Prevalence of Treatment Choices for Snoring and Sleep Apnea in an Australian Population

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Objectives: To assess the prevalence of treatment and diagnosis of snoring and sleep apnea in the population of New South Wales Australia.

Methods: Postal survey of 10,000 people randomly selected from the electoral roll, half aged 18 to 24 and half aged 25 to 64, with telephone follow-up for some nonresponders. Weighted prevalences are reported.

Results: The overall response rate was 35.6% (18-24 n = 1421 and 25-64 n = 1879). One hundred and fifty-nine respondents reported seeking medical help for snoring or sleep apnea (6.3%, 95% confidence interval 5.46-7.12%), with 133 of these being aged 25 to 64. Fifty-one respondents reported subsequent treatment (2.0%; 95% CI 1.49-2.43), with some reporting more than 1 treatment. Continuous positive airway pressure was received in 17 cases, mandibular advancement splints in 9 cases, and upper airway or nasal surgery in 31 cases. Eighty-six reported receiving an overnight sleep study (polysomnography). Most surgical patients did not report having their sleep measured with a sleep study (22/31).

Conclusions: The population of New South Wales has had the longest potential exposure to continuous positive airway pressure. However, few of those in even the middle-aged group reported ever being recommended continuous positive airway pressure treatment. It is more common to have a surgical intervention for snoring or sleep apnea. Surprisingly, most surgical patients do not report any associated sleep study to quantify their snoring or sleep apnea or measure the efficacy of surgery. Since a substantial proportion of patients who experience snoring and sleep apnea are not assessed via a sleep study, it is necessary to increase awareness of undergoing such clinical procedures.

Keywords: Obstructive sleep apnea, snoring, polysomnography, continuous positive airway pressure, mandibular advancement splint, surgery

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In Australia, the provision of polysomnography has steadily increased, paralleling specialist accreditation for sleep medicine practitioners and payment for sleep apnea treatment by government or private insurance. Nasal continuous positive airway pressure (CPAP) is the standard treatment for severe obstructive sleep apnea. CPAP was first used in New South Wales, Australia, giving the population of New South Wales the longest exposure to the possibility of CPAP treatment of any health system worldwide. Other treatments for snoring or sleep apnea, including mandibular advancement splints (MAS) and/or a variety of surgical treatments, have been available in New South Wales for many years, but the relative penetration of these treatments in the population is unknown.

It is also unclear what proportion of the general community has had its sleep investigated via polysomnography in Australia. Although the number of polysomnography procedures undertaken in Australia is known, some of them are expected to be repeat studies on the same individuals. In 1997 the proportion of people in the Wisconsin Sleep Cohort with moderate to severe OSA (an apnea-hypopnea index of at least 15 an hour) who remained clinically undiagnosed was around 93% of women and 82% of men. These diagnosed patients represented 0.32% of the middle-aged sample (n = 4925) and 13 of 16 reported subsequent treatment (81% of those diagnosed). In the larger Sleep Heart Health Study, 1.6% of people reported a physician diagnosis of OSA, but only 0.6% additionally reported treatment.

It is also possible to be screened and treated, via multiple methods, for less severe sleep apnea or for simple primary snoring. The proportion of community-dwelling adults ever offered treatment for sleep apnea or snoring remains unclear. It is also unknown how commonly patients are treated with a combination of methods or whether treatment was preceded by any formal diagnosis via polysomnography.

As part of a cross-sectional survey to investigate sleep habits of community-dwelling New South Wales adults aged 18 to 64, we asked a number of questions relating to sleep symptoms and treatments sought or used and aimed to estimate the prevalence of treatment and testing for sleep apnea or snoring. We aim to provide the first comprehensive estimates of the prevalence of treatment for snoring and sleep apnea in the population of New South Wales. Data describing the general sleep habits and sleepiness in this sample have been published elsewhere.
METHODS

Postal Questionnaire

A single piece of A3 paper folded in half provided 4 A4 pages of questions (copy available from the corresponding author). The questionnaire comprised of 42 questions relating to demographics, sleep behavior, sleep medication, and driver safety/fatigue. Participants were asked whether they had “ever been to a doctor to discuss snoring or sleep apnea?” If the participant answered yes, they were then asked whether the doctor prescribed any of the following: (a) a sleep study in a hospital or sleep laboratory, (b) a trial of CPAP, (c) a dental device or splint, or (d) surgery to the nose or throat. The indication of a sleep study was not assumed to indicate the full standard polysomnography. Instead it was realized that participants also could have indicated a lesser standard of investigation, which they would be unlikely to differentiate from full polysomnography.

