BTS Guideline for diagnosing and monitoring paediatric sleep disordered breathing

Online Appendix 8 Question 8 Evidence Review and Protocol

Q8 For children with suspected sleep disordered breathing, does home respiratory polygraphy, or home pulse oximetry provide the same clinical outcomes as inpatient cardiorespiratory sleep studies?

Contents

Question Evidence Review

Q8 For children with suspected sleep disordered breathing, does home respiratory polygraphy, or home pulse oximetry provide the same clinical outcomes as inpatient cardiorespiratory sleep studies?

Background

While inpatient polysomnography (PSG) remains the gold standard for diagnosing sleep disordered breathing in children, facilities for inpatient cardiorespiratory sleep studies (CRSS) and PSG in the UK are limited and overwhelmed by demand. Inpatient studies normally benefit from the overnight presence of a trained physiologist/nurse who can troubleshoot, and make adjustments, to ensure the maximum amount and quality of the data obtained. However, this is not the case for unattended studies in a child's home and home studies also tend to have fewer channels of physiological data for analysis. As families do not necessarily find it easy for their child to attend inpatient testing, this review investigates if home respiratory polygraphy, or home pulse oximetry provide the same clinical outcomes as inpatient CRSS.

Outcomes

Quality of life, need for repeat monitoring and requirement for surgical or medical intervention.

Evidence Review

The initial literature search identified 45 papers of which 14 were deemed relevant. These included six prospective longitudinal studies[1-6], six prospective cohort studies[7-12], one prospective cross sectional study[13] and one retrospective cohort study[14].

Quality of life

No studies directly reported on changes to quality of life when using home respiratory polygraphy or home pulse oximetry compared to inpatient CRSS for diagnosing sleep disordered breathing in children, but five studies reported on the acceptability and experience of home CRSS. A summary of the results is shown in Table 8a.

Table 8a: Patient/parent/carer acceptability and experience of home CRSS

		% patients/carers finding home CRSS acceptable (no. subjects)			
Study	**Comorbidities**	**Acceptable**	**'Very easy'**	**'Easy'**	**'Okay'**
Brockmann 2013[2]	None	100% (75/75)	-	-	-
Kingshott 2018*[11]	Down syndrome	67% (111/165)	-	22% (37/165)	45% (74/165)
Ikizoglu 2019[10]	Down syndrome	84% (16/19)	-	-	-
Bhattacharjee 2021[7]	Mixed†	71% (14/20)	-	-	-
Kingshott 2018*[11]	Mixed†	96% (43/45)	27% (12/45)	38% (17/45)	31% (14/45)
Mean ± SD		**84% ± 15%**			

* One publication included two study groups, which have both been included in the analyses

† Clinical cohort included children with and without comorbidities and a mix of different comorbidities

Overall, the majority of patients, parents and carers found home CRSS acceptable to use and more comfortable than inpatient sleep studies CRSS or PSG.

Need for repeat monitoring

Pulse oximetry

Two studies reported on the technical success of home pulse oximetry, with one study providing a comparison with inpatient PSG.[3,12] A summary of the results is shown in Table 8b. Neither study analysed the effect of age or the presence of comorbidities on the technical success of home oximetry or inpatient sleep studies.

Table 8b: Comparison of technical success of home oximetry against inpatient polysomnography for children with suspected sleep disordered breathing

Study	**% Acceptable recordings after first attempt** (no. patients) Home pulse oximetry	Inpatient PSG	*p*
Brunetti 2001*[3]	82% (28/34)	-	
Patel 2005[12]	95% (53/56)	62% (158/254)	<0.001
Mean ± SD	**89 ± 9** (%)	**62%**	

