



Implementing an Awake Prone Protocol for COVID-19 Patients with Moderate Hypoxia in the Emergency Department

ORIGINAL PROJECT

JONATHAN NOVER 

MICHAEL OLSHANSKY 

SOL FUERTEZ

TIMOTHY IVERS

BERNADETTE SPRINGER

FRANCELIA THOMAS

EILEEN BROWN-MIGHTY

LAURA GREENBERG

KIMBERLY SOUFFRONT



*Author affiliations can be found in the back matter of this article

ABSTRACT

Background: New York City emergency departments (EDs) faced a sudden influx of critically ill patients during the initial wave of COVID-19, leading to a shortage of resources to care for patients experiencing hypoxia. This study describes the development and implementation of an awake prone protocol in which conscious patients with suspected or confirmed COVID-19 moderate hypoxia were assisted to a prone position to improve oxygenation.

Methods: This one-week project took place in a single New York City ED. An interdisciplinary team of nursing and medical leadership reviewed the literature on the safety and effectiveness of awake prone and developed a treatment protocol and seven-member interdisciplinary prone team. Oxygenation (SpO₂), heart rate (HR), and respiration rate (RR) were recorded at baseline and 10-minutes post-prone.

Results: Thirty patients were included. Mean age was 60.8 and a majority were male (n = 25; 83%). Significant differences between pre- and post-prone measures were found for SpO₂ (p < 0.000), HR (p < 0.028), and RR (p < 0.025) after 10 minutes of awake prone.

Conclusion: Awake prone is a promising technique for improving outcomes in patients with respiratory distress and can be implemented effectively in an ED setting.

CORRESPONDING AUTHOR:

Jonathan Nover

Mount Sinai Queens, US

Jonathan.Nover@mountsinai.org

KEYWORDS:

Nursing; Awake; Prone; Prone; Positioning; ARDS; COVID; COVID-19; Hypoxia; Intubation

TO CITE THIS ARTICLE:

Nover, J., Olshansky, M., Fuertez, S., Ivers, T., Springer, B., Thomas, F., Brown-Mighty, E., Greenberg, L., & Souffront, K. (2023). Implementing an Awake Prone Protocol for COVID-19 Patients with Moderate Hypoxia in the Emergency Department. *Practical Implementation of Nursing Science*, 2(1), pp. 8–12. DOI: <https://doi.org/10.29024/pins.35>

INTRODUCTION

As a locus of international travel, New York City was among the earliest and most impacted regions when severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) emerged as a global health crisis (Centers for Disease Control and Prevention, 2023). A rapid surge of cases and a shortage of healthcare resources in the emergency department (ED) led to unprecedented challenges in managing the outbreak, requiring ED clinicians to think creatively about how to care for the influx of critically ill patients using approaches that were effective, accessible, and affordable (Dubosh et al., 2021). One such approach was awake proning, a technique that involves placing conscious patients with poor oxygenation in a prone position, which has shown promising results in improving oxygenation in patients with respiratory distress (Ferrando et al., 2020).

Awake proning is often used in patients with respiratory distress, including those with acute respiratory distress syndrome (ARDS) and chronic obstructive pulmonary disease (Gad, 2021; Guérin et al., 2013). The technique has been shown to improve oxygenation, decrease the need for intubation and mechanical ventilation, and improve outcomes in critically ill patients (Guérin et al., 2013). Given the high demand for ventilators and limited resources in New York City, awake proning was an attractive option to improve respiratory function and avoid intubation, thereby preserving intensive care unit beds for the most critically ill patients. This paper describes the steps our ED took to rapidly develop, implement, and evaluate an awake proning protocol during the peak of the first local wave of COVID-19.

METHODS

SETTING

This project took place during the first local wave of COVID-19 in a single urban academic emergency department located in Queens, New York. The ED has an annual volume of approximately 70,000 patients and serves a diverse patient population with respect to race, ethnicity, age, and income. The Icahn School of Medicine at Mount Sinai Institutional Review Board retroactively reviewed this project and issued an exempt determination (Protocol 20-00693).

