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Publication Date

2021

Data Availability

The data associated with this publication are not available for this reason: N/A

Utilization of processed EEG's to evaluate depth of sedation in Critically Ill patients:

A Systematic Literature Review

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Introduction

- Maintaining accurate measurements of sedation in the ICU are essential for patient comfort, safety, and clinical outcomes
- Current clinical sedation scales, such as the Richmond Agitation-Sedation Scale (RASS) suffer from subjectivity and poor inter-rater reliability
- Processed EEGs (pEEGs) may provide a more objective and reliable alternative to assess depth of sedation in ICU patients
- In this study, we conducted a systematic literature review on 3 major pEEGs (Masimo Sedline, Bispectral Index, and Narcotrend) and their correlation with gold standard clinical sedation scales



Figure 1. Masimo Sedline

Figure 2. Medtronic BIS

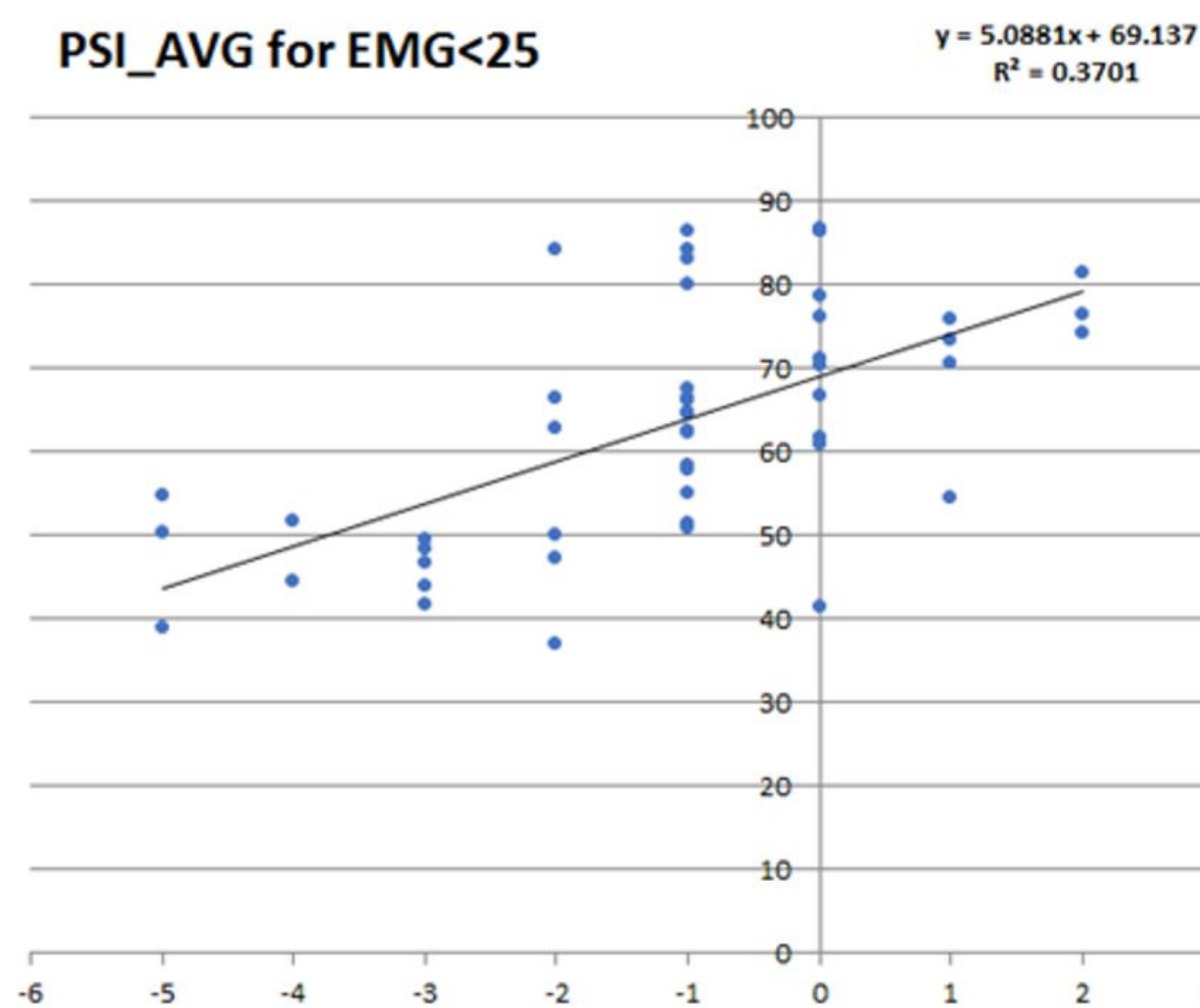


Figure 3. RASS vs PSI

Methods

- Population: Adults 18+, Critically ill patients (MICU, SICU) requiring sedation in ICU setting; utilization of 3 major pEEGs
- To determine relevant citations, we consulted Bruce T. Abbots (UC Davis Health Sciences Librarian, Blaisdell Medical Library) to optimize search patterns and conducted a computerized search in PubMed, Embase, Cochrane Database from 1996-2020 with key terms related to pEEGs and ICU sedation
- Studies were imported into Covidence (www.covidence.org), an online systematic literature review tool) and were screened independently by two reviewers for relevance by abstract and full text, and a consensus was made for any conflicts