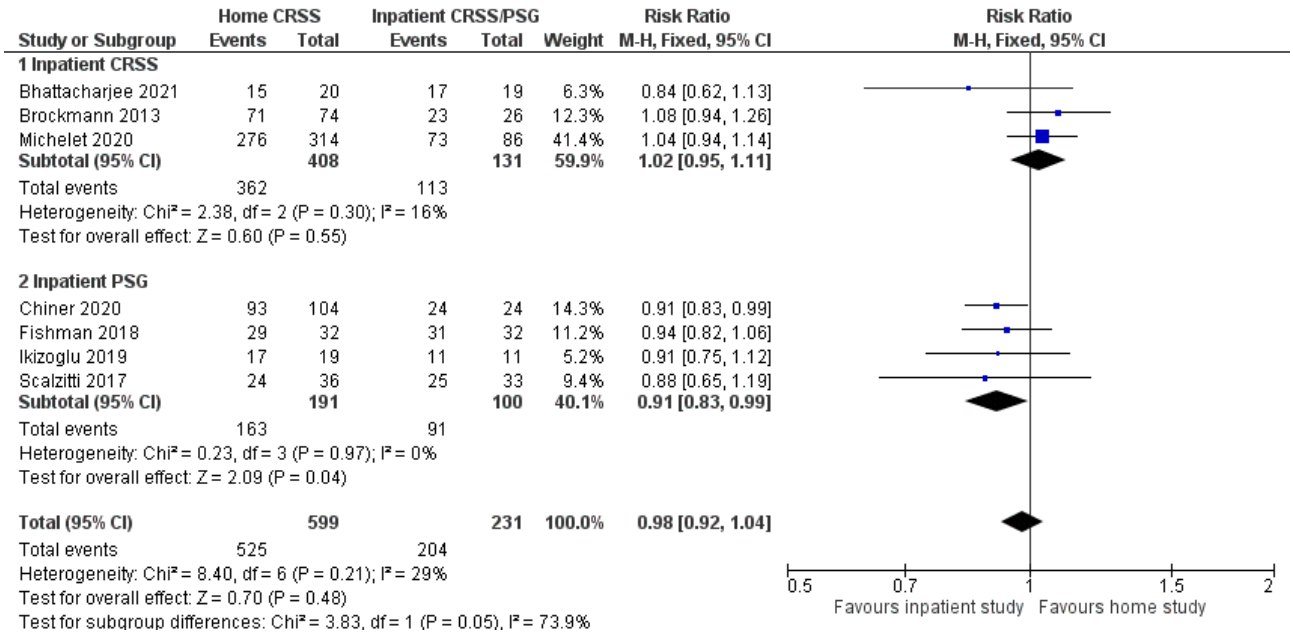
* Brunetti et al compared against inpatient oximetry, but data were not reported for the technical success of inpatient oximetry[3]

PSG – polysomnography

CRSS

Seven studies compared the technical success of home CRSS against inpatient CRSS or PSG, with four studies comparing the same group of patients[5,7,10,13] and the other three comparing separate patient groups[2,8,14]. Meta-analysis of all data showed no overall difference in the number of successful recordings after the first attempt, between home CRSS (865 per 1000 sleep studies (812 to 918)) and inpatient CRSS or PSG (883 per 1000 sleep studies) (Figure 8a).

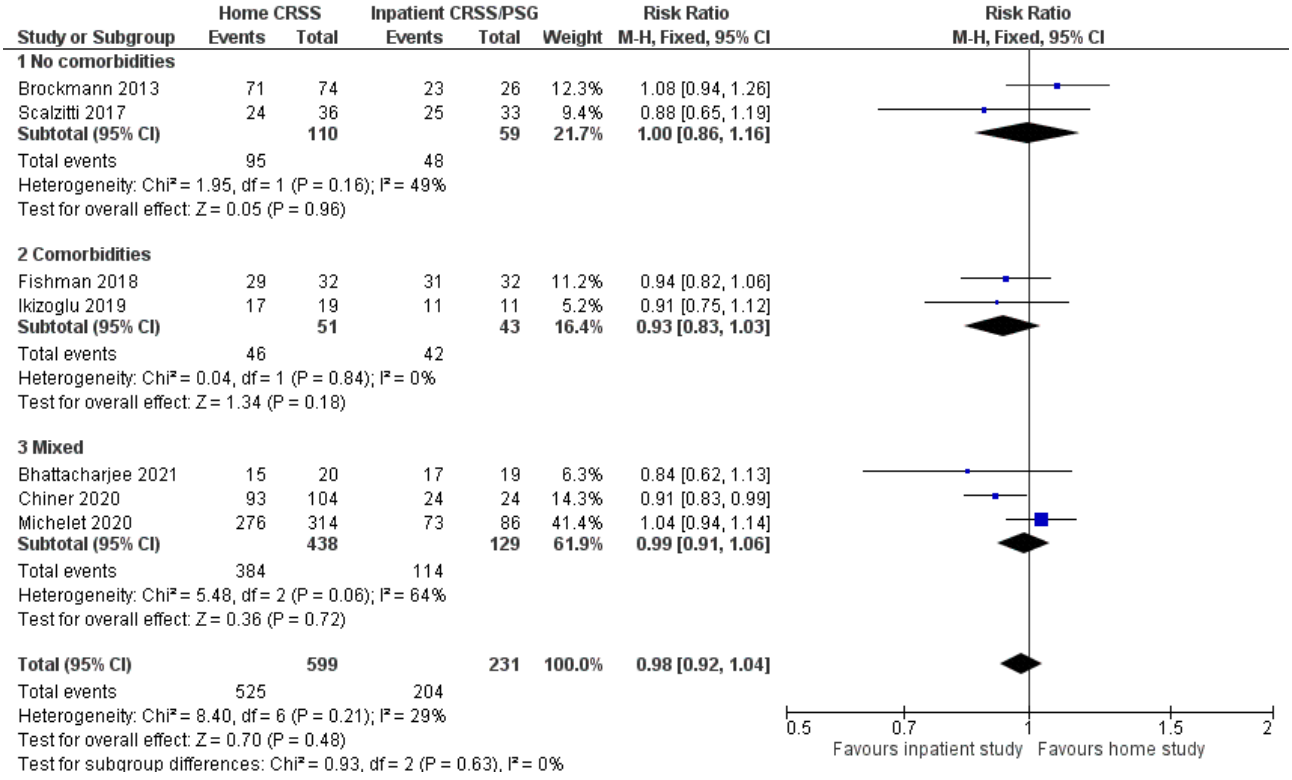
Figure 8a: Comparison of the technical success of home CRSS against inpatient CRSS or PSG for children with suspected sleep disordered breathing