AWAKE PRONING PROTOCOL

Literature review and team development

An interdisciplinary team of nursing and medical leadership first reviewed the literature on the safety and effectiveness of awake proning in patients with ARDS, which concluded that this technique can improve outcomes when closely monitored by clinical teams. We developed a 7-member Awake Proning Team consisting of 2 ED registered nurses (RNs), 3 operating room RNs, and 2 ED physician assistants, with an average of 2, 12, and 3 years of experience, respectively. The team received training on awake proning technique from senior ED leadership in medicine and nursing. In the event of an adverse outcome, such as vital sign deterioration, the Awake Proning Team was instructed to follow standard escalation protocols, which included an overhead announcement for a clinical upgrade to alert the primary ED physician and registered nurse to present to the bedside immediately.

Inclusion and exclusion criteria

Patients were eligible for awake proning if they had moderate hypoxia and confirmed or suspected COVID-19 (Table 1). Patients were excluded if they were: (1) unable to follow staff instructions, delirious, or confused; (2) using non-invasive positive pressure ventilation (i.e., BiPAP (bilevel positive airway pressure) or CPAP (continuous positive airway pressure)); (3) pregnant in the second or third trimester; or (4) unable to independently change position.

MODERATE HYPOXIA (AT LEAST ONE OF THE FOLLOWING CRITERIA)	COVID-19 (AT LEAST ONE OF THE FOLLOWING CRITERIA)
SpO ₂ ≥ 84%	Laboratory confirmation of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)
Use of supplemental oxygen by 6L nasal cannula or 15L nonrebreather mask	Shortness of breath or chest x-ray with ground glass opacity
Mild to moderate dyspnea without use of supplemental oxygen	

Table 1 Operational definitions for study inclusion criteria (Suthar et al., 2022).

Implementation and evaluation

An initial implementation and 7-day evaluation period took place from April 7 through April 14, 2020, between the hours of 12 AM and 8 PM. Each day, two members (any combination) of the Awake Proning Team screened ED patients for eligibility in the electronic health record. Any patient who met criteria was approached by at least two members of the Awake Proning Team. The process, purpose, and known risks and benefits of awake proning were described to each patient verbally and using a visual illustration. Patients who agreed to awake proning were assigned a unique identifier to facilitate de-identified collection of demographic data (age and gender) and therapeutic response. The Awake Proning Team then followed a four-step process:

Step 1. Gather equipment, including a portable pulse oximeter machine, a nasal cannula, a nonrebreather mask, a portable oxygen tank, a pillow, and a watch or timer.

Step 2. Obtain initial set of vital signs, including peripheral oxygen saturation (SpO₂), heart rate (HR; beats per minute), and respiration rate (RR; respirations per minute).

Step 3. Instruct and supervise the patient to place himself/herself in the prone position, offering a pillow for added comfort and support.

Step 4. Reassess vital signs after 10 minutes.

DATA ANALYSIS

Data were analyzed using Statistical Package for the Social Sciences (SPSS), version 28 (IBM Corp., 2021). Descriptive statistics for demographic variables and primary outcomes are presented in percentages or means and standard deviation. Bivariate analyses were conducted using paired *t* tests to test for significant differences between pre- and post-test measures. We performed a post-hoc power analysis, which determined that a sample size of 37 for HR and a sample size of 26 for RR would achieve a statistical power of 0.81.

RESULTS

Thirty patients were included in the analysis. Mean age was 60.8 (standard deviation [SD] 13.6) and a majority were male (*n* = 25; 83%). Significant differences between pre- and post-proning measures were found for SpO₂ (92% [SD 0.04] to 96% [SD 0.05]; *p* < 0.000); HR (90.8 [SD 6.3] to 87.3 [SD 17.5]; *p* < 0.028), and RR (23.3 [SD 6.3] to 21.5 [SD 3.7]; *p* < 0.025). No participants experienced an adverse event.

DISCUSSION

At a time of unprecedented strain in the New York City healthcare system, our team implemented an awake proning protocol for patients with moderate hypoxia and COVID-19 infection, which resulted in improved SpO₂, HR, and RR measures at 10-minutes post-proning. We developed this protocol at a time when little was known about the effectiveness of awake proning for COVID-19 infection and moderate hypoxia, therefore our intervention was based upon the best available data supporting awake proning in ARDS. Several international, multi-center randomized controlled trials published after the initiation of our project documented the safety, cost-effectiveness, and

clinical effectiveness of awake proning at reducing risk for intubation and mortality for patients with acute hypoxia and COVID-19 infection (Cardona et al., 2021; Ehrmann et al., 2021; Li et al., 2022). Data suggest that awake proning may be particularly useful for patients who are awaiting transfer to the intensive care unit, or who are not yet intubated but may require supplemental oxygen. While our study did not evaluate need for intubation following awake proning, Caputo et al. found that awake proning in the ED is associated with improved oxygenation and reduced the need for mechanical ventilation among patients with COVID-19 and ARDS. However, these findings were limited to patients who were middle-aged (Caputo et al., 2020).

