Simplified Pathways for the Diagnosis and Management of Obstructive Sleep Apnea in Primary Care

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ABSTRACT

Obstructive sleep apnea (OSA) is highly prevalent in the Australian community and throughout the world. With growing evidence linking OSA to adverse health consequences and development of effective therapies such as continuous positive airway pressure (CPAP), there has been a steady rise in the demand for laboratory-based sleep testing and specialist consultation. Alternative, cost-effective models of care for OSA are needed to increase patient access to sleep services. Primary care would be an ideal setting for development of a simplified strategy for OSA diagnosis and management.

In the first study (Chapter 2), we developed and validated a two-step diagnostic model for moderate-to-severe OSA consisting of a screening questionnaire and overnight home oximetry. Patients aged 25 to 70 years who were seeing their general practitioner (GP) for any reason at one of 6 primary care clinics completed an Epworth Sleepiness Scale (ESS) and Berlin Questionnaire. They underwent simultaneous recording with a two-channel ApneaLink monitor and full polysomnography (PSG) to identify variables predictive of OSA and to validate the portable monitoring device. Snoring, waist circumference, apneas and age were most predictive of OSA and incorporated into a screening questionnaire (receiver operating characteristic area under curve (ROC AUC) = 0.84 [95%CI: 0.75-0.94], $p<0.001$). ApneaLink oximetry with a ≥3% dip rate was highly predictive of OSA (ROC AUC=0.96 [0.91-1.0], $p<0.001$). The two-stage diagnostic model had a sensitivity of 0.97 [0.81-1.00] and specificity of 0.87 [0.74-0.95] in the development group, and sensitivity of 0.88 [0.60-0.98] and specificity of 0.82

[0.70-0.90] in the validation group. Thus, the two-step model was shown to be accurate in identifying patients with OSA in primary care.

The development and evaluation of a six-hour education program for GPs which was accredited by the Royal Australasian College of General Practitioners is described in Chapter 3. GPs completed an attitudes and knowledge questionnaire before and 2 weeks after attendance at the program, and then again after 17 to 30 months. Two weeks post-education, there were significant improvements in the level of confidence in managing OSA and CPA therapy, and an improvement in knowledge test scores. Improvements in attitudes and knowledge from baseline were sustained on long term testing.

Chapter 4 details the results of a prospective, randomised controlled study conducted to evaluate the clinical efficacy and cost-effectiveness of a simplified model of care for OSA in general practice. Patients with OSA were identified by GPs using the simple two-step diagnostic strategy described in Chapter 2, and were randomised to receive either primary care management led by their GP and a community-based nurse, or usual laboratory-based care in a specialist sleep centre. For the primary outcome, mean change in ESS at 6 months, primary care management was not inferior to specialist management (4.6 vs 5.1, adjusted difference -0.6 [lower bound 95% confidence interval: -1.8], p=0.37). There were no differences in secondary outcomes, including quality of life, OSA symptoms, treatment compliance and overall patient satisfaction. Within-study costs were lower in the primary care

arm, with savings of AUD$2157 (95%CI: $1293 to $3114) per patient.

A simplified model of care for the diagnosis and management of OSA based in the primary care setting is efficacious and cost-effective, and has the potential to reduce the burden of untreated OSA in the community.

PUBLICATIONS ARISING FROM THIS THESIS

Peer-Reviewed Journals

CL Chai-Coetzer, NA Antic, LS Rowland, PG Catcheside, A Esterman, RL Reed, H Williams, S Dunn and RD McEvoy (2011). A simplified model of screening questionnaire and home monitoring for obstructive sleep apnea in primary care. Thorax;66:213-219.

Published Conference Proceedings

CL Chai-Coetzer, N Antic, S Eckermann, LS Rowland, R Reed, A Esterman, P Catcheside, N Vowles, H Williams, S Dunn, RD McEvoy (2012). Cost-effectiveness analysis of a simplified model of care for obstructive sleep apnea in general practice. Sleep and Biological Rhythms;10 (Suppl 1):42.

C Chai-Coetzer, NA Antic, L Rowland, RL Reed, A Esterman, P Catcheside, N Vowles, H Williams, S Dunn, RD McEvoy (2012). A Randomised Controlled Trial To Evaluate A Simplified Model Of Care For Obstructive Sleep Apnea In Primary Care. Am J Respir Crit Care Med;185:A3853.

