

# Australian training for contemporary airway management of obstructive sleep apnoea in ENT surgery: current status and future recommendations

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## Abstract

**Background:** The identification and treatment of adult obstructive sleep apnoea and other sleep-related breathing issues demands nuanced clinical judgement to determine if surgery is appropriate and which surgery should be performed. No study to date has evaluated the sleep medicine curriculum from the perspective of the Australian ENT surgical trainee, or addressed potential strategies for improving levels of surgical skill and knowledge in this field.

**Methods:** A cross-sectional survey was used to assess knowledge of sleep surgery in trainees enlisted with the Australian Society of Otolaryngology Head and Neck Surgery. After a cadaver dissection workshop on the latest reconstructive surgical techniques in adult OSA, a second survey was used to assess changes in the likelihood of applying techniques.

**Results:** Overall, trainee confidence, knowledge and exposure to sleep-disordered breathing cases averaged below 50 per cent. The cadaver dissection workshop achieved consistent improvements in all areas assessed.

**Conclusion:** Low confidence and lack of exposure to sleep surgery cases for ENT trainees supports a broadening of the Australian Society of Otolaryngology Head and Neck Surgery curriculum. This paper outlines possible ways to improve this situation.

**Key words:** Sleep; Surgery; Obstructive Sleep Apnea; Training; Multi-Level Airway Reconstruction; Snoring

## Introduction

A significant proportion of an ENT surgeon's clinical practice is devoted to patients presenting with snoring and sleep-related breathing issues. A recent study suggested that up to one-third of individuals are referred initially to an ENT surgeon for diagnosis and treatment of these disorders.<sup>1</sup> One of the most common sleep-related conditions encountered in clinical practice is obstructive sleep apnoea (OSA). This is a heterogeneous condition associated with deleterious health outcomes, including inflated cardiovascular and metabolic risk, and increased obesity.<sup>2</sup>

Obstructive sleep apnoea occurs due to intermittent upper airway collapse during sleep, which results in snoring, the transient cessation of breathing and daytime sleepiness.<sup>3,4</sup> Obstructive sleep apnoea requires overnight polysomnography for diagnosis and to determine disease severity. Many different options exist for management of the condition, but surgery is not recommended as a first-line treatment

in the majority of patients with moderate to severe OSA.<sup>4</sup> However, when the use of devices such as continuous positive airway pressure (CPAP) is not adhered to, surgery can be considered in order to alleviate daytime sleepiness, improve quality of life and reduce disease severity, by targeting specific levels of airway collapse.<sup>5–7</sup>

The differential diagnosis of airway obstruction and other sleep-related breathing disorders is not uniform, and is not easily accomplished using a singular approach. In addition to a detailed sleep history, examination entails assessment of nasal patency, jaw bony anatomy, and levels of upper airway collapse at a tonsillar, tongue and palate level. This demands specialised ENT training and exposure to previous cases.<sup>8,9</sup>

Nuanced clinical judgement in patient selection is required in order to determine whether surgery is appropriate and decide which surgery should be performed. In addition, ENT clinical practice requires an

understanding of sleep-disordered breathing treatment options other than surgery, awareness of the relevant indications and knowledge of how to facilitate these treatments. Hence, the identification and treatment of OSA and other sleep-related breathing issues can prove challenging, even for the practised clinician.

Assessment of the levels of learning and exposure to sleep-related cases for the Australian ENT trainee surgeon seems timely. No study to date has evaluated curriculum limitations in sleep medicine from the perspective of the ENT trainee, or addressed potential strategies for improving levels of surgical skill and knowledge in this field. The latest educational theory of technical training in medicine suggests that practice on models and simulators,<sup>10,11</sup> as has been demonstrated in endoscopic sinus surgery for instance,<sup>12</sup> facilitates surgical ability more consistently than teaching in the operating theatre.

The purpose of this study was two-fold. Firstly, it aimed to identify the current levels of confidence and knowledge regarding snoring and sleep disorders in Australian Society of Otolaryngology Head and Neck Surgery (ASOHNS) trainees who are in years 1–5 of their training programme. Secondly, it aimed to examine the impact that a cadaver workshop dedicated to the surgical management of sleep-related breathing disorders has on clinical skills and learning in support of expansion of the curriculum.