Similarly, when focusing on home CRSS versus inpatient CRSS, subgroup analysis showed no overall difference in the technical success of a first recording of home CRSS (880 per 1000 sleep studies (819 to 957)) compared to inpatient CRSS (863 per 1000 sleep studies); and there was a marginal reduction in home CRSS success (828 per 1000 sleep studies (755 to 901)) when compared with inpatient PSG (910 per 1000 sleep studies) (Figure 8a).

A second subgroup analysis also compared the technical success of home CRSS versus inpatient CRSS or PSG in different patient groups (those with no comorbidities, those with comorbidities and 'mixed' groups of children with or without comorbidities) (Figure 8b).

Figure 8b: Subgroup analysis of the technical success of home CRSS against inpatient CRSS or PSG for children with and/or without comorbidities and suspected sleep disordered breathing



Despite the low study numbers, all patient groups showed similar technical success between home CRSS and inpatient CRSS or PSG (Table 8c).

Table 8c: Comparison of the technical success of home CRSS against inpatient CRSS or PSG for children with and/or without comorbidities and suspected sleep disordered breathing

	Successful sleep studies at first attempt per 1000	
Patient group	**Home CRSS**	**Inpatient CRSS/PSG**
No comorbidities	814 (700 to 944)	814
Comorbidities	908 (811 to 1000)	977
Mixed*	875 (804 to 937)	883

* Clinical cohort included children with and without comorbidities and a mix of different comorbidities

The study groups included children across differing age groups (0 to 19 years old), but sub-analyses of different age groups were not performed. One study that was included in the meta-analyses (Figure 8a and Figure 8b)[2] and one study that reported on the technical success of home CRSS alone[11] did investigate the association between age and technically unsuccessful studies, but both showed no significance (p=0.76 and p=0.95 respectively).

PSG

One study compared the technical success of home PSG versus inpatient PSG[9] reporting that 147/162 (91%) of unattended home PSGs and 5/5 (100%) of laboratory PSGs were technically successful. Information on the presence of comorbidities was not provided in this study.

Requirement for surgical or medical intervention

No studies compared the requirement for surgical or medical intervention, in children with SDB, following home pulse oximetry or home CRSS. Instead, eight studies reported on the diagnostic accuracy[1,4-6,10,13], diagnostic yield[3], diagnostic agreement[7] or respiratory disturbance index (RDI)[9] of home pulse oximetry[3,6], home CRSS[1,4,5,7,10,13] or home PSG[9] which may infer a need for medical intervention.

Pulse oximetry

Although two studies compared home pulse oximetry with inpatient PSG (reporting diagnostic yield[3] and diagnostic accuracy[6]), a detailed analysis of this topic is presented in *Q2 'For children with suspected sleep disordered breathing, what is the diagnostic accuracy of pulse oximetry and cardiorespiratory sleep studies?'* (online Supplementary Appendix 2). A summary of the pulse oximetry review findings from Question 2 (Table 2b) are shown in Table 8d below.

Table 8d: Diagnostic accuracies of pulse oximetry and cardiorespiratory sleep study for diagnosing sleep disordered breathing in children

Included data	No. datasets	Sensitivity [95% CI]	Specificity [95% CI]
Pulse oximetry (all)	15	0.82 [0.76, 0.87]	0.75 [0.60, 0.85]
Pulse oximetry (AHI ≥1)	6	0.81 [0.69, 0.89]	0.83 [0.58, 0.94]
Pulse oximetry (AHI ≥5)	5	0.81 [0.74, 0.87]	0.62 [0.43, 0.78]
Pulse oximetry (AHI ≥10)	3	0.95 [0.44, 1.00]	0.72 [0.31, 0.94]

CI – confidence intervals

CRSS

Five studies reported on the diagnostic accuracy of home CRSS for diagnosing SDB in children[1,4,5,10,13], but although all studies used PSG as a gold standard, two studies did not provide the necessary raw data for input into a meta-analysis[4,5]. The remaining four datasets were meta-analysed (Figure 8c and Figure 8d) and a summary of the results is shown in Table 8e.

Table 8e: Diagnostic accuracies of home CRSS for diagnosing sleep disordered breathing in children

Included data	No. of datasets	Sensitivity [95% CI]	Specificity [95% CI]
Home CRSS – all data	4	0.85 [0.55, 0.96]	0.71 [0.39, 0.90]
Home CRSS (AHI ≥1)	2	0.85 [0.35, 0.98]	0.41 [0.13, 0.76]
Home CRSS (AHI ≥3)	1	0.92 [0.75, 0.99]	0.83 [0.63, 0.95]
Home CRSS (AHI ≥5)	1	0.62 [0.32, 0.86]	0.87 [0.05, 0.54]

AHI – apnoea-hypopnea index; CI – confidence intervals; AHI ≥1 – includes AHI >1 data

The diagnostic accuracies of home CRSS for the two studies not included in the meta-analysis were also comparable (Table 8f).