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simplified method for identifying obstructive sleep apnea in primary care. Respirology;14(Suppl 3):A146.

CL Chai, N Antic, LS Rowland, P Catcheside, A Esterman, R Reed, H Williams, S Dunn, and RD McEvoy (2009). Development and validation of a simplified method for identifying obstructive sleep apnea in primary care. Am. J Respir Crit Care Med;179:A1249.

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Chai CL, N Antic, S Rowland, P Catcheside, A Esterman, R Reed, H Williams, S Dunn & D McEvoy (2008). A simplified method for identifying obstructive sleep apnea in general practice. Sleep and Biological Rhythms;6(Suppl 1):A11-12.

AWARDS

2012 Assembly on Sleep and Respiratory Neurobiology, American Thoracic Society (ATS), Travel Award to attend 2012 ATS International Conference San Francisco, USA

2011 Executive Dean of the Faculty of Health Sciences PhD Research Student Publication Award, Flinders University, Adelaide, SA

2011 Best Student Paper, Office of the Vice Chancellor (Research), Flinders University, Adelaide, SA

2011 Young Investigator Award Winner, Thoracic Society of Australia & New Zealand South Australia Branch, Adelaide, SA

2011 New Investigator Award Finalist, Australasian Sleep Association ASM, Sydney, NSW

2011 Best Scientific Paper, South Australian Defence & Veteran Health Research Paper Day, Adelaide, SA

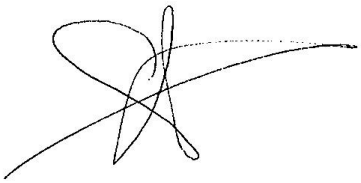
2009 Ann Woolcock Young Investigator Award Winner, Thoracic Society of Australia & New Zealand ASM 2009, Darwin, NT, including Travel Scholarship to attend Asia-Pacific Society of Respirology Conference 2009, Seoul, Korea

2009 Best Practice-based Study, Faculty of Health Sciences Student Research Prize Day, Postgraduate Research Students in the School of Medicine (PRISM), Flinders University, SA

2007-2010 Flinders Medical Centre Clinicians Trust PhD Medical Research Scholarship

DECLARATION

I certify that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.



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GLOSSARY

AASM	American Academy of Sleep Medicine
AHI	apnea-hypopnea index
ANCOVA	analysis of covariance
APAP	automatically-adjusting continuous positive airway pressure
AUC	area under curve
BMI	body mass index
BTS	British Thoracic Society
CAD	coronary artery disease
CHAID	Chi-square automatic interaction detection
CPAP	continuous positive airway pressure
CT90	cumulative time spent under SaO_2 of 90%
CVD	cardiovascular disease
ECG	electrocardiogram
EEG	electroencephalogram
EMG	electromyogram
EOG	electrooculogram
ESS	Epworth Sleepiness Scale
FOSQ	Functional Outcomes of Sleep Questionnaire
GP	general practitioner
ICER	incremental cost-effectiveness ratio
MAP index	Multivariable Apnea Risk index
MAS	mandibular advancement splint
MCQ	multiple-choice question

MSAC	Medical Services Advisory Committee
MVA	motor vehicle accident
NICE	National Institute for Health and Clinical Excellence
MBS	Medicare Benefits Scheme
NPV	negative predictive value
ODI	oxygen desaturation index
OSA	obstructive sleep apnea
PPV	positive predictive value
PSG	polysomnography
QA&CPD	Quality Assurance and Continuing Professional Development
QALY	quality adjusted life year
QOL	quality of life
RACGP	Royal Australasian College of General Practitioners
RDI	respiratory disturbance index
ROC	receiver operating characteristic
SACS	Sleep Apnea Clinical Score
SaO_2	arterial oxygen saturation
SAQLI	Sleep Apnea Quality of Life Index
SASQ	Sleep Apnea Symptoms Questionnaire
SF-36	Short-Form 36 Health Survey
SHHS	Sleep Heart Health Study
TBT	tennis ball technique
VSQ-9	Visit-Specific Satisfaction Questionnaire