Welcome to the May issue of Respiratory Research Review, with the topic of sleep. As in the past, this is only a snapshot of the exciting research published over the last year. The more interested reader may wish to study Sleep Medicine Research Review edited by my colleague A/Prof Alistair Neill, always an enjoyable read.

Disruptive technology is reaching sleep research. The accepted gold standard sleep study is a supervised polysomnography, which is a rather resource-intensive modality available only for a minority of patients. Pragmatically, and with an increasing evidence base, many of us use sleep studies with limited channels (Ann Intern Med). At the other end of the spectrum is a rapidly growing market of sleep tracking and wearable technology. Colleagues from the University of Michigan present a fascinating evaluation of 80 different devices, several with validation studies versus polysomnography. I encourage you to flick through this review summarising the plethora of wearable devices and the clinical opportunities these will bring. Particularly fascinating is the opportunity for crowd-sourced research funding for investigations that were previously unsolvable because of funding limitation through traditional channels. When a company called Dream:ON was calling for consumer participation to explore research on dream manipulation and sleep spindle detection, they recruited more than 100,000 volunteers via their app on the first day in 2012. Stanford’s CV study recruited more than 10,000 participants via the Apple Research Kit within the first 24 hours.

Just in case you got lost in the discussion on sleep apnoea and cardiometabolic risk, you may wish to read the great review from Camilla Hoyos, Luciano Drager and Sanjay Patel. Lancet Respir Med published a comprehensive review on the clinical relevance and practice approaches to the management of mild OSA (obstructive sleep apnoea), defined as patients with an AHI (apnoea-hypopnoea index) 5–15. And, our Australian colleagues Simon Joosten, Garun Hamilton and Matthew Naughton published one of the leading articles in the Chest sleep week on the impact of weight loss in the management of OSA. Finally, Eur Respir J published the taskforce report on the ‘Principles of practice parameters for the treatment of sleep-disordered breathing in the elderly and frail elderly: the consensus of the International Geriatric Sleep Medicine Task Force’.

Many readers are affected by shift work, which forcefully interrupts the normal sleep pattern. Göran Kecklund and John Axelsson present a great state of the art review in the BMJ on the ‘Health consequences of shift work and insufficient sleep’. They explore which aspects of shift work, like the altered light exposure, the altered food/dietary pattern, the altered sleep pattern and altered behaviours, may have the biggest impact on the circadian disruption, disturbed sleep, risky behaviours and psychosocial stress. They come up with a pragmatic figure and table on organisational and individual countermeasures, such as favourable scheduling like forward rotation, sleep recovery strategies including napping, pharmacological aids like caffeine, melatonin or modafinil, light adaptation techniques and the limitation of night eating.

Thank you for the feedback and comments and we hope you enjoy the selection for May 2017.

Kind regards

Professor Lutz Beckert
lutzbeckert@researchreview.co.nz

Abbreviations used in this issue
AHI = apnoea-hypopnoea index
BMI = body mass index
BP = blood pressure
CBT = cognitive behavioural therapy
CPAP = continuous positive airway pressure
CV = cardiovascular
ESS = Epworth Sleepiness Scale
OSA = obstructive sleep apnoea
QOL = quality of life
RCT = randomised controlled trial
SDB = sleep-disordered breathing

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Physician decision making and clinical outcomes with laboratory polysomnography or limited-channel sleep studies for obstructive sleep apnea

Authors: Chai-Coetzee CL et al.

Summary: This noninferiority RCT included patients aged 25–80 years with suspected OSA, for whom sleep study information was disclosed to sleep physicians at one of the following three levels: 1) polysomnography data (n=135); 3) airflow, thoracoabdominal bands, body position, electrocardiography and oxygen saturation (n=136); or 4) oxygen saturation and heart rate (n=135). Noninferiority was confirmed between levels 3 and 4 versus level 1 for change in Functional Outcomes of Sleep Questionnaire score, and between level 3 versus level 1 for change in ESS (Epsworth Sleepiness Scale) score (inconclusive for level 1 versus level 4). Compared with level 1, level 4 was associated with less improvement in Sleep Apnea Symptoms Questionnaire score (−17.8 vs. −24.7 [p=0.018]), less CPAP use (4.5 vs. 5.3 hours per night [p=0.04]) and lower physician diagnostic confidence (p=0.003).