Table 8f: Diagnostic accuracies of home CRSS for diagnosing sleep disordered breathing in children

Study	**PSG (O)AHI**	**Age** (years)	**Home CRSS** **Sensitivity**	**Specificity**
Jacob 1995	>1	2-12	1.00	0.62
Scalzitti 2017	≥1	2-17	0.70	0.43
Jacob 1995	>5	2-12	1.00	1.00

(O)AHI – (obstructive) apnoea-hypopnea index

Question 2 also reviewed the diagnostic accuracy of inpatient CRSS for diagnosing sleep disordered breathing in children and a summary of the results from Question 2, Table 2b is shown in Table 8g.

Table 8g: Diagnostic accuracies of inpatient cardiorespiratory sleep study for diagnosing sleep disordered breathing in children

Included data	**No. datasets**	**Sensitivity [95% CI]**	**Specificity [95% CI]**
CRSS (all)	6	0.77 [0.68, 0.84]	0.95 [0.85, 0.99]
CRSS (AHI ≥1)*	2	0.84 [0.76, 0.89]	0.81 [0.67, 0.90]
CRSS (AHI ≥5)	3	0.64 [0.53, 0.74]	0.97 [0.87, 0.99]

CI – confidence intervals; CRSS – cardiorespiratory sleep study

* Due to the lack of supporting evidence, one dataset with a cut-off value of AHI ≥1.5 was included in the CRSS (AHI ≥1) analysis

Despite the small study numbers for home and inpatient CRSS, the diagnostic accuracies were comparable. However, two studies comparing home CRSS apnoea-hypopnea index (AHI) measurements with inpatient PSG AHI measurements reported that home CRSS AHI measurements were often underestimated and investigated what the optimal cut-off home CRSS AHI values should be. A summary of the results is shown in Table 8h.

Table 8h: Diagnostic validity indexes for home CRSS versus inpatient PSG

Study	**PSG (O)AHI**	**Home CRSS (O)AHI**	**Age** (years)	**Home CRSS** **Sensitivity**	**Specificity**
Alonso-Alvarez 2015	≥1	≥3	2-14	0.73	0.90
	≥3	**≥4**	**2-14**	**0.92**	**0.83**
	≥5	≥6.7	2-14	0.82	0.93
Ikizoglu 2019	≥1	≥1	6-18	1.00	0.30
	≥1	**≥3**	**6-18**	**1.00**	**0.85**
	≥1	≥4.3	6-18	0.83	1.00

(O)AHI – (obstructive) apnoea-hypopnea index; CRSS – cardiorespiratory sleep study

For note, a further study comparing the accuracy of home or inpatient CRSS against inpatient PSG also noted an underestimation of AHI in 10% of home CRSS (2/20) and 5% of inpatient CRSS (1/19).[7]

One study reported the diagnostic accuracy of home CRSS and inpatient CRSS in children under six years of age and children between six and 18 (Table 8i) and a greater margin of error was reported in AHI values in the younger age group than the older age group (p = 0.00003).[5]

Table 8i: Diagnostic accuracy comparison of home CRSS and inpatient CRSS for diagnosing sleep disordered breathing in children of different age groups

Study	PSG (O)AHI	Age (years)	Home CRSS		Inpatient CRSS	
			Sensitivity	Specificity	Sensitivity	Specificity
Scalzitti 2017[5]	≥1	2-17	0.70	0.43	0.81	0.60
Scalzitti 2017[5]	≥1	2-5	0.75	0.50	1.00	0.67
Scalzitti 2017[5]	≥1	6-17	0.57	0.33	0.70	0.63

Comorbidities

All participants in the Fishman et al study had a comorbid diagnosis of neuromuscular disease[13] and those in the Ikizoglu et al study had Down syndrome[10]. A comparison of the sensitivity and specificity of home CRSS in those with and with comorbidities is summarised in Table 8j.

Table 8j: Comparison of the diagnostic accuracy of home cardiorespiratory sleep studies for diagnosing sleep disordered breathing in children with and without comorbidities

Comorbidities	PSG (O)AHI	No. studies	Age (years)	Home CRSS	
				Sensitivity	Specificity
None	≥1	3	2-17	0.70 – 1.00	0.43 – 0.90
NMD and Down Syndrome	>1	2	6-18	0.68 – 1.00	0.30 – 0.67
None	≥5	2	2-14	0.82 – 1.00	0.93 – 1.00
NMD and Down Syndrome	≥5*	2	6-18	0.62 – 0.83	0.87 – 1.00

* Includes one study with AHI > 4.3

NMD – neuromuscular disease

Overall, although these data did not directly report on the requirement for surgical or medical intervention, a positive diagnosis of SDB would direct clinical management.