Our findings must be interpreted in light of limitations, which include short duration, single-center location, missing data, and lack of a control group. Although patients with a confirmed or presumed COVID-19 diagnosis were included in this study, we did not record or assess differences in outcomes between these groups. Furthermore, feasibility data (number of participants screened, approached, and accepted) were not recorded. While most patients immediately improved peripheral oxygen saturation in the prone position, the effect on mortality and the need for intubation was not assessed. Despite these limitations, our data add to the body of literature demonstrating that awake proning may be beneficial in improving short-term peripheral oxygen saturation in patients who are moderately hypoxic and infected with COVID-19.

The adoption of an awake proning protocol in emergency nursing practice has far-reaching implications. Nursing education about this practice is crucial for (1) ensuring safe and effective awake proning technique, (2) understanding indications and selection criteria for awake proning, and (3) understanding potential benefits, limitations, and complications of awake proning. These complications may include, but are not limited to, skin breakdown and pressure injuries, although the likelihood of such occurrences may be rare if proning is brief, as evidenced by our study. Furthermore, aspiration and airway obstruction are risks that require careful monitoring. Finally, the implementation of an awake proning protocol in emergency nursing practice requires collaboration and communication among interdisciplinary teams, including nursing and medical leadership, emergency providers (e.g., physicians, physician assistants, and nurse practitioners), and clinical nurses. While our proning team did not include respiratory therapists or other allied health professionals, future teams may benefit from including their expertise. By understanding and implementing an awake proning protocol in partnership with interdisciplinary teams, emergency nurses can contribute to improved outcomes for patients with COVID-19 and moderate hypoxia.

COMPETING INTERESTS

The authors have no competing interests to declare.

AUTHOR AFFILIATIONS

Jonathan Nover  orcid.org/0000-0002-6923-381X
Mount Sinai Queens, US

Michael Olshansky  orcid.org/0000-0001-5962-7551
Mount Sinai Queens, US

Sol Fuertez
Mount Sinai Queens, US

Timothy Ivers
Mount Sinai Queens, US

Bernadette Springer
Mount Sinai Queens, US

Francelia Thomas
Mount Sinai Queens, US

Eileen Brown-Mighty
Mount Sinai Queens, US

Kimberly Souffront

Associate Director, Center for Nursing Research and Innovation, Mount Sinai Health System, US; Assistant Professor, Department of Emergency Medicine, Icahn School of Medicine at Mount Sinai Hospital, US