Comment: If you did wish to investigate a patient with possible sleep apnoea, which test is the best? Our Australian colleagues present the results of a prospective, multicentre, randomised study comparing laboratory-based polysomnography (level 1) to a potentially home-based study with fewer recordings (level 3) and to overnight oximetry (level 4). Physician confidence in data based on oximetry was low and there was also a reduction in CPAP use and a lesser improvement in daytime sleepiness. Bottom line: all three sleep tests including overnight oximetry performed similarly in improving outcomes based on the Functional Outcomes of Sleep Questionnaire.


Abstract
Obstructive sleep apnoea and frequency of occupational injury

Authors: Allen AJH et al.

Summary: The risk of occupational injury associated with OSA was explored in 1236 patients referred for suspected OSA. Compared with patients without OSA, those with OSA were more likely to have experienced ≥1 occupational injury during the 5 years prior to polysomnography (adjusted odds ratio 1.76 [95% CI 0.86, 3.59]), particularly an injury more likely related to reduced vigilance such as a fall or commercial motor vehicle crash (2.42 [0.085, 6.93]).

Comment: These authors used the database from British Columbia to correlate OSA in more than 1000 patients with a claim for occupational injuries. If patients with untreated OSA have decreased daytime alertness and decreased neurocognitive function, one would expect an increased number of occupational injuries. The authors postulate to identify high-risk occupational groups and consider screening, diagnostic testing and CPAP treatment. Bottom line: patients with sleep apnoea had almost twice the number of occupational injuries and almost three times the number of vigilance-related injuries in the 5 years prior to the diagnosis compared with patients without sleep apnoea.


Association between reported sleep need and sleepiness at the wheel

Authors: Quera-Salva MA et al.

Summary: For this research into sleep problems and risks when driving, 2196 highway drivers in France were interviewed in 1996 and 3545 were interviewed in 2011. Compared with the 1996 results, drivers in 2011 reported significantly shorter sleep times on both weekdays and weekends and significantly shorter optimal sleep time, with significantly more drivers reporting significantly shorter sleep times on both weekdays and weekends interviewed in 2011. Compared with the 1996 results, drivers in 2011 took a nap, twice as many drivers had to stop because of sleepiness, and twice as many drivers had an ESS score >15. For this research into sleep problems and risks when driving, 2196 highway drivers in France were interviewed in 1996 and 3545 were interviewed in 2011. Compared with the 1996 results, drivers in 2011 reported significantly shorter sleep times on both weekdays and weekends and significantly shorter optimal sleep time, with significantly more drivers feeling sleepy at the wheel and 2.5-fold more having severe sleepiness (ESS score >15).

Comment: Imagine you are driving along a French motorway, reach the toll station and while looking for money you are being approached by the highway patrol to participate in a study to explore your sleep habits. It is impressive that 80% of all drivers stopped participated, so that the authors present data on more than 5000 drivers. Compared with 1996, in 2011 more drivers took a nap, twice as many drivers had to stop because of sleepiness and 2.5-fold more had an ESS score >15. Bottom line: drivers in 2011 appear chronically sleep deprived with seven times the rate of near-miss sleepy accidents compared with 1996.

Reference: BMJ Open 2016;6(12):e012382

Fixed-pressure CPAP versus auto-adjusting CPAP: comparison of efficacy on blood pressure in obstructive sleep apnoea

Authors: Pépin JL et al.

