couple of months
□ Never

11). When after treatment initiation of insomnia with zopiclone do you regard it safe to drive a car?

□ Immediately after treatment initiation
□ After a couple of days
□ After a couple of weeks
□ After a couple of months
□ Never

12). When after treatment initiation of insomnia with zolpidem do you regard it safe to drive a car?

□ Immediately after treatment initiation
□ After a couple of days
□ After a couple of weeks
□ After a couple of months
□ Never

13). Drivers with confirmed (untreated) sleep apnea should not drive

□ Agree
□ Disagree
Comments: .....
.....

14). CPAP treated drivers with > 4 hours per night compliance for at least 1 month should be authorized to drive

□ Agree
□ Disagree
Comments: .....
.....

15). Drivers with confirmed (untreated) narcolepsy should not drive

□ Agree
□ Disagree
Comments: .....
.....

16). Successfully treated drivers with narcolepsy should be authorized to drive

□ Agree
□ Disagree
Comments: .....
.....