## Materials and methods

### *Trainee knowledge assessment*

A questionnaire was compiled by an experienced sleep physician and an ENT surgeon well practised in sleep medicine. The questionnaire consisted of nine questions, each with a four-choice Likert scale, and three brief clinical scenarios. The first nine questions assessed the trainees' level of confidence and number of previous exposures to sleep disorders. The number of previous exposures was queried in relation to the particular role of the trainee during the exposures: clinician, assisting surgeon or primary surgeon.

Trainees' level of confidence was examined for all stages of sleep-related breathing disorder management, from patient history through to the surgical techniques used for upper airway reconstruction. Application of knowledge was assessed with three clinical scenario questions; these required interpretation of a sleep study report, recognition of anatomy based on five nasendoscopy photographs and the best management strategy for a patient with severe OSA.

Following approval from the local human research ethics committee, the questionnaire was distributed at the annual ENT registrars' conference in July 2013 to ASOHNS trainees in surgical education training years 1, 2, 3, 4 and 5 (with surgical education training year 5 (or level 5) being the most senior). Frequency data were generated for each factor examined and expressed in percentages.

### *Cadaver workshop*

A 13-question survey was distributed via e-mail to attendees after a 2-day surgical cadaver dissection workshop run by the first author. The workshop focused on approaches to sleep surgery and enabled extensive guided practice in the latest reconstructive surgical techniques.

Eight of the questions in the survey utilised a five-point Likert scale to assess: improvements in understanding the diagnosis and management of sleep-disordered breathing (answer options ranged from 'no gains' to 'great gains'); willingness to apply demonstrated surgical techniques (answer options ranged from 'not likely' to 'great increase in likelihood'); and advancement of technical skills (answer options ranged from 'no gains' to 'great gains'). Four questions required brief qualitative answers on: suggestions for course improvement, changes to confidence in performing surgical procedures for specific disorders of sleep, and changes in overall attitude to sleep surgery. The remaining question concerned the respondent's professional qualifications; this information was requested to assess demographics.

Respondents' permission to use the de-identified data was obtained. Frequency data were generated for each factor examined and expressed in percentages.

## Results

### *Trainee knowledge findings*

Of 28 respondents, 3 were not on the Australian surgical training programme and were ineligible for inclusion; hence, the number of eligible respondents was 25. Three respondents were from surgical education training year 5, seven were from year 4, two were from year 3, six were from year 2, and seven were from year 1, where year 5 is the most senior.

*Exposure to cases.* Only 9 per cent of trainees had been exposed to greater than 30 cases, through either clinical assessment, as the assisting surgeon or as the primary surgeon (Figure 1). Fifty-three per cent of all trainees only had exposure to 0–10 cases in each of these settings. Fifty-four per cent of surgical education training year 5 respondents had less than 20 exposures during training. Fifteen per cent of surgical education training year 5 respondents had exposure to greater than 30 cases (Figure 2).

*Confidence.* Only 12 per cent of trainees were very or extremely confident in performing specific upper airway surgical techniques ranging from uvulopalatopharyngoplasty to maxillomandibular advancement (Figure 3). Only 24 per cent of surgical education training year 5 respondents were confident with assessing patients for sleep surgery and subsequent management (Figure 4).

*Application of knowledge.* Only 12 per cent of all trainees interpreted the sleep study correctly. However,

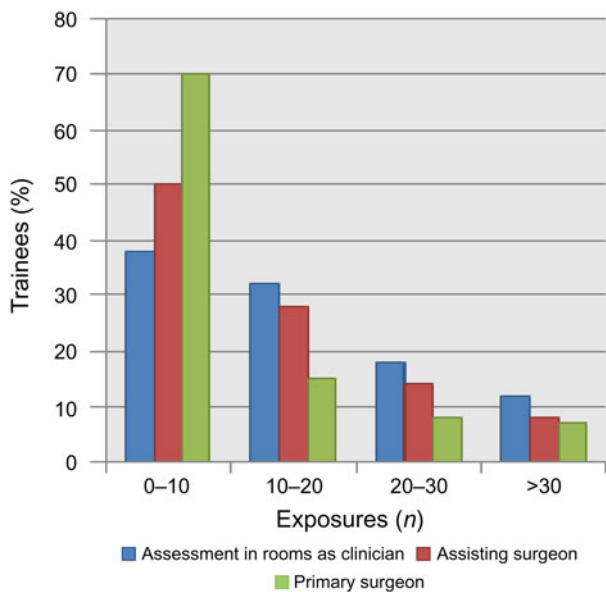


FIG. 1

Number of sleep cases that trainees were exposed to, as experienced in various roles.