PSG

One study compared home PSG to inpatient PSG and reported no statistical difference in respiratory disturbance index (RDI) between the two methods (p >0.13, n = 5), but the raw data for RDI were not provided.[9] Goodwin et al also did not report on the presence of comorbidities and did not investigate the effect of age on diagnosing SDB using home PSG.[9]

Evidence statements

Most parents, or carers of children with suspected sleep disordered breathing, with or without comorbidities, appear to find undergoing a home CRSS a positive experience (**Ungraded**)

The need for repeat monitoring when using home pulse oximetry (**Ungraded**), home CRSS (**Very low**), or home PSG (**Ungraded)** is comparable with inpatient CRSS or inpatient PSG

Based on very limited evidence, home CRSS appear to have a high sensitivity and moderate specificity for diagnosing sleep disordered breathing in children (**Very low**)

The diagnostic accuracy of home CRSS appears to be comparable with inpatient CRSS, but there may be an underestimation of AHI with home CRSS compared with inpatient PSG (**Ungraded**)

Recommendation

- Home cardiorespiratory sleep studies can be considered for diagnosing sleep disordered breathing in children without comorbidities where the patients and/or carers are deemed appropriate for implementing a home sleep study. If a test result is inconsistent with the clinical picture a repeat study should be offered and consideration should be given as to whether this should be undertaken as an inpatient (**Conditional** – by consensus)

Good practice point

- ✓ Home cardiorespiratory sleep studies can be also considered for children with comorbidities and pulse oximetry can be considered for children with, or without comorbidities if the patient and carer are deemed appropriate for home sleep studies
- ✓ Care should be taken in defining 'total sleep time' during home sleep studies as it may differ between centres e.g. some may use total recording time, while some may base it on sleep time documented in the overnight sleep diary
- ✓ If the data acquired during a home study is fragmented with frequent interruptions due to poor signal quality consideration should be given to repeating the study as an inpatient
- ✓ Parents who choose home monitoring should be supported with training in order to optimise data acquisition of sleep studies in the home environment. This training might involve patient leaflets, patient videos or videoconferencing calls with health professionals skilled in setting up sleep studies

Research recommendations

- Further research is needed into investigating if home cardiorespiratory sleep studies, or home pulse oximetry are as good as inpatient cardiorespiratory sleep studies for improving clinical outcomes in children with suspected sleep disordered breathing
- Research is needed into determining if there are specific age groups of children with suspected sleep disordered breathing, or groups of children with suspected sleep disordered breathing and defined comorbidities who are more, or less suitable for undergoing home sleep studies
- Research is needed into determining how much parental/carer technical advice, support and/or guidance is required to achieve a successful home sleep study for children with suspected sleep disordered breathing

Diagnostic accuracy meta-analyses

Diagnostic accuracy table contents and summary receiver operating characteristic (SROC) curve legend

Table contents

Pooled sensitivity [95% confidence intervals]

Pooled specificity [95% confidence intervals]

Likelihood ratio of a positive test result (LR+) [95% confidence intervals]

Likelihood ratio of a negative test result (LR-) [95% confidence intervals]

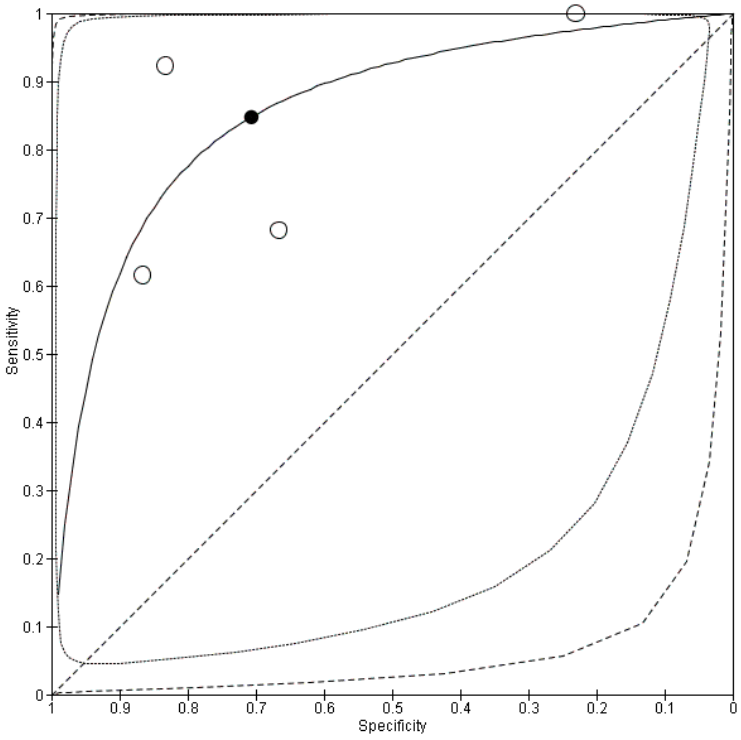
Diagnostic odds ratio (DOR, an indicator of the likelihood of a positive test result) [95% confidence intervals]

