

**Abstract Title:** Validity of Non-Contact technology for Diagnosis of Sleep-Disordered Breathing: A Systematic Review & Meta-Analysis

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**BACKGROUND** Obstructive Sleep Apnea (OSA) is a known perioperative risk factor impacting many body systems including cardiac, respiratory and neurological functions<sup>1</sup>. OSA is highly prevalent yet significantly under-diagnosed with roughly 82-93% of surgical patients with OSA not having a formal diagnosis<sup>2,3,4</sup>. This can lead to adverse patient outcomes in a perioperative setting. Polysomnography (PSG, gold standard test) is costly, and resource intensive<sup>5,6,7</sup>. Pre-operative OSA diagnosis is currently utilized by way of screening questionnaires (high sensitivity, but poor specificity), and more accurate screening tools are needed that are portable, and can provide non-contact assessment of OSA severity, more objectively. The objective of this systematic review and meta-analysis is to evaluate the utility of non-contact methods used in the diagnosis of obstructive sleep apnea, and their diagnostic accuracy as compared with the gold standard PSG.

**METHODS** A systematic search of MEDLINE, EMBASE CENTRAL, and Cochrane Central Register of Controlled Trials (CENTRAL) was conducted from database inception to March 2021. Both published and unpublished trials were searched. Inclusion criteria were observational cohort and randomized controlled trials of adult patients undergoing OSA diagnosis concurrently with both PSG and a non-contact method. Only English language literature was searched. Two independent reviewers completed the article screening, data extraction, and summarization. Conflicts were resolved by consulting the senior author. Diagnostic properties and association between non-contact methods (index test) and OSA diagnosis using apnea-hypopnea index (AHI) determined by a PSG (reference standard) were evaluated. Summary receiver operative curves were generated wherever applicable. Risk of bias assessment was done using the QUADAS tool.

**RESULTS** Our search yielded 4929 studies, of which 23 cross-sectional cohort studies were included in the meta-analysis. Overall, a total sample size of 1232 participants were included, with the vast majority being patients referred to sleep clinics (79%). The average age of participants was 50.7 years, female sex (35%), average BMI of 30.25, average AHI of 23.54 events per hour, and pooled OSA prevalence of 69%. The pooled sensitivity and specificity of non-contact methods in diagnosing OSA (AHI > 5 events per hour) was found to be 0.846 (95% CI 0.771-0.900) and 0.829 (95% CI 0.764-0.878). Overall heterogeneity was low ( $I^2$  15.39%). The majority of the devices used 1) video analysis, 2) sound analysis, 3) biomotion sensors. Risk of bias assessment showed an overall low risk of bias for reference standard, flow and timing and low-moderate risk for index test, applicability concerns, and patient selection.

**CONCLUSION** The results of this study show that contactless methods have the potential to revolutionize the field of sleep medicine through a convenient, affordable, and accessible approach in diagnosing sleep disordered breathing. This is highly relevant in a perioperative setting where patients can be readily assessed for OSA prior to their elective surgery, leading to safer planning and management of their anesthetic care. Further subgroup analysis of the various types of technology including video, sound, and biomotion sensor is warranted.

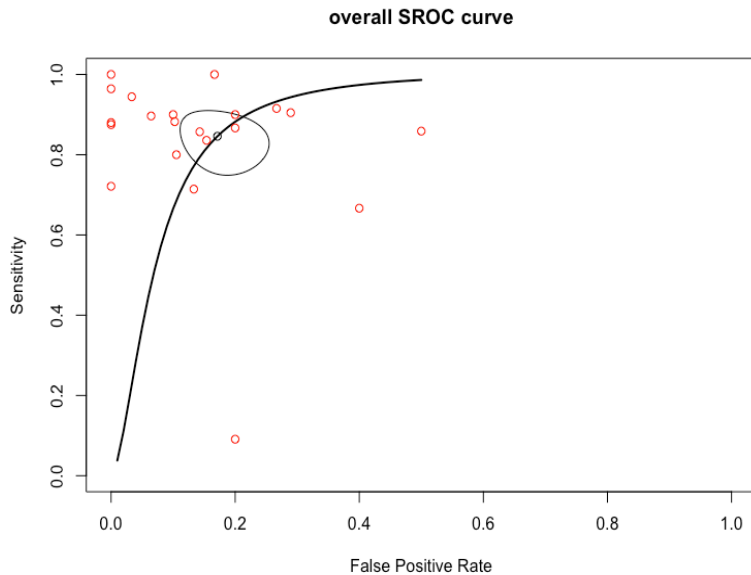


Table. Pooled results of overall sensitivity and specificity

<b>Sensitivity</b>	<b>0.846 (0.771,0.9)</b>
<b>Specificity</b>	<b>0.829 (0.764,0.878)</b>
<b>Prevalence</b>	<b>0.688 (0.583,0.776)</b>
<b>AUC</b>	<b>0.898</b>
<b>Higgins' I<sup>2</sup></b>	<b>15.39%</b>

Figure. Summary receiver operative curve (SROC) for OSA diagnosis (AHI>5 events per hour), and contactless methods used.

### References

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