66 per cent of surgical education training year 5 trainees were correct in their interpretation. Forty-four per cent of all trainees responded correctly to upper airway anatomical landmarks seen in the nasendoscopy photographs, and this increased to 87 per cent in the surgical education training year 5 cohort (Figure 5).

#### Cadaver workshop findings

Of the 30 respondents who attended the course, 67 per cent registered as dissectors and the remainder registered as observers. Ninety-seven per cent of individuals in attendance were ENT surgeons or ENT registrars; the remaining 3 per cent were sleep or respiratory registrars.

*Improvements in understanding.* Of the 30 respondents, 93.3 per cent made moderate, significant or great gains in terms of their level of knowledge regarding the

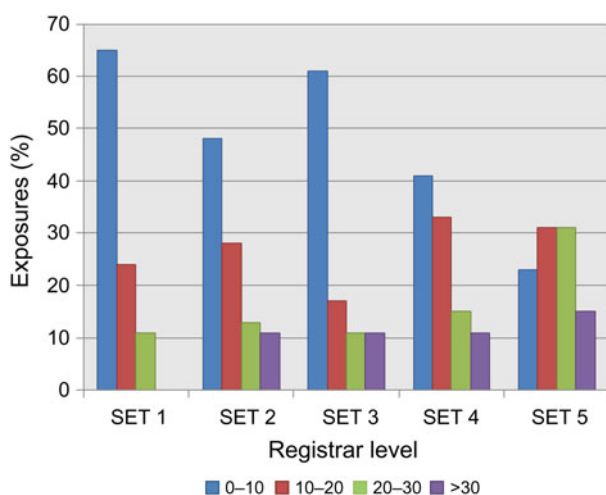


FIG. 2

Number of sleep cases that trainees were exposed to, according to year of surgical education training (SET).

management of OSA (20 per cent moderate gains, 50 per cent significant gains and 23.3 per cent great gains). Ninety-seven per cent of respondents claimed moderate, significant or great gains in their confidence in understanding approaches to sleep disorder patients (30 per cent moderate gains, 50 per cent significant gains and 16.7 per cent great gains). Only 3 per cent reported a slight gain and none of the responders reported no gain (Figure 6).

*Willingness to manage patients and apply techniques.* Of the 30 respondents, 90 per cent expressed a moderate, significant or great increase in the likelihood that they would manage adult OSA patients (36.7 per cent moderate likelihood, 40 per cent significant likelihood and 13.3 per cent great increase in likelihood). Approximately 77 per cent expressed a moderate, significant or great increase in the likelihood that they would operate on sleep disorder patients (23.3 per cent moderate likelihood, 40 per cent significant likelihood and 16.7 per cent great increase in likelihood) (Figure 7).

*Advancement of technical skills.* Of the 30 respondents, 93.3 per cent made moderate, significant or great gains in terms of their technical surgical skills (26.7 per cent moderate gains, 53.3 per cent significant gains and 13.3 per cent great gains) (Figure 8).

Of the 17 respondents who chose to provide a more detailed perspective on the question 'Please comment on how your understanding of the subject has changed because of this class', the most consistent answers related to a more structured, knowledgeable approach to sleep disorder patients, better awareness of the various reconstructive surgical techniques available, and improved confidence in recommending or performing surgical approaches.

## Discussion

This is the first study to examine the experience an ASOHNS trainee gains in sleep surgery, and their levels of proficiency and confidence when handling sleep-disordered breathing. In addition, we set out to document the effectiveness of a cadaver and dissection workshop for improving practitioner knowledge of sleep disorder patients and advancing skills in the performance of the latest surgical techniques. Given the conservative prevalence estimates of between 4 and 6 per cent for sleep disorders in the adult population,<sup>2</sup> which is comparable to adult asthma prevalence at 9 per cent,<sup>13</sup> the effective training of those responsible for the management of this common, complex condition is of paramount concern.