Summary: Patients with OSA indicated for CPAP were randomised to fixed-pressure CPAP (n=161) or auto-adjusting CPAP (n=161), with change in systolic BP at 4 months set as the primary endpoint; median CPAP use duration was 5.1 hours per night. There was no significant difference between the fixed-pressure and auto-adjusting CPAP arms for the primary endpoint in an intent-to-treat analysis (difference –1.3mm Hg [p=0.37]), but the secondary endpoint of change in 24-hour diastolic BP was greater in the fixed-pressure CPAP group (–1.7 vs. –0.5mm Hg [p=0.048]).

Comment: These French authors explore the efficacy of two modes of CPAP to reduce BP in patients with sleep apnoea. Auto-adjusting CPAP changes the delivered air pressure according to the pressure detected in the airway and tends to achieve a similar reduction in AH over the whole treatment period. These authors used the database from British Columbia to correlate OSA in more than 1000 patients with a claim for occupational injuries. If patients with untreated OSA have decreased daytime alertness and decreased neurocognitive function, one would expect an increased number of occupational injuries. The authors postulate to identify high-risk occupational groups and consider screening, diagnostic testing and CPAP treatment. Bottom line: both fixed-pressure and auto-adjusting CPAP treatments improve BP at the office. Fixed-pressure CPAP lowers the diastolic BP and mean BP over a 24-hour cycle.

Reference: Thorax 2016;71(8):726–33

Independent commentary by Professor Lutz Beckert.

Professor Lutz Beckert is the Head of Department of Medicine of the University of Otago, Christchurch. He is also a Respiratory Physician at Canterbury District Health Board with particular clinical interests in interstitial lung disease, pulmonary vascular disease, respiratory physiology and COPD (chronic obstructive pulmonary disease). Lutz is happy to be contacted to discuss research ideas either as a sounding board or considering future collaborations.

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Research Review publications are intended for New Zealand health professionals.
**CPAP for prevention of cardiovascular events in obstructive sleep apnea**

**Authors:** McEvoy RD et al., for the SAVE Investigators and Coordinators

**Summary:** This study examined whether CPAP use prevented major CV events in 2717 patients aged 45–75 years with moderate-to-severe OSA and coronary or cerebrovascular disease who were randomised to usual care with or without CPAP. After a mean follow-up of 3.7 years, rates of the primary composite endpoint (death from CV causes, myocardial infarction, stroke or hospitalisation for unstable angina, heart failure or transient ischaemic attack) in the CPAP and usual care groups did not differ significantly (17% and 15.4%, respectively), and there were no significant between-group differences for the primary endpoint’s components.

**Comment:** The Spanish investigators of the study highlighted earlier in this issue, investigating the use of CPAP in woman with OSA, reported that the quality of life improvement was greater the longer they used CPAP overnight (*Am J Respir Crit Care Med*: see page 2). This study orchestrated from Adelaide recruited more than 2500 adults after coronary or cerebrovascular events and randomised them to receive CPAP or usual care. However, more than half of the patients randomised to CPAP therapy used it for <4 hours per night. In retrospect, the study may have been underpowered and better compliance may have led to further improvements. This study joins three others that didn’t show an improvement in CV or cerebrovascular events.

**Bottom line:** CPAP therapy did not significantly prevent CV events in patients with OSA and established CV disease.


**Abstract**

**Motivational enhancement for increasing adherence to CPAP**

**Authors:** Bakker JP et al.

**Summary:** Patients aged 45–75 years with moderate or severe OSA (mean AHI 26.2) without marked sleepiness but with established or risk factors for CV disease were randomised to receive CPAP with (**n**=41) or without (**n**=42) motivational enhancement delivered by a psychologist during two appointments and six phone calls over 32 weeks, resulting in 14,273 nights of evaluable data. Compared with CPAP only, the inclusion of motivational enhancement was associated with 99 minutes greater adherence to CPAP each night at 6 months (**p**=0.003), and the improvement persisted in a subset of 52 patients who continued in the study for 12 months, with a 97 minute per night improvement in adherence in motivational enhancement recipients.

