BTS Guideline for diagnosing and monitoring paediatric sleep disordered breathing

Online Appendix 6 Question 6 Evidence Review and Protocol

Q6 For children with suspected sleep disordered breathing, what is the optimal monitoring time when using pulse oximetry or cardiorespiratory sleep studies?

Contents

Question Evidence Review

Q6 For children with suspected sleep disordered breathing, what is the optimal monitoring time when using pulse oximetry or cardiorespiratory sleep studies?

Background

Sleep breathing parameters in children can be significantly affected by the length of monitoring time. Measuring equipment can be rejected by a child, requiring re-application during the night of study, so a full night of study with high quality data can be a practical challenge and studies may be of a duration much less than a full night of sleep. In children REM density and duration increases over the course of the night, however AHI does not increase across REM cycles. Hence, this review aimed to determine the optimal monitoring time, when using pulse oximetry or cardiorespiratory sleep studies (CRSS), to accurately diagnose suspected sleep disordered breathing (SDB) in children.

Outcomes

The diagnostic accuracy of ≤10 hours of pulse oximetry or CRSS monitoring to diagnose SDB in children.

Evidence Review

The literature search identified five papers, but none were directly relevant to the review.

Instead, one study reported on the diagnostic accuracy of four hours of polysomnography (PSG) sleep monitoring (containing at least one cycle of rapid eye movement (REM)) to diagnose total apnoea-hypopnea index (AHI), obstructive AHI and central apnoea indices (AI) in children under two years of age with suspected SDB.[1] Full night PSG was used as the gold standard and the results are summarised in Table 6a.

Table 6a: Diagnostic accuracy of four hours polysomnography (PSG) sleep monitoring

Age	**≤6 months**		**>6 months, <2 years**		**Combined data (<2 years)**	
Diagnosis	**Sensitivity** (TP/D+)	**Specificity** (TN/D-)	**Sensitivity** (TP/D+)	**Specificity** (TN/D-)	**Sensitivity** (TP/D+)	**Specificity** (TN/D-)
Total AHI	1.00 (48/48)	- (0/0)	0.93 (52/56)	1.00 (1/1)	0.96 (100/104)	1.00 (1/1)
Obstructive AHI	0.98 (46/47)	1.00 (1/1)	0.91 (41/45)	0.92 (11/12)	0.95 (87/92)	0.92 (12/13)
Central AI	1.00 (8/8)	0.83 (33/40)	0.72 (13/18)	0.87 (34/39)	0.81 (21/26)	0.85 (67/79)

AHI – apnoea-hypopnea index, AI – apnoea indices, D+ – number of subjects with the disease (determined by full polysomnography), D- – number of subjects without the disease (determined by full polysomnography), TN – true negative TP – true positive

Evidence Statement

There is minimal evidence to support this review.

Four hours of polysomnography (PSG) monitoring appears to have a high specificity and high sensitivity for diagnosing sleep disordered breathing in children less than two years of age when using full night PSG as the gold standard (**Ungraded**)

Recommendations

No recommendations can be made based on the limited evidence

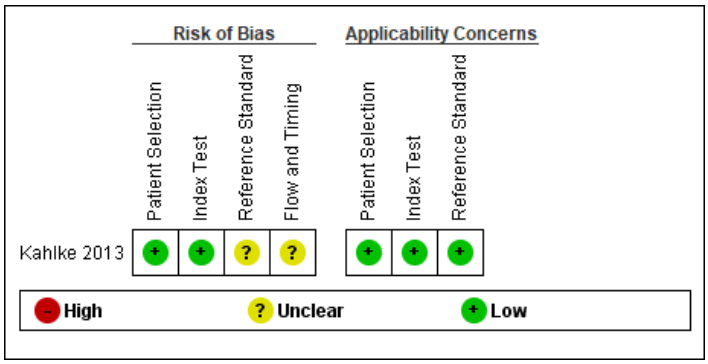
Good Practice Point

- ✓ Sleep studies, using pulse oximetry or a CRSS, with four to six hours of continuous sleep duration should be adequate for diagnosing moderate-to-severe SDB in children. The sleep duration is defined as continuous to allow adequate opportunity for all sleep stages to occur. Combining short episodes of sleep interspersed with wake to create four to six hours of sleep recording may miss parts of the sleep cycle and is not advised. This includes children under the age of two years, where rapid eye movement (REM) cycles are more evenly dispersed through the night. If a child is older than two years of age (when REM sleep is greater in the latter half of the night), or if mild disease is to be excluded, a period of longer than six hours is advised

Research Recommendation

- Research is needed into determining the optimal monitoring time of pulse oximetry or cardiorespiratory sleep studies (CRSS) to diagnose sleep disordered breathing in children with and without co-morbidities

Risk of bias summary



Reference

1. Kahlke PE, Witmans MB, Alabdoulsalam T, Young R, MacLean JE, Mandhane PJ. Full-night versus 4h evening polysomnography in children less than 2 years of age. *Sleep Medicine.* 2013;14:177-182.