Despite a comprehensive ASOHNS curriculum, which addresses patient assessment, diagnostic interpretation, and consideration of both surgical and non-surgical options in sleep medicine, over 40 per cent of the surgical education training registrar respondents were unsure or expressed a lower level of confidence

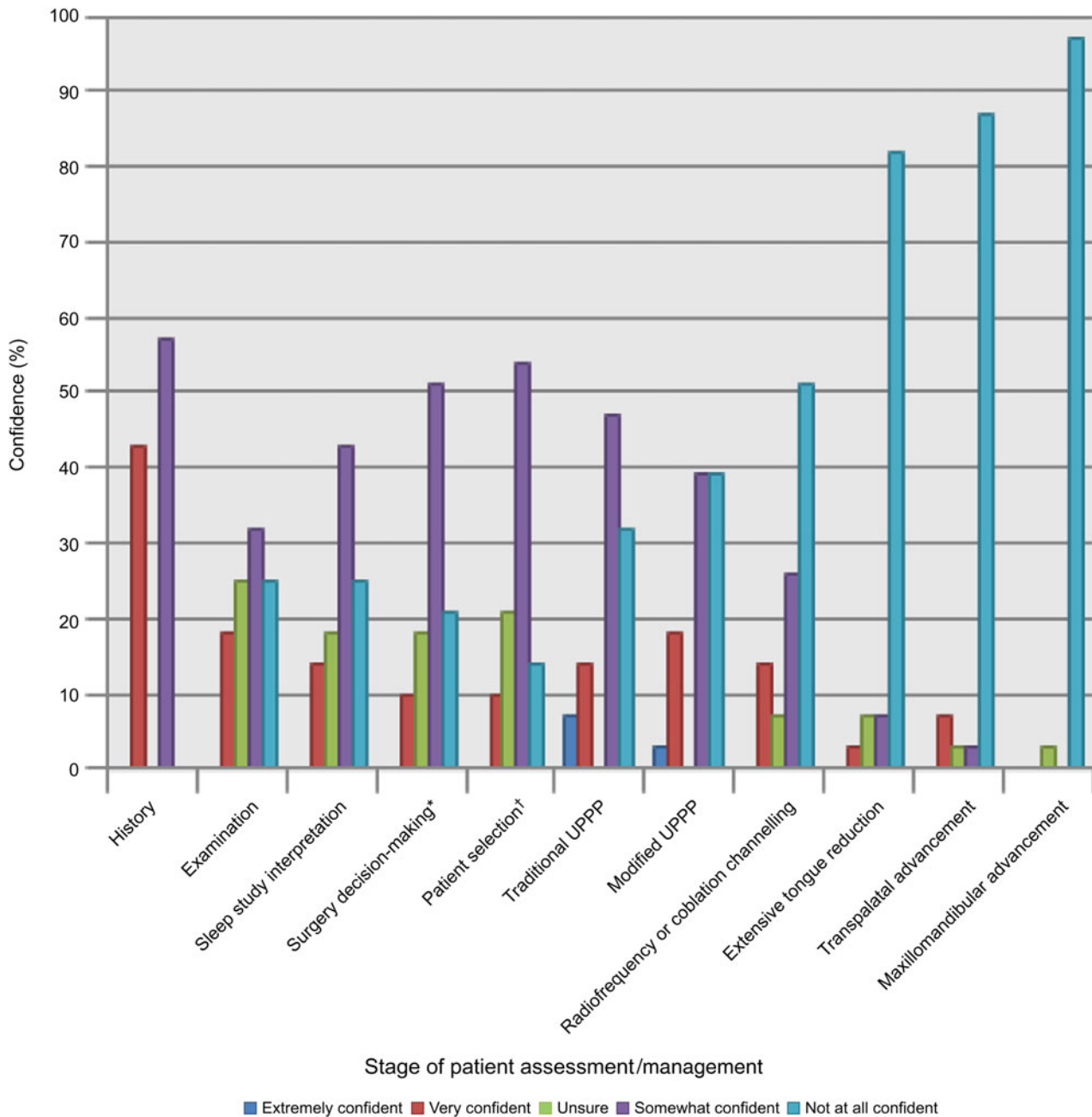


FIG. 3

Trainees' responses regarding their confidence in assessing sleep disorders and performing appropriate surgery. \*Sleep study assessment to assist decision-making in sleep surgery. †Selection of patients for sleep surgery. UPPP = uvulopalatopharyngoplasty

