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EFFECTIVENESS OF AWAKE PRONE POSITIONING IN NON-INTUBATED ADULTS WITH ACUTE HYPOXEMIC RESPIRATORY FAILURE AN UPDATED SYSTEMATIC REVIEW AND QUANTITATIVE DESCRIPTIVE SYNTHESIS

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ABSTRACT

Awake prone positioning is a low-cost intervention intended to improve ventilation-perfusion matching and oxygenation while avoiding invasive ventilation. Its effect depends on patient selection, timing, duration, respiratory-support modality, adherence, tolerance, and rapid recognition of failure. Objective: To evaluate the effectiveness, safety, and implementation implications of the specified noninvasive respiratory-support strategy in adults with acute hypoxemic respiratory failure. Methods: This PRISMA 2020-aligned updated systematic-review draft maps PubMed-indexed and publisher-verified evidence available through 29 August 2026. Comparative trials, evidence syntheses, and relevant Saudi/GCC implementation studies were extracted. Heterogeneous populations, comparators, and outcome definitions precluded a new pooled meta-analysis; published estimates are displayed descriptively. Results: Eight core reports were mapped. The 2025 IPD meta-analysis of 14 RCTs and 3,019 patients reported lower intubation (OR 0.70, 95% CI 0.59–0.84), lower hospital mortality (OR 0.77, 0.63–0.95), and improved survival without intubation (OR 1.42, 1.20–1.68). Benefit appeared greater with early and sustained positioning, while adherence and tolerance limited several trials. Saudi studies mainly demonstrated feasibility and short-term physiologic improvement. Conclusion: Awake prone positioning probably reduces intubation in selected adults with COVID-19-related acute hypoxemic respiratory failure, and the most recent IPD evidence suggests a modest mortality benefit.

KEYWORDS: Acute Hypoxemic Respiratory Failure; Respiratory Therapy; Noninvasive Respiratory Support; Intubation; Mortality; Patient Safety; Systematic Review.

1. INTRODUCTION

Awake prone positioning is a low-cost intervention intended to improve ventilation-perfusion matching and oxygenation while avoiding invasive ventilation. Its effect depends on patient selection, timing, duration, respiratory-support modality, adherence, tolerance, and rapid recognition of failure.

Respiratory therapists are central to patient selection, device setup, interface optimization, oxygen titration, monitoring, adherence support, secretion management, escalation, and prevention of delayed intubation. Evidence must therefore be interpreted as both a treatment-effect question and an implementation-and-monitoring question.

2. METHODS

2.1 Design and Eligibility

The review was structured according to PRISMA 2020. Eligible reports involved adults with acute hypoxemic respiratory failure and evaluated the intervention/comparator in the title. Outcomes included intubation, mortality, treatment escalation, oxygenation, tolerance, adverse events, and length of stay. Pediatric-only studies and studies without evaluable clinical or physiologic outcomes were

excluded.

2.2 Search and Appraisal

PubMed concepts combined acute hypoxemic respiratory failure, the intervention terms, intubation, mortality, randomized trial, systematic review, Saudi Arabia, and Gulf/GCC terms. Randomized trials should be appraised with RoB 2 and non-randomized studies with ROBINS-I. Current certainty labels are provisional until duplicate independent assessment.

2.3 Synthesis

Study characteristics and results were summarized narratively. Published meta-analytic estimates were retained with their original effect measures and confidence intervals. They were not recombined because doing so would mix different review populations, comparators, and estimands.

3. RESULTS

3.1 Evidence Profile

The evidence map includes 8 reports. Figure 1 describes the mix of evidence syntheses, randomized/controlled studies, and observational or implementation evidence.