The questionnaire was administered via a 2-stage mail-out process. Ten thousand participants were randomly selected from the New South Wales state electoral roll—5000 from age groups 18 to 24 years of age and 5000 from 25 to 64 years of age. In Australia, voting is compulsory, with all citizens expected to register on the electoral roll, and therefore our sample is representative of the population. By definition, however, any sample will not include residents who are not citizens of Australia. The first mail-out in 2002 included a postage-paid reply envelope as well as the questionnaire and a cover letter detailing the reasons for the study and guaranteeing the respondents’ anonymity. Returned completed questionnaires were bar code scanned. If a survey had not been received after 4 weeks of the initial mail-out, a follow-up letter was resent to that participant. Dead letters were classified as those that were returned to sender with an indication either that the intended recipient had died or that he or she had moved away without a forwarding address. An incentive prize of a gift voucher draw was also offered to encourage participation. A data scan of 3% of completed surveys was reviewed to check accuracy, in which no errors of scanning were found. The questionnaire, study design, and follow-up of nonresponders were all approved by the Central Sydney Area Health Service Ethics Committee (Royal Prince Alfred Hospital Zone).

Prevalence estimates were adjusted so that 18- to 24-year-olds were given 15% of the total weighting in line with their proportion of the Australian population aged 18 to 64 at the 2001 census (www.abs.gov.au). An attempt was made to characterize nonresponders via telephone interview, and these data are described elsewhere.7

RESULTS

Response Rate

The total response rate was 35.6% once dead letters were removed from the denominator (total responses n = 3300, with 1899 in the first 4 weeks from the first mail-out). Response rates differed between age groups, with 28.5% of 18- to 24-year-olds (raw n = 1421) responding, whereas 37.6% of 25- to 65-year-olds responded (raw n = 1879). The characteristics of nonresponders are described elsewhere.7 Briefly, the nonresponders tended to be younger, male, and shiftworkers and to report their general health as being worse. They were also less likely to have insomnia or report poor enthusiasm (a marker of depression).

Prevalence of visits to the doctor and treatment for snoring, OSA, or both

The weighted prevalence for reporting a doctor visit for sleep apnea or snoring was 6.3% (95% confidence interval [CI] 5.46%-7.12%; n = 159), with 1.8% in the 18- to 24-year-olds (1.13%-2.53%; n = 26) and 7.1% in the 25- to 64-year-olds (5.95-8.27%; n = 133). The weighted prevalence of reporting treatment for snoring or sleep apnea was 2.0% (95% CI 1.49%-2.43%), with 10 cases or 0.7% (0.27%-1.13%) in the 18- to 24-year-olds and 41 cases or 2.2% (1.55%-2.85%) in the 25- to 64-year-olds.

Paths to treatment and the raw number of participants who indicated which treatments, if any, they received are detailed in Figure 1. Of the 159 people who sought treatment for snoring or sleep apnea, only 26 were aged 18 to 24. Seven of these received a sleep study only, 4 a sleep study and at least 1 treatment (MAS and surgery, CPAP, and 2 surgery alone), and 7 were surgically treated without a sleep study. The remaining 8 received neither treatment nor a sleep study. One hundred and thirty-three people who sought treatment were aged 25 to 64. Of these, 56 received a sleep study only and 19 a sleep study and some treatment (including 9 on CPAP, 2 MAS, 4 surgical, 2 MAS+CPAP, 1 CPAP+surgery, and 1 MAS+surgery). In those 21 patients aged 25 to 64 who were treated but claimed not to have received a sleep study, 4 received CPAP, 2 MAS, 14 surgery, and 1 MAS+surgery. The remaining 39 were neither treated nor had their sleep investigated despite seeking help for snoring or sleep apnea.