for all sleep-related procedures. These included the taking of a patient's sleep history, assessment of sleep issues for treatment decisions and the performance of pertinent upper airway surgical procedures. Although there was the expected increase in overall confidence with advancing levels of training, trainees in surgical education training year 5 were significantly represented in the 'unsure', 'somewhat confident' and 'not at all confident' response categories.

It seems likely that those respondents in surgical education training years 4 and 5 who were, overall, very or extremely confident in managing sleep cases, required exposure to at least 30 cases. One individual

completed surgical education training year 5 having only experienced 0–10 sleep cases. In comparison, surgical education training year 5 trainees' exposure to surgical cases in rhinology during the same year averaged 165, with a low of 55 cases. Even at the earliest stage of training for surgery in rhinology (surgical education training year 1), 50 per cent of trainees averaged experience of 28.5 cases, with a high of 195 cases. The number of exposures to cases jumped substantially in each subsequent year of training, whereby at completion of training the average number of cases experienced reached 816. Possible reasons for this disparity include a lack of surgeons sufficiently experienced to



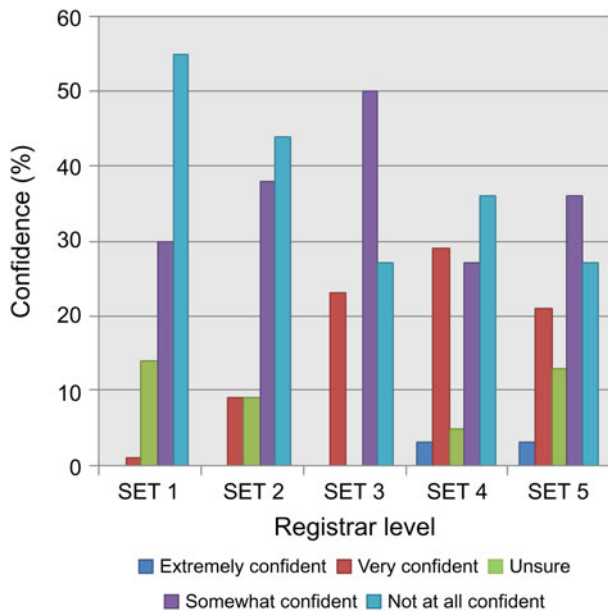


FIG. 4

Trainees' responses regarding their overall confidence in managing sleep cases, according to year of surgical education training (SET).

teach contemporary multi-level airway surgery for sleep apnoea, and the fact that sleep disorder patients are traditionally offered CPAP as the first-line treatment (although rhinology patients are usually managed with, or at least offered, medical therapy prior to surgery).

As current concepts in OSA surgery focus on multi-level airway reconstruction, the suggestion that trainees are on the whole lacking confidence and exposure to simpler surgical approaches is disconcerting. It is most alarming that 60 per cent of the respondents in surgical education training year 4 (the largest group of trainees) gave incorrect answers for all three clinical scenarios. The interpretation of a sleep study is a fundamental diagnostic requirement in the management of sleep disorder patients; it demands an understanding of apnoea/hypopnoea index severity, the oxygen desaturation index, and various other measures of

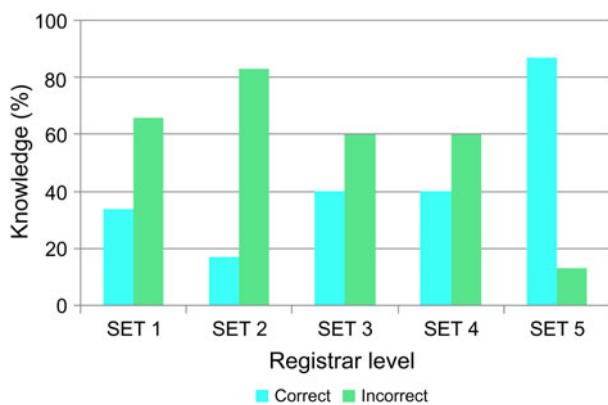


FIG. 5

Trainees' overall level of knowledge of upper airway anatomical landmarks (as seen in nasendoscopy photographs), according to year of surgical education training (SET).