Summary receiver operating characteristic (SROC) curve legend

——	SROC
○	Study estimate
●	Summary point
·····	95% confidence region
- - -	95% prediction region

Figure 8c Home CRSS (all data)

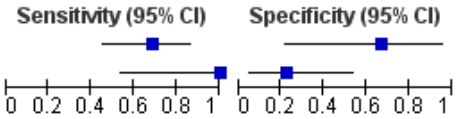
Study	TP	FP	FN	TN	Sensitivity (95% CI)	Specificity (95% CI)
Alonso-Alvarez 2015 (AHI3)	24	4	2	20	0.92 [0.75, 0.99]	0.83 [0.63, 0.95]
Fishman 2018 (AHI1)	15	2	7	4	0.68 [0.45, 0.86]	0.67 [0.22, 0.96]
Fishman 2018 (AHI5)	8	2	5	13	0.62 [0.32, 0.86]	0.87 [0.60, 0.98]
Ikizoglu 2019 (AHI1)	6	10	0	3	1.00 [0.54, 1.00]	0.23 [0.05, 0.54]



Pooled Sensitivity	0.848	[0.549, 0.962]
Pooled Specificity	0.707	[0.387, 0.902]
LR+	2.889	[1.202, 6.942]
LR-	0.216	[0.066, 0.705]
DOR	13.386	[2.804, 63.896]

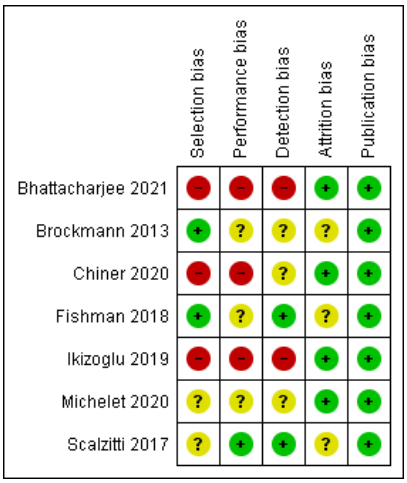
Figure 8d Home CRSS (AHI ≥1)

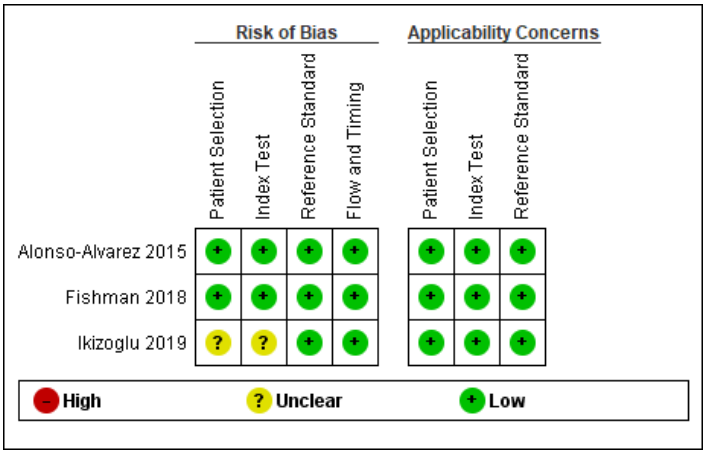
Study	TP	FP	FN	TN	Sensitivity (95% CI)	Specificity (95% CI)
Fishman 2018	15	2	7	4	0.68 [0.45, 0.86]	0.67 [0.22, 0.96]
Ikizoglu 2019	6	10	0	3	1.00 [0.54, 1.00]	0.23 [0.05, 0.54]



Pooled Sensitivity	0.848	[0.353, 0.983]
Pooled Specificity	0.413	[0.134, 0.762]
LR+	1.444	[0.801, 2.604]
LR-	0.368	[0.059, 2.286]
DOR	3.921	[0.419, 36.697]

Risk of bias summaries





GRADE analyses

Home CRSS versus inpatient CRSS or PSG

For children with suspected sleep disordered breathing, does home respiratory polygraphy, or home pulse oximetry provide the same clinical outcomes as inpatient cardiorespiratory sleep studies?