Methods

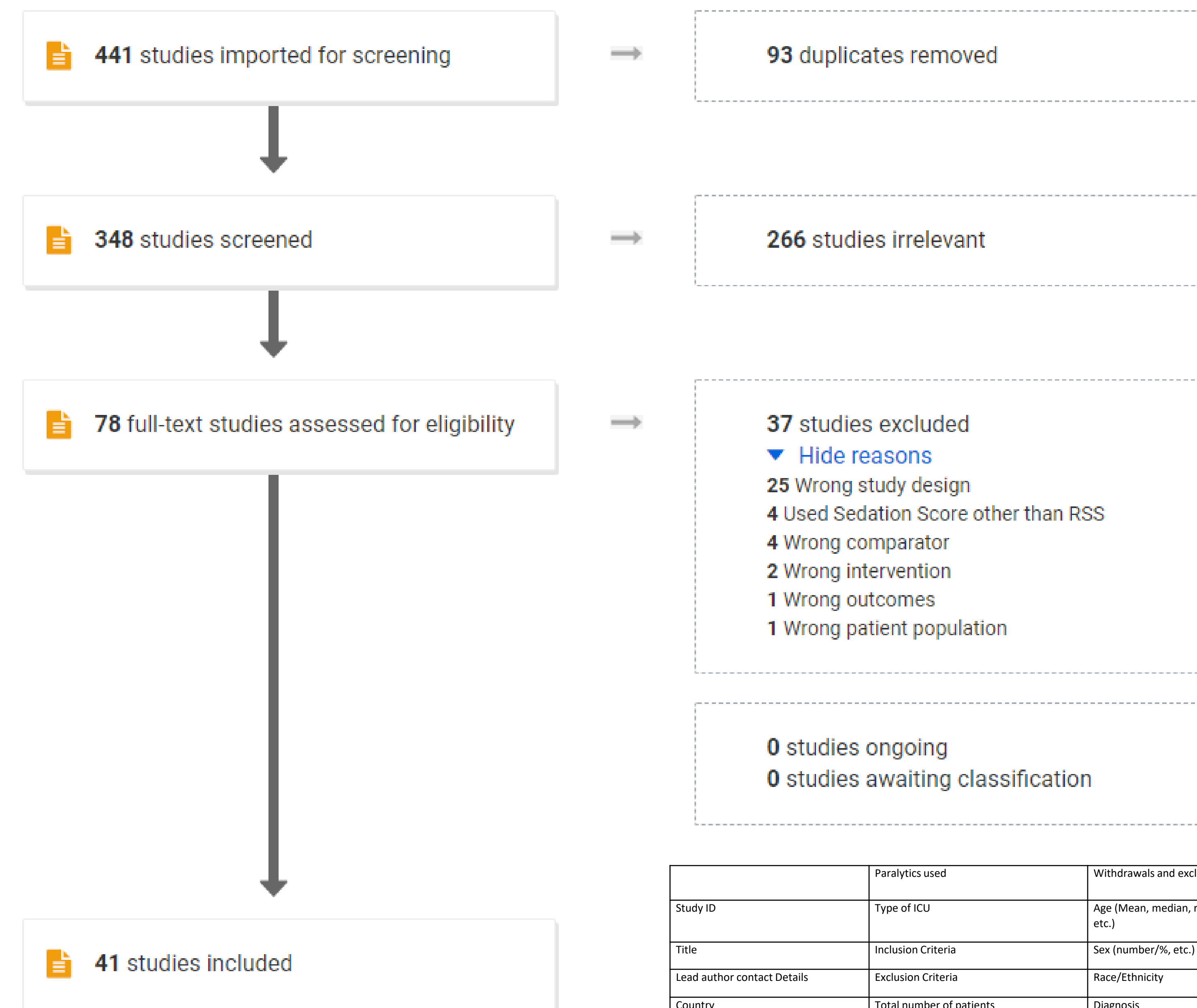


Figure 4. Review Flow Diagram

- Relevant studies underwent data extraction and quality assessment generated by the reviewers