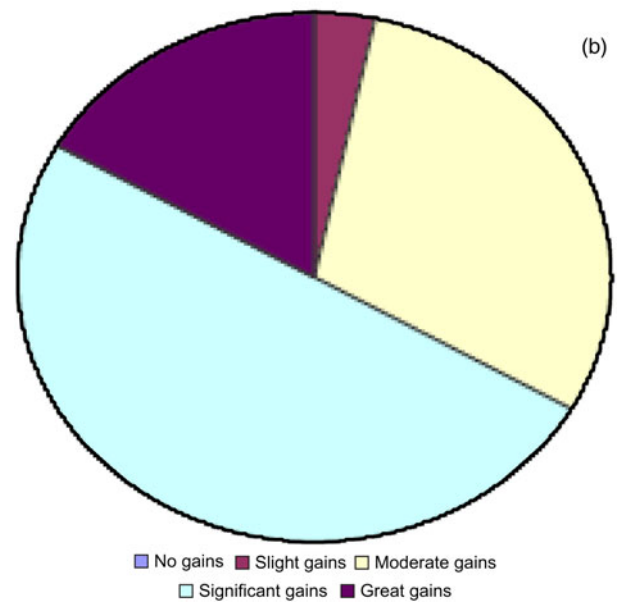
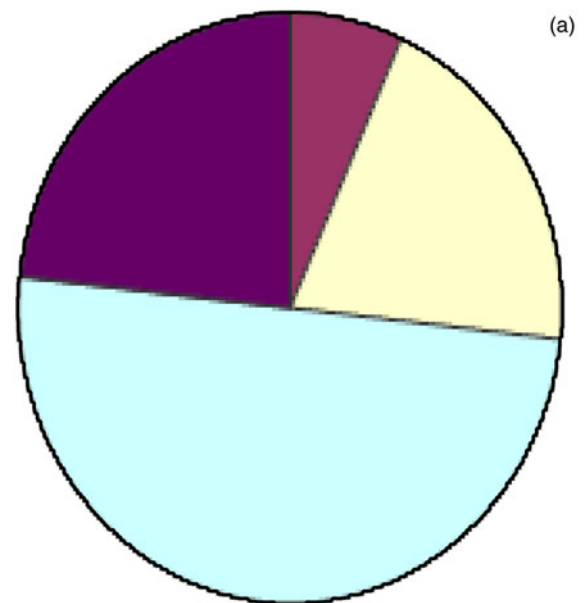


FIG. 6

Attendees' responses regarding overall perceived gains (following attendance at the cadaver workshop) in: (a) their knowledge of the surgical management of obstructive sleep apnoea, and (b) confidence regarding their understanding of sleep issues.

sleep duration and efficiency.<sup>14</sup> Airway assessment via oral and nasal examination and nasendoscopy forms the basis upon which surgical decisions rest, and the failure to identify anatomical markers precluded a correct response on the final question regarding an appropriate surgical approach. The fact that some trainees at this advanced level performed poorly on likely patient scenarios implies insufficient learning or low exposure to clinical presentations, or both.