Question Protocol

Field	Content
Review Question	For children with suspected sleep disordered breathing, what is the optimal monitoring time when using pulse oximetry or CRSS?
Type of review question	Diagnostic accuracy
Objective of the review	There is a broad range of opinion as to what defines an appropriate minimum period of monitoring during sleep. This review aims to objectively define this for oximetry and CRSS: • Does 4 hours of monitoring provide the same level of care, medical management and requirement for repeat investigations as compared to more than 4 hours of monitoring
Eligibility criteria – population / disease / condition / issue / domain	Children (<17 years) with suspected sleep disordered breathing
Eligibility criteria – index test(s)	Pulse oximetry for ≤10 hours of monitoring CRSS for ≤10 hours of monitoring
Eligibility criteria – gold standard	Polysomnography
Outcomes and prioritisation	Diagnostic accuracy
Eligibility criteria – study design	Meta-analyses Randomised controlled trials – oximetry versus cardiorespiratory sleep studies Prospective Cohort Studies Retrospective Case Note Reviews
Other inclusion /exclusion criteria	Non-English language excluded unless full English translation Conference abstracts, Cochrane reviews, systematic reviews, reviews Cochrane reviews and systematic reviews can be referenced in the text, but **DO NOT** use in a meta-analysis
Proposed sensitivity / subgroup analysis, or meta-regression	Children (<17 years), ≤4 hours monitoring Typically developing children <2 years, ≤4 hours monitoring Typically developing children 2-16 years, ≤4 hours monitoring

	Children with co-morbidities <2 years, ≤4 hours monitoring Children with co-morbidities 2-16 years, ≤4 hours monitoring Children (<17 years), >4-7 hours monitoring Typically developing children <2 years, >4-7 hours monitoring Typically developing children 2-16 years, >4-7 hours monitoring Children with co-morbidities <2 years, >4-7 hours monitoring Children with co-morbidities 2-16 years, >4-7 hours monitoring Children (<17 years), >7-10 hours monitoring Typically developing children <2 years, >7-10 hours monitoring Typically developing children 2-16 years, >7-10 hours monitoring Children with co-morbidities <2 years, >7-10 hours monitoring Children with co-morbidities 2-16 years, >7-10 hours monitoring
Selection process – duplicate screening / selection / analysis	Agreement should be reached between Guideline members who are working on the question. If no agreement can be reached, a decision should be made by the Guideline co-chairs. If there is still no decision, the matter should be brought to the Guideline group and a decision will be made by consensus
Data management (software)	RevMan5 — Meta-analysis data input. Evidence review/considered judgement. Storing Guideline text, tables, figures, etc. MetaDTA — Data meta-analyses Gradepro — Quality of evidence assessment / Recommendations
Information sources – databases and dates	MEDLINE, Embase, PubMED, Central Register of Controlled Trials and Cochrane Database of Systematic Reviews No date restrictions
Methods for assessing bias at outcome / study level	RevMan5 diagnostic accuracy full review template (based on QUADAS2) (follow instructions in '*BTS Guideline Process Handbook - Diagnostic Accuracy*')
Methods for quantitative analysis – combining studies and exploring (in)consistency	If 3 or more relevant studies: RevMan5 for forest plots, summary ROC plot MetaDTA to combine studies (pooled specificity, sensitivity, likelihood ratios, diagnostic odds ratio and confidence intervals) and calculate RevMan parameters for summary ROC plot (follow instructions in '*BTS Guideline Process Handbook - Diagnostic Accuracy*')

Meta-bias assessment – publication bias, selective reporting bias	GRADEpro Diagnostic accuracy quality of evidence assessment for each index test (follow instructions in '*BTS Guideline Process Handbook - Diagnostic Accuracy*')
Rationale / context – what is known	There is an absence of evidence in this area. There are studies that have reported minimum recording lengths of 4 hours but this has not been validated.