Study ID	Paralytics used	Withdrawals and exclusions
Title	Type of ICU	Age (Mean, median, range, etc.)
Lead author contact details	Inclusion Criteria	Sex (number/%, etc.)
Country	Exclusion Criteria	Race/Ethnicity
Age of Study	Total number of patients	Diagnosis
Study Design	Baseline imbalances	Comorbidities
Start Date	Withdrawals and exclusions	Additional study interventions
End Date	Age (Mean, median, range, etc.)	Method of recruitment
Study funding resources	Sex (number/%, etc.)	Processed EEG used
Possible conflicts of interest	Race/Ethnicity	Total Duration of EEG
Total Study duration	Diagnosis	Clinical Assessment comparison
Severity of illness scoring system	Comorbidities	Correlation Coefficient
Possible conflicts of interest	Paralytics used	Withdrawals and exclusions
Total Study duration	Type of ICU	Age (Mean, median, range, etc.)
Severity of illness scoring system	Inclusion Criteria	Sex (number/%, etc.)
Sedatives Used (name, dosage, #patients)	Exclusion Criteria	Race/Ethnicity
	Total number of patients	Diagnosis
	Baseline imbalances	Comorbidities

Figure 5. Data Extraction Template

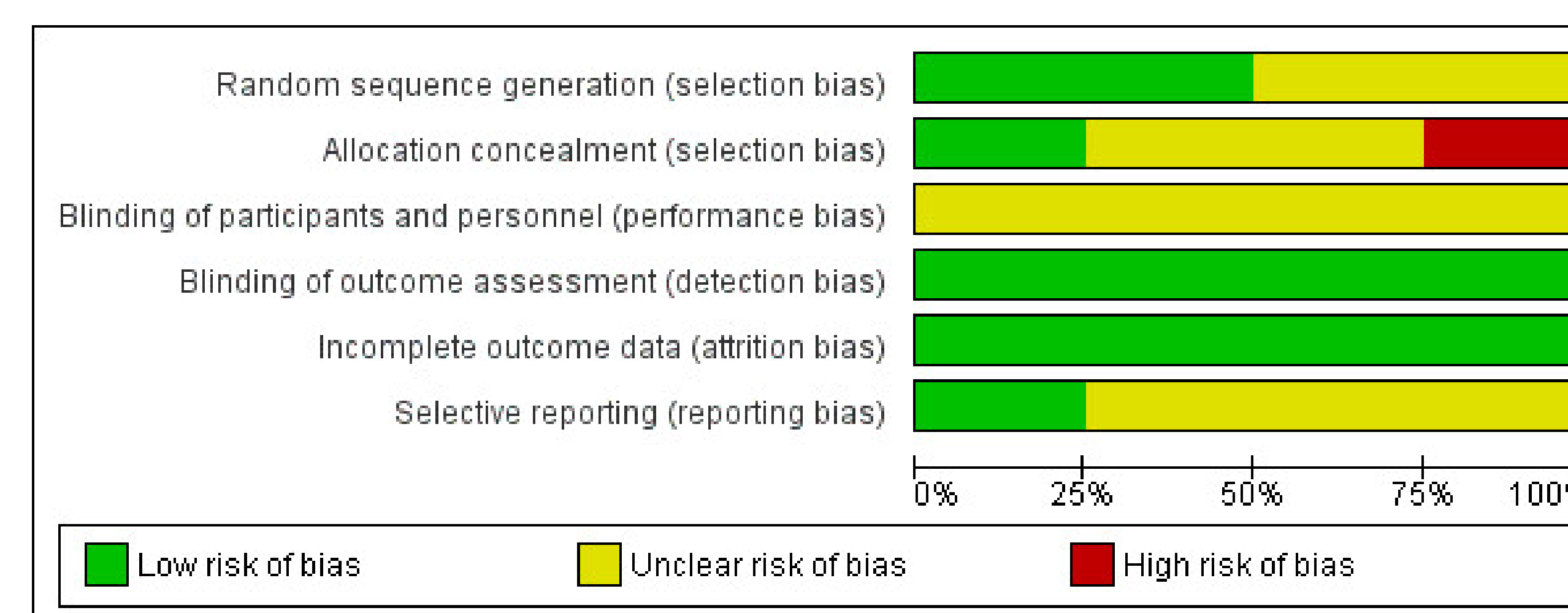


Figure 6. Quality Assessment Example Shetty et al. 2018

Summary

- Here we have demonstrated a method for how a clinical question like ours may be addressed using a systematic literature review
- From our preliminary screenings, we have discovered that there are few studies that evaluate Masimo Sedline and Narcotrend in relationship to the gold standard clinical sedation scores in comparison to Medtronic's BIS
- Out of 441 studies initially imported by our search algorithm, 41 studies were included and are currently undergoing data extraction and quality assessment

Further Study

- Future work will focus on continued data extraction and quality assessment to help us understand their comparison to the gold standard clinical sedation scores and evaluate their clinical outcomes

References

- Khalid S Khan MB MSc Regina Kunz MD MSc, Jos Kleijnen MD PhD, Gerd Antes PhD Five steps to conducting a systematic review. J R Soc Med 2003;96:118-121
- Shetty RM, Bellini A, Wijayatilake DS, Hamilton MA, Jain R, Karanth S, Namachivayam A. BIS monitoring versus clinical assessment for sedation in mechanically ventilated adults in the intensive care unit and its impact on clinical outcomes and resource utilization. Cochrane Database Syst Rev. 2018 Feb 21;2(2):CD011240