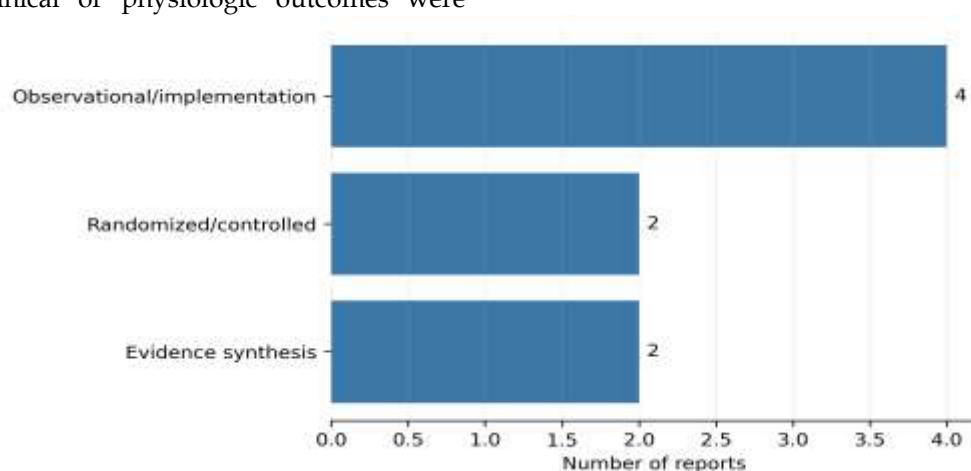


Figure 1: Distribution of Mapped Evidence by Study Type.

3.2 Study Characteristics

Table:

Study	Setting	Design	Sample	Key finding
Ehrmann et al. (2021)	International	Multinational meta-trial/RCT	1,126	Reduced treatment failure, driven mainly by lower intubation; benefit concentrated in patients on HFNC.
Alhazzani et al. (2022)	International	Randomized clinical trial	400	No statistically significant reduction in intubation in this individual trial; adherence/duration were important limitations.
Weatherald et al. (2023)	International	Systematic review/meta-analysis of RCTs	17 trials; 2,931 patients	Intubation 24.2% versus 29.8%; RR 0.83 (95% CI 0.73–0.94). Mortality was not clearly reduced.

Althunayyan et al. (2022)	Saudi Arabia	Prospective protocol evaluation	Single-center cohort	Immediate improvement in oxygenation, respiratory rate, and respiratory distress after proning; uncontrolled design limits causal inference.
Al Duhailib et al. (2023)	Saudi Arabia	Prospective observational	Single-center cohort	Reported feasibility and physiologic response; selection and confounding remain important.
Lehingue et al. (2022)	France	Randomized crossover physiologic trial	Physiologic sample	Proning improved physiologic measures in selected patients; not powered for intubation or mortality.
Luo et al. (2025)	International	Individual participant data meta-analysis	14 RCTs; 3,019 patients	Survival without intubation OR 1.42 (1.20–1.68); intubation OR 0.70 (0.59–0.84); mortality OR 0.77 (0.63–0.95).
Luo et al. (2025)	International	IPDdose-response analysis	3,019 patients	Duration ≥ 10 h/day during the first 3 days was associated with improved survival without intubation (OR 1.85, 1.37–2.49); exploratory association.

3.3 Clinical and Implementation Findings

Across randomized evidence, the most reproducible benefit was a reduction in intubation. The updated IPD analysis also suggested lower hospital mortality. Duration appeared clinically important: at least 10 hours/day during the first 3 days was associated with improved survival without intubation, although this dose-response comparison was exploratory. Saudi studies showed immediate

physiologic improvement and feasibility but were not designed to establish mortality benefit.

3.4 Selected Quantitative Estimates

Figure 2 displays selected published relative effects and their 95% confidence intervals. The figure does not contain a newly pooled estimate and should not be interpreted as one meta-analysis.

