BONUS DIGITAL CONTENT

Medicine by the Numbers

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Awake Prone Positioning for Nonintubated Patients With COVID-19 and Acute Hypoxemic Respiratory Failure

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Details for This Review

Study Population: 1,985 patients from 10 randomized controlled trials (RCTs) who had acute hypoxemic respiratory failure due to COVID-19

Efficacy End Points: Primary outcome was cumulative intubation risk; secondary outcomes included all-cause mortality, the need for escalating respiratory support, need for transfer to the intensive care unit (ICU), and duration of ICU and hospital stay

Harm End Points: Cardiac arrest, vomiting, and central or arterial line dislodgement

Narrative: Prone positioning may improve oxygenation in intubated patients with acute respiratory distress syndrome.[1] Some studies have suggested that prone positioning may prevent the need for intubation in patients with acute hypoxemic respiratory failure who are awake and not intubated.[2,3] Physiologically, prone positioning improves lung aeration through recruitment of dorsal alveoli, which reduces blood shunting in areas with collapsed or nonaerated alveoli.[4] This practice in patients who are intubated and sedated requires multiple staff members to change the patient's position several times per day and may result in disconnection or dislodgement of central or arterial lines.

This systematic review included 10 RCTs (1,985 patients) and 19 observational studies (2,669 patients) comparing prone with supine positioning for awake, nonintubated patients older than 18 years who were hospitalized with COVID-19 pneumonia.[5] For our evidence-based review, we focused only on RCT data because of the greater potential for confounding in observational studies. Procedures for awake prone positioning varied, with targeted daily duration ranging from one hour to 16 hours, or as long as patients could tolerate. Participants were recruited from ICUs in two RCTs, general wards in six RCTs, both settings in one RCT, and multiple settings (including the ICU, intermediate care unit, emergency department, and general ward) in one RCT. Seven trials included patients with lower levels of respiratory support (i.e., conventional oxygen therapy), two studies included patients requiring advanced support (i.e., high-flow nasal cannula or noninvasive positive pressure ventilation), and one study included all types of respiratory support.

The primary outcome of the systematic review was the cumulative intubation risk. Secondary outcomes included all-cause mortality; the need for escalating respiratory support, defined as the progression to a higher level of oxygen or respiratory support (room air to conventional oxygen therapy to high-flow nasal cannula to noninvasive ventilation to invasive ventilation); the need for transfer to the ICU; and length of ICU and hospital stay. Safety outcomes included cardiac arrest, vomiting, and central or arterial line dislodgement.

Awake prone positioning was associated with reduced risk of intubation (relative risk = 0.84; 95% CI, 0.72 to 0.97; absolute risk reduction = 4.9%; number needed to treat = 21). However, awake prone positioning did not reduce mortality, the need for escalation of respiratory support, the need for ICU admission, or length of ICU or hospital stay. Seven RCTs reported adverse events, with six reporting mild complications, including vomiting, back pain, bloating sensation, skin breakdown, general discomfort, and central or arterial line dislodgement. One RCT showed no complications.

THE NUMBERS

Benefits	Harms
1 in 21 was helped (intubation avoided)	Not available
4.9% reduction in rate of intubation	

The NNT Group Rating System

Green	Benefits greater than harms
Yellow	Unclear benefits
Red	No benefits
Black	Harms greater than benefits

Caveats: This systematic review had several limitations. Although results suggest awake prone positioning reduces the need for intubation in patients requiring advanced respiratory support or in the ICU setting, it did not reduce the need for intubation in patients requiring conventional oxygen or in the general ward setting. The lack of effectiveness in these settings may be due to several confounders, including higher patient to nurse ratios, less intensive monitoring, lower disease severity, and lower adherence to awake prone positioning in the general ward. Patient adherence to awake prone positioning and the duration of prone positioning varied significantly (and were infrequently reported) in the included trials, even in the ICU setting. Several trials were terminated early, which can lead to an overestimation of the beneficial effects of an intervention. All included RCTs evaluated mortality as a secondary outcome and therefore were not sufficiently powered to fully evaluate this patient-centered outcome. The follow-up period was short, with most studies reporting in-hospital or 28-day mortality. Positions other than prone and supine (e.g., lateral decubitus) were not evaluated.

Conclusion: The evidence suggests that awake prone positioning is safe and may reduce the risk of respiratory deterioration (i.e., need for intubation) in certain patients with COVID-19. We have assigned a color rating of green (benefits greater than harms) for the use of awake prone positioning in patients with COVID-19 and acute hypoxemic respiratory failure. Larger RCTs are needed to assess how this practice affects mortality. Further data are also needed to better evaluate the duration of prone positioning, different positions, and adverse events.

This series is coordinated by Christopher W. Bunt, MD, *AFP* assistant medical editor, and the NNT Group.

A collection of Medicine by the Numbers published in *AFP* is available at https://www.aafp.org/afp/mbtn.

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References

1. Papazian L, Aubron C, Brochard L, et al. Formal guidelines: management of acute respiratory distress syndrome. *Ann Intensive Care*. 2019;9(1):69.
2. Scaravilli V, Grasselli G, Castagna L, et al. Prone positioning improves oxygenation in spontaneously breathing nonintubated patients with hypoxemic acute respiratory failure: a retrospective study. *J Crit Care*. 2015;30(6):1390-1394.
3. Ding L, Wang L, Ma W, et al. Efficacy and safety of early prone positioning combined with HFNC or NIV in moderate to severe ARDS: a multi-center prospective cohort study. *Crit Care*. 2020;24(1):28.
4. Raoof S, Nava S, Carpati C, et al. High-flow, noninvasive ventilation and awake (nonintubation) proning in patients with coronavirus disease 2019 with respiratory failure. *Chest*. 2020;158(5):1992-2002.
5. Li J, Luo J, Pavlov I, et al.; Awake Prone Positioning Meta-Analysis Group. Awake prone positioning for non-intubated patients with COVID-19-related acute hypoxaemic respiratory failure: a systematic review and meta-analysis. *Lancet Respir Med*. 2022:S2213-2600(22)00043-1. ■