Population: Children (<17 years) with sleep disordered breathing

Intervention: Home CRSS

Comparator: Inpatient CRSS or PSG

Outcome	Number of participants (studies)	Relative effect (95% CI)	Anticipated absolute effects		Quality of the Evidence (GRADE)
			Home CRSS	Inpatient CRSS/PSG	
First attempt success – all*	830 (7 studies)	RR 0.98 (0.92 to 1.04)	**865 per 1000** (812 to 918)	**883 per 1000**	⨁◯◯◯ **VERY LOW** [a,b]
First attempt success – inpatient CRSS†	539 (3 studies)	RR 1.02 (0.95 to 1.11)	**880 per 1000** (819 to 957)	**863 per 1000**	⨁◯◯◯ **VERY LOW** [a,b]
First attempt success – inpatient PSG‡	291 (4 studies)	RR 0.91 (0.83 to 0.99)	**828 per 1000** (755 to 901)	**910 per 1000**	⨁◯◯◯ **VERY LOW** [a,b]
First attempt success (no comorbidities)	169 (2 studies)	RR 1.00 (0.86 to 1.16)	**814 per 1000** (700 to 944)	**814 per 1000**	⨁◯◯◯ **VERY LOW** [a,b]
First attempt success (with comorbidities)	94 (2 studies)	RR 0.93 (0.83 to 1.03)	**908 per 1000** (811 to 1000)	**977 per 1000**	⨁◯◯◯ **VERY LOW** [a,b]
First attempt success ('Mixed')	567 (3 studies)	RR 0.99 (0.91 to 1.06)	**875 per 1000** (804 to 937)	**884 per 1000**	⨁◯◯◯ **VERY LOW** [a,b]

CI: Confidence interval

Explanations

a. High risk of bias across studies
b. Some inconsistency and large confidence intervals

* Home CRSS versus inpatient CRSS/PSG

† Home CRSS versus inpatient CRSS

‡ Home CRSS versus inpatient PSG

Home CRSS (all data) – diagnostic accuracy

For children with suspected sleep disordered breathing, what is the diagnostic accuracy of home cardiorespiratory sleep studies?

Patient or population: Children (<17 years) with suspected sleep disordered breathing

New test: Home CRSS

Pooled sensitivity: 0.85 (95% CI: 0.55 to 0.96) | **Pooled specificity**: 0.71 (95% CI: 0.39 to 0.90)

Test result	Number of results per 1,000 patients tested (95% CI)	Number of participants (studies)	Certainty of the Evidence (GRADE)
	Prevalence 40%* Typically seen in		
True positives	**339** (220 to 385)	67 (4)	⨁◯◯◯ **VERY LOW** [a,b,c]
False negatives	**61** (15 to 180)		
True negatives	**424** (232 to 541)	58 (4)	⨁◯◯◯ **VERY LOW** [a,b,c]
False positives	**176** (59 to 368)		
	Prevalence 60%* Typically seen in		
True positives	**509** (329 to 577)	67 (4)	⨁◯◯◯ **VERY LOW** [a,b,c]
False negatives	**91** (23 to 271)		
True negatives	**283** (155 to 361)	58 (4)	⨁◯◯◯ **VERY LOW** [a,b,c]
False positives	**117** (39 to 245)		
	Prevalence 80%* Typically seen in		
True positives	**678** (439 to 770)	67 (4)	⨁◯◯◯ **VERY LOW** [a,b,c]
False negatives	**122** (30 to 361)		
True negatives	**141** (77 to 180)	58 (4)	⨁◯◯◯ **VERY LOW** [a,b,c]
False positives	**59** (20 to 123)		

CI: Confidence interval

Explanations

a. Some risk of bias across the studies
b. Some inconsistency across the studies, particularly for specificity
c. Some inconsistency across the studies with moderate confidence intervals

* 40% typically seen in district general hospitals; 60% typically seen in general respiratory clinics; 80% typically seen in sleep clinics

Home CRSS (AHI ≥1) – diagnostic accuracy

For children with suspected sleep disordered breathing, what is the diagnostic accuracy of home cardiorespiratory sleep studies?

Patient or population: Children (<17 years) with suspected sleep disordered breathing

New test: Home CRSS (AHI ≥1)

Pooled sensitivity: 0.85 (95% CI: 0.35 to 0.98) | **Pooled specificity**: 0.41 (95% CI: 0.13 to 0.76)

Test result	Number of results per 1,000 patients tested (95% CI)	Number of participants (studies)	Certainty of the Evidence (GRADE)
	Prevalence 40%* Typically seen in		
True positives	**339** (141 to 393)	28 (2)	⨁◯◯◯ **VERY LOW** [a,b,c]
False negatives	**61** (7 to 259)		
True negatives	**248** (80 to 457)	19 (2)	⨁◯◯◯ **VERY LOW** [a,b,c]
False positives	**352** (143 to 520)		
	Prevalence 60%* Typically seen in		
True positives	**509** (212 to 590)	28 (2)	⨁◯◯◯ **VERY LOW** [a,b,c]
False negatives	**91** (10 to 388)		
True negatives	**165** (54 to 305)	19 (2)	⨁◯◯◯ **VERY LOW** [a,b,c]
False positives	**235** (95 to 346)		
	Prevalence 80%* Typically seen in		
True positives	**678** (282 to 786)	28 (2)	⨁◯◯◯ **VERY LOW** [a,b,c]
False negatives	**122** (14 to 518)		
True negatives	**83** (27 to 152)	19 (2)	⨁◯◯◯ **VERY LOW** [a,b,c]
False positives	**117** (48 to 173)		

CI: Confidence interval

Explanations

a. Some risk of bias across the studies
b. Some inconsistency across the studies, particularly for specificity
c. Moderate confidence intervals for sensitivities and specificities

* 40% typically seen in district general hospitals; 60% typically seen in general respiratory clinics; 80% typically seen in sleep clinics