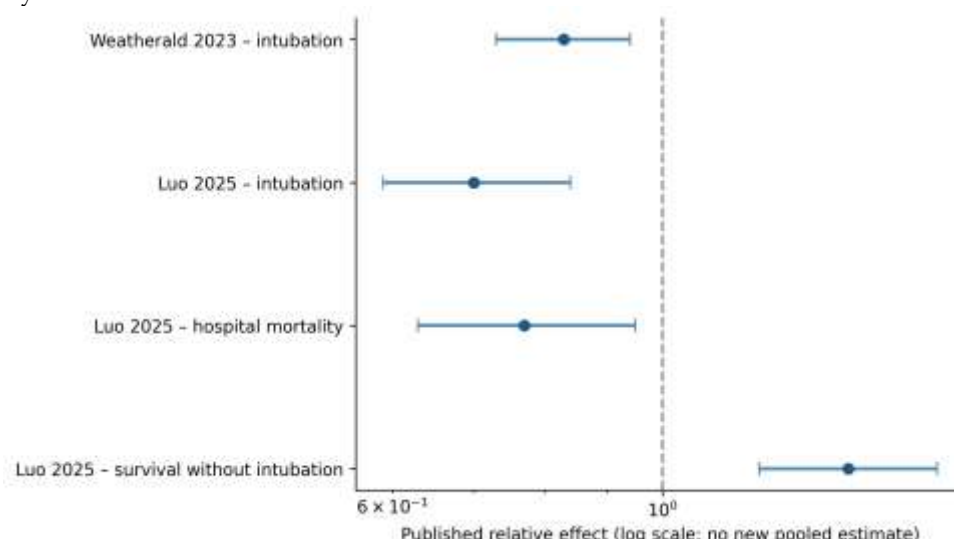


Figure 2: Selected Published Effect Estimates; No New Pooled Estimate.

3.5 Certainty and Risk of Bias

Certainty varied from moderate to low. Key limitations included open-label interventions, variable adherence or crossover, heterogeneous interfaces and oxygen targets, evolving co-interventions, single-center regional cohorts, inconsistent escalation criteria, and limited power for mortality. Physiologic improvement should not be equated with prevention of intubation or death.

4. DISCUSSION

Awake prone positioning probably reduces intubation in selected adults with COVID-19-related

acute hypoxemic respiratory failure, and the most recent IPD evidence suggests a modest mortality benefit. The intervention is not a substitute for escalation; sustained adherence and continuous monitoring are essential

Saudi and GCC evidence is useful for operational context but remains insufficient for definitive comparative effectiveness. Multicenter regional studies should standardize eligibility, initiation thresholds, monitoring intervals, failure criteria, escalation pathways, adverse-event reporting, and patient-centered outcomes.

4.1 Practice Implications

Use a written eligibility and contraindication checklist.

Initiate early when the patient is cooperative and hemodynamically stable.

Support cumulative daily duration while rotating lateral and semi-prone positions for tolerance.

Monitor SpO₂, respiratory rate, work of breathing, mental status, hemodynamics, and oxygen requirement.

Define failure criteria and avoid delaying intubation.

4.2 Strengths and Limitations

This draft integrates recent international and

Saudi/GCC evidence and provides an auditable workbook. It does not claim completed duplicate screening, full database coverage, final risk-of-bias adjudication, or original pooled meta-analysis. Those steps are mandatory before journal submission.

5. CONCLUSION

Awake prone positioning probably reduces intubation in selected adults with COVID-19-related acute hypoxemic respiratory failure, and the most recent IPD evidence suggests a modest mortality benefit. Clinical use should be protocolized, closely monitored, and coupled with timely escalation when predefined failure criteria are met.

Ethics Approval: Not applicable because the review uses published, aggregated evidence and does not recruit participants or use identifiable patient-level data. PRISMA 2020 is a reporting guideline, not an approving ethics body.

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Data availability: The evidence-extraction workbook accompanies this draft; final search exports, screening records, extraction forms, and risk-of-bias assessments should be retained.

Saudi evidence demonstrates both need and opportunity. Prospective studies have found unintended discrepancies in more than two-fifths of selected admissions, with omissions consistently the most frequent type. However, implementation studies often lack concurrent controls and focus on discrepancies detected rather than prevented harm. An updated synthesis is therefore useful for designing services at King Abdulaziz Medical City and other regional hospitals.

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