Diagnostic accuracy of level 3 portable sleep tests versus level 1 polysomnography for sleep-disordered breathing: a systematic review and meta-analysis

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CRD summary
This review concluded that level 3 sleep studies are safe and convenient for diagnosing obstructive sleep apnoea in patients with a high pretest probability of moderate to severe forms of the condition without significant comorbidities but that level 1 polysomnography remains the reference standard. On the basis of the available evidence these broad conclusions appear to be reliable.

Authors' objectives
To assess the diagnostic accuracy of portable monitor (level 3) testing compared with in-laboratory polysomnography (level 1) and to identify the appropriate patient population for each test.

Searching
PubMed, The Cochrane Library and EMBASE databases were searched for studies in English published from 2007 to March 2012 with update searches of PubMed until March 2013. The search was supplemented with studies from a previous systematic review that covered the period from 2004 to 2009.

Study selection
Studies were eligible for inclusion in the review if they compared level 3 with level 1 sleep tests involving adults and reported on either diagnostic accuracy parameters or management after testing. Studies that reported 2x2 diagnostic data were eligible for inclusion in a meta-analysis.

Included participants had a mean age of 50.8 years, a mean Epworth Sleepiness Scale score of 11.6, a mean body mass index (BMI) of 30.4 and a male:female ratio of 2.9:1. Most studies included patients suspected of having simple obstructive sleep apnoea without comorbidities or with stable cardiovascular comorbidities. Respiratory conditions made up only 0.7% of total reported comorbidities.

Two reviewers independently assessed study eligibility.

Assessment of study quality
Study quality was assessed according to QUADAS-2 criteria which evaluate internal and external validity across seven different domains. It was not clear how many reviewers performed the assessment.

Data extraction
Data were extracted on diagnostic accuracy parameters (2x2 data and/or reported sensitivity, specificity, area under the receiver operating characteristic (ROC) curve and positive and negative likelihood ratios) and clinical management parameters (acceptance of positive airway pressure treatment, treatment adherence, mechanical estimates of residual apnoea-hypopnoea index, mean machine pressure difference between patients whose diagnoses were made with the two different tests, quality of life and functional status).

Two reviewers independently extracted data from the included studies. Disagreements were resolved by discussion.

Methods of synthesis
Studies were initially combined in a narrative synthesis with the subset of studies that reported 2x2 data included in a meta-analysis using a bivariate mixed-effects binary regression model. Heterogeneity was tested for using the Q statistic and quantified using I². Summary ROC curves were produced for different apnoea-hypopnoea severity levels. Sensitivity analyses were conducted by removing studies including only patients with comorbidities.

Results of the review
Fifty-nine studies (5,026 evaluable patients) were included in the review. Where information was available, most
studies were rated as having a low risk of bias and 17 studies were considered to be at high risk of selection bias.

Where reported, area under the curve (AUC) exceeded 0.90 for most severity cut-off points in studies of both level 1 and level 3 tests. None of the studies reported significant differences in disease management parameters. Adverse events were rarely reported (one hypertensive crisis and one pacemaker interference in in-laboratory level 3 tests). Technical failures were more common in at-home level 3 tests (10.3%) than in in-laboratory level 3 (1.3%) or level 1 (0.4%) tests.

Nineteen studies were included in the meta-analysis. AUC ranged from 0.85 to 0.89 for at-home level 3 tests and from 0.92 to 0.99 for in-laboratory tests across different levels of severity. For at-home tests, summary estimates of sensitivity ranged from 0.79 to 0.93 and estimates of specificity ranged from 0.60 to 0.90. For in-laboratory tests, summary estimates of sensitivity ranged from 0.92 to 0.97 and estimates of specificity ranged from 0.76 to 0.93.

Results of sensitivity analyses were similar to the main analysis.

Authors' conclusions
Level 3 sleep studies are safe and convenient for diagnosing obstructive sleep apnoea in patients with a high pretest probability of moderate to severe forms of the condition without significant comorbidities. Level 1 polysomnography remains the reference standard.

CRD commentary
This review was based on a clearly defined research question that was supported by appropriate study selection criteria. Appropriate methods were used to assess the validity of included studies and statistically combine diagnostic accuracy data where available. The authors acknowledged that limiting inclusion to studies in English may have led to the exclusion of some relevant studies.

While level 3 tests did not appear to be as accurate outside a laboratory setting, the authors' broad conclusions appear to be reliable and recognise that available data reflect diagnostic accuracy in patients suspected of obstructive sleep apnoea but not other forms of sleep-disordered breathing.

Implications of the review for practice and research
The authors did not state any implications for practice.

Research: The authors stated that further evaluation of portable sleep studies was needed in patients with sleep apnoea with comorbidities and other conditions.

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