Recommendation Table

Question Details

POPULATION:	Children (<17 years) with suspected sleep disordered breathing
INTERVENTION:	Home cardiorespiratory sleep study (CRSS)
COMPARATOR:	Inpatient CRSS or polysomnography (PSG)
OUTCOME:	Need for repeat monitoring

Need for repeat monitoring

SUMMARY OF JUDGEMENTS

	JUDGEMENT						
PROBLEM	No	Probably no	Probably yes	**Yes**		Varies	Don't know
DESIRABLE EFFECTS	Trivial	Small	**Moderate**	Large		Varies	Don't know
UNDESIRABLE EFFECTS	Large	Moderate	**Small**	Trivial		Varies	Don't know
CERTAINTY OF EVIDENCE	**Very low**	Low	Moderate	High			No included studies
BALANCE OF EFFECTS	Favours the comparison	Probably favours the comparison	**Does not favour the intervention or the comparison**	Probably favours the intervention	Favours the intervention	Varies	Don't know

TYPE OF RECOMMENDATION

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	**Conditional recommendation for the intervention**	Strong recommendation for the intervention
☐	☐	☐	☒	☐

CONCLUSIONS

Recommendation

Home cardiorespiratory sleep studies can be considered for diagnosing sleep disordered breathing in children without comorbidities where the patients and/or carers are deemed appropriate for implementing a home sleep study

Justification

Most parents, or carers of children with suspected sleep disordered breathing, with or without comorbidities, appear to find undergoing a home CRSS a positive experience (Ungraded)

The need for repeat monitoring when using home CRSS is comparable with inpatient CRSS or inpatient PSG (Very low)

Subgroup considerations

Despite the small number of datasets, home CRSS appears to be comparable with inpatient CRSS and inpatient PSG. Home CRSS is also comparable with inpatient CRSS or inpatient PSG in children with comorbidities or without co-morbidities

Research priorities

Further research is needed into investigating if home cardiorespiratory sleep studies, or home pulse oximetry are as good as inpatient cardiorespiratory sleep studies for improving clinical outcomes in children with suspected sleep disordered breathing

Research is needed into determining if there are specific age groups of children with suspected sleep disordered breathing, or groups of children with suspected sleep disordered breathing and defined comorbidities who are more, or less suitable for undergoing home sleep studies

Research is needed into determining how much parental/carer technical advice, support and/or guidance is required to achieve a successful home sleep study for children with suspected sleep disordered breathing

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Question Protocol

Field	Content
Review Question	For children with suspected sleep disordered breathing, does home respiratory polygraphy, or home pulse oximetry provide the same clinical outcomes as inpatient CRSS?
Type of review question	Intervention review
Objective of the review	Facilities for inpatient CRSS and PSG in the UK are limited and overwhelmed by demand. Inpatient studies normally benefit from the overnight presence of a trained physiologist/nurse who can troubleshoot, and make adjustments, to ensure the maximum amount and quality of the data obtained. This is not the case for unattended studies in the child's home. Home studies also tend to have fewer channels of physiological data for analysis. Families do not necessarily find it easy for their child to attend for inpatient testing. • Can multichannel studies be done in the home? • What is the quality of data obtained? • What proportion of studies produce data capable of analysis? • Are there subgroups of patients in whom home studies are more successful than others? • How acceptable are these studies to families?
Eligibility criteria – population / disease / condition / issue / domain	Children (<17 years) with suspected sleep disordered breathing
Eligibility criteria – intervention(s)	Home respiratory polygraphy
Eligibility criteria – comparators(s)	Inpatient CRSS
Outcomes and prioritisation	Quality of life Need for repeat monitoring Requirement for surgical or medical intervention
Eligibility criteria – study design	Randomised controlled trials Observational studies Case series Superiority trials

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	Typically developing children <2 years Typically developing children 2-16 years Children with co-morbidities <2 years Children with co-morbidities 2-16 years Children with neuro-disabilities <2 years Children with neuro-disabilities 2-16 years	
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 Gradeprofiler Gradepro	Pairwise meta-analyses Evidence review/considered judgement. Storing Guideline text, tables, figures, etc. 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 restriction	
Methods for assessing bias at outcome / study level	RevMan5 intervention review template and NICE risk of bias checklist (follow instructions in '*BTS Guideline Process Handbook – Intervention Review'*)	
Methods for quantitative analysis – combining studies and exploring (in)consistency	If 3 or more relevant studies: RevMan5 for meta-analysis, heterogeneity testing and forest plots (follow instructions in '*BTS Guideline Process Handbook – Intervention Review'*)	
Meta-bias assessment – publication bias, selective reporting bias	GRADEprofiler (follow instructions in '*BTS Guideline Process Handbook – Intervention Review'*)	Intervention review quality of evidence assessment for each outcome

Rationale / context – what is known	There are studies describing the use of home monitoring but ongoing controversy as to whether the data quality is sufficient for accurate diagnosis. There are concerns as to how many studies may require to be repeated.