REFERENCES

- Caputo, N. D., Strayer, R. J., & Levitan, R. (2020). Early Self-Prone in Awake, Non-intubated Patients in the Emergency Department: A Single ED's Experience During the COVID-19 Pandemic. *Academic Emergency Medicine*, 27(5), 375–378. DOI: <https://doi.org/10.1111/acem.13994>
- Cardona, S., Downing, J., Alfasasi, R., Bzhilyanskaya, V., Milzman, D., Rehan, M., Schwartz, B., Yardi, I., Yazdanpanah, F., & Tran, Q. K. (2021). Intubation rate of patients with hypoxia due to COVID-19 treated with awake prone: A meta-analysis. *The American Journal of Emergency Medicine*, 43, 88–96. DOI: <https://doi.org/10.1016/j.ajem.2021.01.058>
- Centers for Disease Control and Prevention. (2023). *CDC Covid Data tracker*. Centers for Disease Control and Prevention. <https://covid.cdc.gov/covid-data-tracker/>
- Dubosh, N. M., Wong, M. L., Grossestreuer, A. V., Loo, Y. K., Sanchez, L. D., Chiu, D., Leventhal, E. L., Ilg, A., & Donnino, M. W. (2021). Early, awake prone in emergency department patients with COVID-19. *The American journal of emergency medicine*, 46, 640–645. DOI: <https://doi.org/10.1016/j.ajem.2020.11.074>
- Ehrmann, S., Li, J., Ibarra-Estrada, M., Perez, Y., Pavlov, I., McNicholas, B., Roca, O., Mirza, S., Vines, D., Garcia-Salcido, R., Aguirre-Avalos, G., Trump, M. W., Nay, M. A., Dellamonica, J., Nseir, S., Mogri, I., Cosgrave, D., Jayaraman, D., Masclans, J. R., Laffey, J. G., & Tavernier, E. (2021). Awake prone positioning for COVID-19 acute hypoxaemic respiratory failure: A randomised, controlled, multinational, open-label meta-trial. *The Lancet. Respiratory medicine*, 9(12), 1387–1395. DOI: [https://doi.org/10.1016/S2213-2600\(21\)00356-8](https://doi.org/10.1016/S2213-2600(21)00356-8)
- Ferrando, C., Mellado-Artigas, R., Gea, A., Arruti, E., Aldecoa, C., Adalia, R., Ramasco, F., Monedero, P., Maseda, E., Tamayo, G., Hernández-Sanz, M. L., Mercadal, J., Martín-Grande, A., Kacmarek, R. M., Villar, J., & Suárez-Sipmann, F. (2020). Awake prone positioning does not reduce the risk of intubation in COVID-19 treated with high-flow nasal oxygen therapy: A multicenter, adjusted cohort study. *Critical Care (London, England)*, 24(1), 597. DOI: <https://doi.org/10.1186/s13054-020-03314-6>
- Gad, G. S. (2021). Awake prone positioning versus noninvasive ventilation for COVID-19 patients with acute hypoxic respiratory failure. *Egyptian Journal of Anaesthesia*, 37(1), 85–90. DOI: <https://doi.org/10.1080/011101849.2021.1889944>
- Guérin, C., Reignier, J., Richard, J.-C., Beuret, P., Gacouin, A., Boulain, T., Mercier, E., Badet, M., Mercat, A., Baudin, O., Clavel, M., Chatellier, D., Jaber, S., Rosselli, S., Mancebo, J., Sirodot, M., Hilbert, G., Bengler, C., Richecoeur, J., Gaïnnier, M., Bayle, F., Bourdin, G., Leray, V., Girard, R., Baboi, L., & Ayzac, L. (2013). Prone Positioning in Severe Acute Respiratory Distress Syndrome. *New England Journal of Medicine*, 368(23), 2159–2168. DOI: <https://doi.org/10.1056/NEJMoa1214103>
- IBM Corp. (2021). *IBM SPSS Statistics for Windows*, Version 28.0. Armonk, NY: IBM Corp.
- Li, J., Luo, J., Pavlov, I., Perez, Y., Tan, W., Roca, O., Tavernier, E., Kharat, A., McNicholas, B., Ibarra-Estrada, M., Vines, D. L., Bosch, N. A., Rampon, G., Simpson, S. Q., Walkey, A. J., Fralick, M., Verma, A., Razak, F., Harris, T., Laffey, J. G., Guerin, C., & Ehrmann, S. (2022). Awake prone positioning for non-intubated patients with COVID-19-related acute hypoxaemic respiratory failure: A systematic review and meta-analysis. *The Lancet. Respiratory Medicine*, 10(6), 573–583. DOI: [https://doi.org/10.1016/S2213-2600\(22\)00043-1](https://doi.org/10.1016/S2213-2600(22)00043-1)
- Suthar, A. B., Schubert, S., Garon, J., Couture, A., Brown, A. M., & Charania, S. (2022). Coronavirus Disease Case Definitions, Diagnostic Testing Criteria, and Surveillance in 25 Countries with Highest Reported Case Counts. *Emerging Infectious Diseases*, 28(1), 148–156. DOI: <https://doi.org/10.3201/eid2801.211082>

TO CITE THIS ARTICLE:

Nover, J., Olshansky, M., Fuertez, S., Ivers, T., Springer, B., Thomas, F., Brown-Mighty, E., Greenberg, L., & Souffront, K. (2023). Implementing an Awake Prone Protocol for COVID-19 Patients with Moderate Hypoxia in the Emergency Department. *Practical Implementation of Nursing Science*, 2(1), pp. 8–12. DOI: <https://doi.org/10.29024/pins.35>

Submitted: 17 June 2022

Accepted: 21 April 2023

Published: 03 May 2023

COPYRIGHT:

© 2023 The Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC-BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. See <http://creativecommons.org/licenses/by/4.0/>.

Practical Implementation of Nursing Science is a peer-reviewed open access journal published by Levy Library Press.