An extremely conservative approach to estimating prevalence of treatment and prevalence of polysomnography diagnosis in this sample is to assume that all people who received interventions responded to our questionnaire and that all younger people (who were oversampled) carry the same weight as middle-aged people. Under this assumption, the unadjusted prevalence of receiving a sleep study is 86 in 10,000 (0.86%; 95% CI 0.68%-1.04%), and the unadjusted prevalence of treatment for snoring or sleep apnea is 51 in 10,000 (0.51%; 95% CI 0.37%-0.65%). Other prevalence estimates can similarly be calculated by using the denominator for the whole sample or the age-specific sample sizes as required.

DISCUSSION

This is the first population-representative study to assess the prevalence of exposure to sleep studies and treatment of snoring or sleep apnea in Australia. Sleep apnea is probably present in approximately 9% to 25% of the middle-aged population and in an unknown proportion of younger and older people in Australia.89 Despite these findings, only 17 individuals out of 3300 respondents (weighted prevalence 0.73%, 0.44%-1.02% or, using very conservative estimation, 0.17%) reported being prescribed CPAP (see Figure 1), which is notable given that CPAP treatment was invented in New South Wales; this population has the longest potential exposure to therapy.

Sixteen of these patients were aged 25 to 64; thus, CPAP has possibly been offered to around 0.85% (95% CI 0.43%-1.27%) of the middle-aged population in New South Wales. Four respondents indicated that they had received CPAP but did not have a sleep study in a hospital or sleep laboratory. We speculate that
these people either received some form of home-based study to diagnose their sleep apnea before being prescribed an automatically titrating CPAP device or perhaps failed to tick the sleep study box when in fact they had actually received standard in-lab polysomnography (recall error or omission). However, it could also be that they did not have any formal investigation at all, as they have indicated.

Interestingly, about half of people who reported to a primary care physician with a complaint of sleep apnea or snoring reported that they had received a sleep study (see Figure 1). However, only about a quarter of these participants (23/86) reported subsequent treatment. Those who did not receive an overnight sleep study were more likely to receive treatment (see Figure 1), with that treatment predominantly being surgical. These patients might represent those being treated predominantly for snoring rather than sleep apnea; however, our data cannot clarify whether this explanation is correct. We also cannot tell from these data what proportion of patients tested negative for sleep apnea on the sleep

Figure 1—PSG refers to a sleep study that may not necessarily have been standard polysomnography; CPAP, continuous positive airway pressure; MAS, mandibular advancement splint or dental device/splint. Some patients received more than 1 treatment, which is why there are apparent addition errors. See the results section for a full breakdown of treatments received across the 2 age groups.
study, which would explain why so few report being offered treatment.

Participants in the Wisconsin Sleep Cohort who were clinically diagnosed with OSA (0.32% of sample) were subsequently treated for their sleep apnea in 81% of cases. Although not directly comparable to the Wisconsin cohort, the percentage of people aged 25 to 64 in this study who were treated following a sleep study for snoring or sleep apnea is 1.0% (19/1879) (95% CI: 0.55%-1.45%). Even after assuming that zero nonrespondents had a treatment, the likelihood of being treated for snoring or sleep apnea after a sleep study in middle-aged people was 0.38% (95% CI: 0.10%-0.66%). This conservative figure is higher than that reported in the Wisconsin cohort but is less than that reported by the Sleep Heart Health Study for the treatment of OSA (0.6%, range between sites 0.11% - 0.88%).1 Interestingly, the prevalence of treatment with CPAP in Iceland is estimated at around 2% of the entire population (Thorarinn Gislason, personal communication, 2006). It would therefore appear that individuals in New South Wales are more likely than those in the USA but less likely than those in Iceland to be diagnosed with and treated for sleep apnea. Our figures, however, include reports of treatment for snoring, whereas the other 3 population-based estimates address treatment for sleep apnea only.