Our results are consistent with a recent US study which found that standards in training were not keeping pace with advances in sleep surgery.<sup>15</sup> In another study, of 44 programme directors surveyed on the state of otolaryngology residency programmes

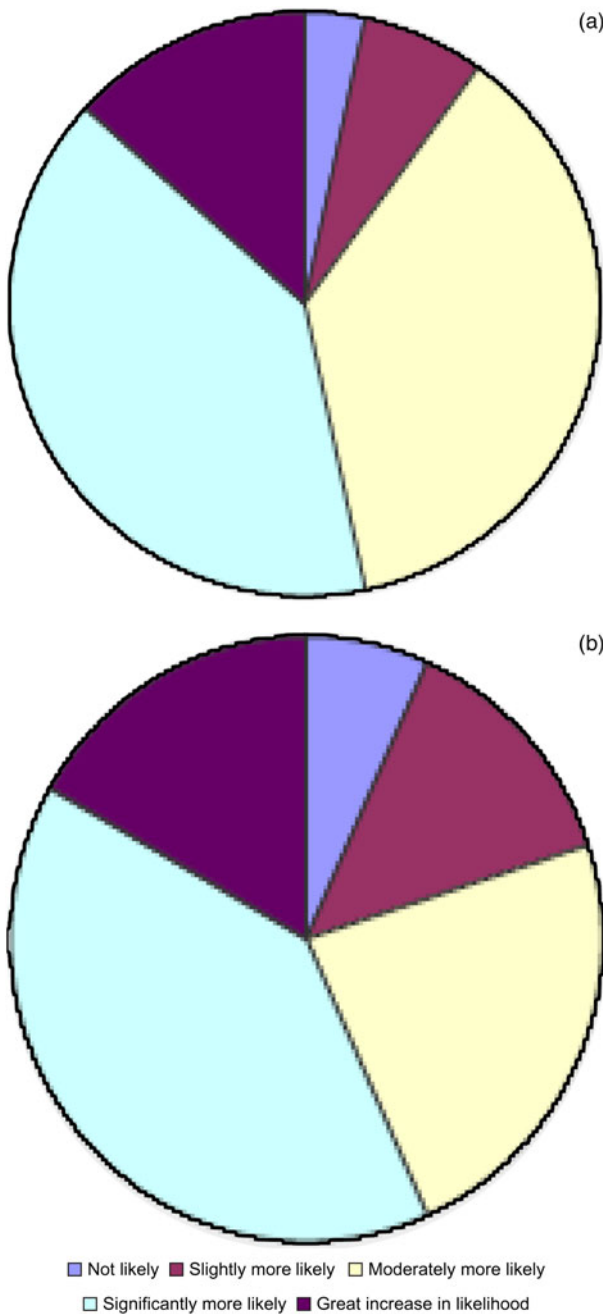


FIG. 7

Attendees' responses regarding perceived overall gains (following attendance at the cadaver workshop) in terms of the likelihood of: (a) managing adult obstructive sleep apnoea (OSA) patients, and (b) operating on OSA patients in whom device-based therapy (e.g. continuous positive airway pressure) has failed.

in sleep medicine and sleep surgery, 44 per cent considered the quality only 'fair', which indicates potential for improvement. Trainees were well prepared to conduct common procedures such as tonsillectomy and turbinate reduction, but training on hypopharyngeal or multi-level surgical procedures was perceived as lacking.<sup>16</sup> This is reflected in a recent investigation of OSA surgery practice patterns, whereby practitioners avoided targeting retroglottal obstruction and 75 per cent preferred to focus on the palate in isolation.<sup>1</sup>

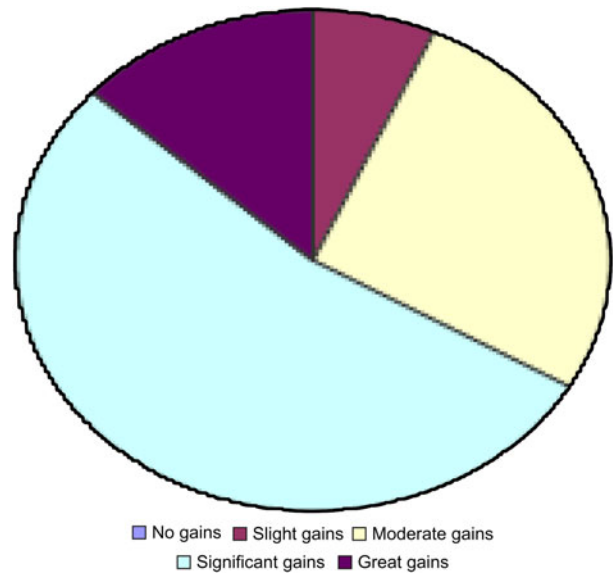


FIG. 8

Attendees' responses regarding perceived overall gains (following attendance at the cadaver workshop) made in technical surgical skills.