**Comment:** These Harvard researchers investigated the effect of motivational enhancement to increase adherence to CPAP therapy. They randomised 83 patients with severe sleep apnoea to standard care, or standard care with two appointments and six phone calls by a psychologist with the principal goal to collaboratively reduce the subjects’ ambivalence towards CPAP therapy over 32 weeks. After 6 months, patients in the standard group used CPAP for 3.3 hours per night and patients in the motivational enhancement group adhered for 4.4 hours per night. **Bottom line:** motivational enhancement improved CPAP adherence by 90 minutes.

**Reference:** Chest 2016;150(2):337–45

**Abstract**

**Idiopathic pulmonary fibrosis (IPF) treatment now funded**

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Randomised sham-controlled trial of transcutaneous electrical stimulation in obstructive sleep apnoea

Authors: Pengo MF et al.

Summary: Thirty-six patients with OSA (median oxygen desaturation index 25.7 per hour; median AHI 28.1) were randomised to receive one night of transcutaneous electrical stimulation and one night of sham stimulation in a randomised order in this crossover trial. Active treatment was associated with an improvement in the primary outcome measure (4% oxygen desaturation index) compared with sham stimulation (median 26.9 vs. 19.5 per h [p=0.026]), and responders (>25% reduction in oxygen desaturation index with active versus sham stimulation; 47.2%) were mostly participants with mild-to-moderate OSA for whom the oxygen desaturation index was reduced by 10.0 per h (p=0.001) and AHI was reduced by 9.1 per h (p=0.004). Active stimulation was well tolerated.

Comment: CPAP adherence is a perennial problem and it is important to look at treatment alternatives. We have previously reported on the success rate of the implantable stimulator to activate the hypoglossal nerve in the treatment of sleep apnoea (Respiratory Research Review, issue 100). In this paper, a group of London researchers report a randomised, sham-controlled crossover trial of continuous transcutaneous electrical stimulation of the upper airway dilator muscles in patients with sleep apnoea. The stimulation was well tolerated.

Bottom line: transcutaneous electrical stimulation of the pharyngeal dilators during sleep modestly improves upper airway obstruction resulting in about four fewer desaturations per hour.


Abstract

Telephone-based cognitive behavioral therapy for insomnia in perimenopausal and postmenopausal women with vasomotor symptoms

Authors: McCurry SM et al.

Summary: The MsFLASH RCT compared telephone-based CBT (cognitive behavioural therapy) for insomnia (n=53) with menopause education control (n=53) in perimenopausal or postmenopausal women aged 40–65 years with moderate insomnia symptoms and ≥2 hot flashes each day. Compared with menopause education, CBT was associated with: i) greater reductions at 8 weeks in Insomnia Severity Index and Pittsburgh Sleep Quality Index scores (9.9 vs. 4.7 points [p<0.001] and 4.0 vs. 1.4 points [p<0.001], respectively), which persisted out to 24 weeks; ii) greater proportions of women with Insomnia Severity Index scores in the ‘no insomnia’ range at 8 weeks and 24 weeks (70% vs. 24% and 84% vs. 43%, respectively); iii) greater improvements in diary-reported sleep latency, wake time and sleep efficiency; and iv) decreased hot flash interference at 8 and 24 weeks (-15.7 vs. -7.1 [p=0.03] and -22.8 vs. -11.6 [p=0.003], respectively, despite no significant between-group difference for frequency of daily hot flashes.

Comment: This is a pragmatic single-centre study comparing the efficacy of CBT therapy delivered via the telephone with an education session about menopause and women’s health in reducing insomnia. Interestingly, the researchers started out posting 20,000 postcards to eventually randomise 106 participants. The six CBT sessions covered topics like sleep scheduling, bed restriction, stimulant control, sleep cycles across the lifespan, a behavioural sleep plan, sleep hygiene and a relapse prevention plan. Control patients were offered information about menopausal symptoms including hot flashes.

Bottom line: women with access to CBT delivered via the telephone significantly improved their insomnia and sleep quality.


Abstract