Because increasing age is a risk factor for sleep apnea,2 our raw figures underestimate the true prevalence because half of the sample is aged 18 to 24 and half is 25 to 64. However, a prevalence for snoring or sleep apnea treatment of 2.2% in the sample that is 25 to 64 years of age seems reliable in a country such as Australia with reasonably easy access to polysomnography and sleep medicine services.1

Eighty-six of the 3300 respondents indicated that they had received an overnight sleep study (weighted prevalence 3.5%, 2.88%-4.14%). This is probably a slight overestimate due to response bias. In New South Wales we have Medicare billing data to indicate that around 1909 polysomnograms per 100,000 (1.9%) of the adult population were funded between 1995 and 2002.1 We have already estimated that about one third of these Medicare-funded studies may be repeat sleep investigations on the same patients. However, a few of our postal survey respondents (i.e., the 3.5% estimate) could also be reporting sleep studies not funded by Medicare and may be limited sleep studies that do not qualify as full polysomnographic investigations under Medicare-billing definitions. In addition, our 3.5% figure may be inflated because middle-aged adults are much more likely to receive Medicare-funded polysomnography in New South Wales, and the 1.9% estimate includes post-retirement-age people, whereas our postal survey does not. Conversely, the Medicare estimate may underestimate the exposure to polysomnography because it does not include data from before 1995. Thus, although we are satisfied that our estimates of sleep-study exposure are probably not markedly overstated, they are probably higher than the true population prevalence. Readers may wish to rely on our conservative estimate method, which probably represents a lower-boundary prevalence estimate (0.22% in 18- to 24-year-olds and 1.54% in 25- to 64-year-olds).

The largest diagnosis or treatment group was the group that did not receive overnight polysomnography but did receive upper airway surgery for their sleep apnea or snoring. As previously stated, we are unable to ascertain whether these people were being treated for simple snoring or for sleep apnea. The lack of polysomnographic investigation before surgery for snoring or sleep apnea may be changing as the Australasian College of Surgeons’ training modules for otolaryngology, head and neck surgeons now include education on polysomnography use and interpretation (available at www.surgeons.org; accessed November 2006).

This study has some other important potential weaknesses. Firstly, the study response rate was 35.6%. It is thus possible that our estimates of people who have been treated for snoring or sleep apnea are inflated if people who have been treated are more likely to respond to a survey such as this. Medicare-billing data for New South Wales3 provides some evidence to support this hypothesis. As such, we have also provided supplementary prevalence estimates based on very conservative assumptions that no nonrespondents had a sleep study or received treatment to provide a lower limit of prevalence. Second, a survival effect might be operating. Patients who are diagnosed with and treated for OSA are more likely to survive than are patients whose OSA is diagnosed but not treated.10,11 This outcome might overestimate prevalence with the polysomnography-tested group. Thirdly, all data are based on self-report and are thus subject to recall bias. A weakness to the generalizability of these findings is the lack of data on people aged 65 year and older, who are also at risk for sleep apnea12 and who are also being tested1 and treated for snoring or sleep apnea in New South Wales.

These are the first estimates of the population-level exposure to sleep studies and common treatments for snoring and sleep apnea in New South Wales, Australia. This is potentially of international importance because the population of New South Wales has had the longest exposure to the potential for CPAP treatment because the device was invented here. Approximately 0.85% (95% CI 0.43%-1.27%) of middle-aged people (25-64 years old) reported having been prescribed CPAP at some point in their lives. However, surgical options are still the most commonly reported treatment for snoring or sleep apnea. Most surgical procedures are not accompanied by any overnight sleep study to quantify either baseline severity or procedure efficacy. Our prevalence estimates for diagnosis and treatment, although appearing low, are higher than the few available overseas estimates, except probably for Iceland. Despite the long history of sleep medicine availability in New South Wales, there still appears to be little population penetration for known efficacious treatments for snoring or sleep apnea.

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