While the latest study to evaluate trends in OSA surgery indicates some improvement in the application of advanced techniques, the authors conclude that 'surgical practice patterns in the United States do not reflect current practice recommendations for treatment of OSA, which emphasise multilevel surgery'.<sup>16</sup>

There were several limitations inherent in this preliminary investigation. Extrapolation from a small sample taken at a single time point may not represent outcomes for every intake of ENT registrars. Future studies could comparatively assess other modules of the ASOHNS curriculum to clarify if low confidence and technical achievement for each year of surgical education training are specific to sleep surgery. It is difficult to gain a complete understanding of surgical expertise unless an objective metric is applied over consecutive years; this would enable one to address inconsistencies in respondent numbers across different surgical education training years. A more detailed analysis of demonstrated competencies at each module level would better inform conclusions regarding the adequacy of the curriculum for sleep surgery.

To increase the likelihood of participant involvement, questions were restricted to the most obvious aspects of sleep disorder management, avoiding the complexities of patient selection for more extensive reconstructive techniques. In addition, a systematic, standardised assessment of skill acquisition was lacking. Furthermore, it is difficult to speculate on the cumulative hours of practical training and didactic teaching required to produce ENT surgeons who are acceptably competent in sleep surgery.

In light of the trainee reporting of skill levels revealed in this study, a broadening of the curriculum and a higher level of trainee exposure to cases is not

an unreasonable expectation in this evolving multidisciplinary field. Possible solutions to overcome inadequate training include: (1) sleep surgery fellowships (that involve time with a sleep physician interpreting polysomnography), in which standards in case management, from consultation to post-surgical care, are quantified; (2) increased rotations through sleep clinics that offer surgical interventions, from surgical education training year 3 onwards; (3) attendance at interdisciplinary team meetings; (4) an increase in the availability of trained mentors with pertinent clinical and surgical expertise, which may currently be a limiting factor (although this situation is likely to improve as the trainee progresses in their specialty); (5) attendance at cadaver dissection courses in sleep surgery; and (6) formal certification in sleep surgery through accreditation consistent with recent changes to professional recognition in the USA.<sup>17,18</sup>

- **Multi-level airway reconstruction can be an effective surgical alternative to device-based therapy for adult obstructive sleep apnoea (OSA)**
- **Clinical assessment of this heterogeneous condition and the choice of appropriate surgical approach demand comprehensive sleep surgery training**
- **This training has reportedly not kept pace with developments in this evolving discipline**
- **This novel study evaluated shortfalls in sleep surgery training from the ENT trainee perspective**
- **It also reviewed the success of a cadaver workshop in enhancing surgical and clinical skills for treating OSA**
- **Evidence is presented for the broadening of the curriculum to adequately equip the ENT surgical trainee in the management of sleep disorders in Australia**

The study findings relating to the cadaver dissection workshop provided firm support that such a course should be incorporated into ENT training in sleep medicine. Significant gains in knowledge, technical skills and the likelihood of managing sleep disorder patients surgically were recorded in 40 per cent or more respondents on all questions. The overwhelming majority of specialists in attendance on the workshop were enthusiastic about the usefulness of such a course for overall advancement of competence. The workshop was conducted over 2 days, which is a conveniently short time in which to accelerate surgical skills to such a degree. The demonstration of even the most advanced multi-level staged surgical procedures for OSA, in conjunction with extensive access to specialists in the field and opportunities for guided practice

of the techniques described, provides an efficient and effective learning approach.<sup>10,11</sup> For future assessments of the course, pre- and post-workshop questionnaires would provide better judgements of: pre-existing surgical expertise in sleep surgery, improvements made (through attendance on the course) in the conduct of multi-level airway reconstruction and the long-term likelihood of adopting these techniques in clinical practice. The development of criterion-based competency assessments would ensure appropriate standards for all trainees.

## Conclusion

The lack of confidence and limited exposure to cases in sleep surgery reported by ENT trainees provides compelling impetus for improved standards and a broadening of the ASOHS curriculum to accommodate this developing multidisciplinary field in Australia.

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