Cost-effectiveness analysis of nocturnal oximetry as a method of screening for sleep apnea-hypopnea syndrome

Epstein L J, Dorlac G R

Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
Nocturnal oximetry as a method of screening for sleep apnea-hypopnea syndrome (SAHS).

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis.

Study population
Military personnel and family members who potentially suffer from OSA.

Setting
The study was carried out at a USA Air Force tertiary teaching hospital, San Antonio, Texas.

Dates to which data relate
The dates of the effectiveness and resource use data were not stated. The price year was not reported.

Source of effectiveness data
The evidence for the final outcomes was derived from a single study.

Link between effectiveness and cost data
The costing was undertaken prospectively on the same patient sample as that used in the effectiveness study.

Study sample
100 patients referred for evaluation for possible sleep-disordered breathing who underwent PSG in the sleep centre. 93 men and 7 women were studied, aged 19 to 72 years (mean 39.3 years), with a mean body mass index (BMI) of 28.2 (+/- 4.4) kg/m². No power calculations were reported. Both the intervention and control screening procedures were applied to the same sample.

Study design
This was a retrospective case series. No loss to follow-up was reported. The oximetry strip chart tracings were examined by a single physician interpreter blinded to the results of the PSG. Oximetry results were verified by a second scoring physician, blinded to the PSG results and the results of the first scorer, on 10 randomly selected tracings.
Analysis of effectiveness
The analysis of the clinical study was based on intention to treat. Diagnostic accuracy of the two oximetry algorithms and PSG was reported in terms of the sensitivity, specificity, and positive and negative predictive values. The main effectiveness measure was the ability of the screening procedures to detect SAHS.

Effectiveness results
A diagnosis of SAHS was made by PSG in 53 patients, with a mean apnea-hypopnea index (AHI) of 32.4 (+/- 22.1). SAHS was diagnosed by oximetry (fluctuating pattern) in 72 patients and by oximetry (deep pattern) in 44 patients. Use of the fluctuating pattern for oximetry interpretation resulted in a higher sensitivity and negative predictive value, but decreased specificity and positive predictive value compared to the deep pattern of oximetry. Both deep and fluctuating patterns were more sensitive and had a higher positive predictive value in patients with BMI greater than 30 kg/m2. The specificity for the fluctuating pattern and the negative predictive value for the deep pattern were lower in patients with BMI less than 30 kg/m2. 17 of 28 patients with normal oximetry had a treatable disorder missed by screening oximetry alone. Split-night studies were successfully performed in 21 of 33 patients with an AHI greater than 20.

Clinical conclusions
The value of oximetry as a diagnostic and a screening tool is questionable. A significant number of patients with sleep disorders would remain undiagnosed and untreated by using screening oximetry. Screening oximetry was most successful in detecting SAHS in patients with a high likelihood of having OSA or those with more severe disease. The sensitivity of oximetry can be improved with the use of less rigid criteria for interpretation of an abnormal test result.

Measure of benefits used in the economic analysis
The main effectiveness measure was the ability of the screening procedures to detect SAHS.

Direct costs
Costs of oximetry, PSG, titration trial and a split-night PSG were reported and included in the economic analysis. Costs related to the fluctuating pattern for oximetry interpretation were used. The quantity/cost boundary adopted was that of the hospital. The estimation of costs was based on the results of a survey. Price estimates were obtained by telephone survey of local sleep centres. The date of the price data was not reported. Costs were calculated at both the mean and the lowest prices.

Statistical analysis of costs
No sensitivity analysis was reported.

Indirect Costs
Not included.

Currency
US dollars ($).

Sensitivity analysis
A sensitivity analysis was undertaken on the diagnostic accuracy of oximetry for detecting an AHI greater than 10. The parameter on which the sensitivity analysis was carried out was the level of BMI.

Estimated benefits used in the economic analysis
Oximetry screening using the fluctuating pattern was not as sensitive as PSG for detecting patients with mild disease: 17 of 28 patients (61%) with normal oximetry results had treatable conditions detected by PSG.

Cost results
The mean charge reported for oximetry was $294 (range: 125 - 464), the mean charge for PSG and CPAP titration trial was $1,123 (range: 1,000 - 1,217). The cost of a split-night study was the same as that of a diagnostic PSG. Total costs for oximetry, PSG and PSG/split-night were $167,529, $171,819 and $148,236 respectively. Use of screening oximetry prior to PSG would have saved $4,290 per 100 patients evaluated compared to initial PSG testing if all patients with SAHS had required a second night study for CPAP titration. Cost savings calculated with the lowest prices increased to $17,500 per 100 patients. The use of PSG in split-night studies resulted in cost savings of $19,293 per 100 patients compared to the initial oximetry algorithm.

Synthesis of costs and benefits
Estimated costs and benefits were not combined in a cost-effectiveness measure.

Authors' conclusions
Screening oximetry is not cost-effective because of poor diagnostic accuracy despite increased sensitivity using the fluctuating pattern. Only minor savings are achieved by screening oximetry which can easily be offset by increased treatment costs due to its poor accuracy. Compared with oximetry, greater savings, without loss of diagnostic accuracy, may be achieved through split-night studies.

CRD COMMENTARY - Selection of comparators
The rationale for the choice of the comparator was clear.

Validity of estimate of measure of benefit
The measures of effectiveness and benefit seem to be valid. The results depended on the value of AHI and BMI. No justification was given for the thresholds of AHI and BMI that were used in the study.

Validity of estimate of costs
Only direct costs related to the screening equipment were reported. No personnel or overhead costs were included. A statistical analysis should have been applied to the cost results. The conduct of a sensitivity analysis might have been worthwhile given the small cost difference between oximetry and PSG.

Other issues
The effectiveness results are probably context specific and not generalisable: the population studied had a lower BMI and milder disease.

Implications of the study
Other methods of screening for OSA other than oximetry, such as multiple parameter monitors or portable PSG, should be evaluated for cost-effectiveness.

Source of funding
None stated.

Bibliographic details

PubMedID
9440575

Other publications of related interest


Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; Aged; Cost-Benefit Analysis; Female; Humans; Male; Middle Aged; Oximetry /economics; Oxyhemoglobins /metabolism; Polysomnography /economics; Predictive Value of Tests; Reproducibility of Results; Retrospective Studies; Sleep Apnea Syndromes /blood /diagnosis; Syndrome

AccessionNumber
21998000175

Date bibliographic record published
31/03/1999

Date abstract record published
31/03/1999