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PRONE POSITIONING OF PATIENTS WITH CORONAVIRUS DISEASE 2019 WHO ARE NONINTUBATED IN HYPOXIC RESPIRATORY DISTRESS: SINGLE-SITE RETROSPECTIVE HEALTH RECORDS REVIEW

Authors: Christine Wendt, MSN, RN, CEN, TCRN, Kristi Mobus, BSPH, NREMT, Dan Weiner, MD, FACEP, Barnet Eskin, MD, PhD, and John R. Allegra, MD, PhD, Morristown, NJ

Contribution to Emergency Nursing Practice

- The practice of prone positioning of patients in adult respiratory distress syndrome who are intubated has been practiced since the 1970s with documented positive clinical outcomes.
- The main finding of this article is a significant improvement in oxygen saturation during prone positioning of patients with coronavirus disease 2019 in hypoxic respiratory distress who are awake, alert, and nonintubated in the emergency department.
- Recommendations for translating the findings of this article into clinical practice include emergency nurse-initiated prone positioning guidelines for patients with coronavirus disease 2019 who are awake, alert, and nonintubated in the emergency department are easily implemented with positive patient impact.

Abstract

Introduction: In March and April 2020 of the coronavirus disease 2019 pandemic, site clinical practice guidelines were

implemented for prone positioning of patients with suspected coronavirus disease 2019 in hypoxic respiratory distress who are awake, alert, and spontaneously breathing. The purpose of this pandemic disaster practice improvement project was to measure changes in pulse oximetry associated with prone positioning of patients with coronavirus disease 2019 infection in adult acute respiratory distress or adult respiratory distress syndrome, who are awake, alert, spontaneously breathing, and nonintubated.

Methods: A retrospective chart review of patients who were coronavirus disease 2019 positive in the emergency department from March 30, 2020 to April 30, 2020 was conducted for patients with a room air pulse oximetry <90% and a prone position pulse oximetry \leq 94% who tolerated prone positioning for at least 30 minutes. The primary outcome was the change in pulse oximetry associated with prone positioning, measured on room air, with supplemental oxygen, and approximately 30 minutes after initiating prone positioning. Median and mean differences were compared with the Wilcoxon signed-rank test and paired *t*-test.

Results: Of the 440 patients with coronavirus disease 2019, 31 met inclusion criteria. Median pulse oximetry increased as 83% (interquartile range, 75%-86%) on room air, 90%

Christine Wendt is a Clinical Specialist, *Member ENA Northern New Jersey Chapter*, Morristown Medical Center, Morristown, NJ. **ORCID identifier:** <https://orcid.org/0000-002-7045-2366>.

Kristi Mobus is an ED Data Coordinator, Morristown Medical Center, Morristown, NJ.

Dan Wiener is Chairman Emergency Medicine, Morristown Medical Center, Morristown, NJ.

Barnet Eskin is an Emergency Medicine Physician, Morristown Medical Center, Morristown, NJ.

John R. Allegra is an Emergency Medicine Physician, Morristown Medical Center, Morristown, NJ.

For correspondence, write: Christine Wendt, MSN, RN, CEN, TCRN, Morristown Medical Center, 100 Madison Avenue, Morristown, NJ 07960; E-mail: Christine.wendt@atlantichhealth.org.

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(interquartile range, 89%-93%) with supplemental oxygen, and 96% (interquartile range, 94%-98%) with prone positioning ($z = -4.48$, $P < .001$). A total of 45% ($n = 14$) were intubated during their hospital stay, and 26% ($n = 8$) of the included patients died.

Discussion: In patients with coronavirus disease 2019 who are awake, alert, and spontaneously breathing, an initially

low pulse oximetry reading improved with prone positioning. Future studies are needed to determine the association of prone positioning with subsequent endotracheal intubation and mortality.

Key words: Coronavirus disease 2019; Adult respiratory distress syndrome; prone position

Introduction

The 2019 novel coronavirus emerged out of the Hubei Province of China in November 2019. The first United States case of coronavirus disease 2019 (COVID-19) was confirmed on January 20, 2020, in Seattle, WA. In the subsequent weeks, the virus spread globally and was declared a pandemic by the World Health Organization on March 11, 2020. In our emergency department in northern New Jersey, the first patient with COVID-19 arrived on March 11, 2020.

Emergency services worldwide were tasked with responding to a crisis with presentations ranging from patients who were asymptomatic to those in hypoxic respiratory distress. Testing centers appeared across the US in the form of tents and drive-throughs, thus accommodating patients' requests for testing, however this met only the need of the "walking well."

Emergency departments in areas experiencing clustered, high incidences of the spread of COVID-19 were inundated with patients who were symptomatic, many of whom arrived critically ill. As this crisis unfolded, little was known about the epidemiology and clinical course of the virus, although cases of severe pneumonia, adult respiratory distress syndrome (ARDS), and multiple organ failure associated with COVID-19 infection were reported from Wuhan, China, in January 2020.¹

To lessen aerosolization of the virus, many health care providers avoided the use of continuous positive airway pressure or high-flow nasal cannula (HFNC), leading to the early intubation of patients in severe hypoxic respiratory distress. To forestall intubation, alternative methods of respiratory support were explored. The anatomical and physiological changes attributed to prone positioning (PP) result in a more even tidal volume distribution. These changes include enhanced lung volume in the dorsocaudal regions through the reduction of superimposed pressure of the heart and the abdomen and improvement in alveolar ventilation/perfusion relationship as a result of pulmonary perfusion preferentially distributed to the expanded dorsal regions of the lung.² The treatment of patients in ARDS with PP who are intubated and mechanically ventilated has been

an accepted practice for decades.^{3,4} An early account of the use of PP for patients who were intubated was by Douglas et al³ in 1977 who reported on 6 patients (5 were intubated) with pneumonia in acute respiratory failure who were prone. After being placed in the prone position, PaO₂ increased by a median of 32 mm Hg (interquartile range [IQR], 31-105 mm Hg), but PCO₂ and respiratory rate were unchanged. The meta-analysis by Bloomfield et al,⁴ published in 2015, included 9 randomized controlled trials of PP in patients with respiratory failure who were intubated (described in later text). However, data regarding the use of PP on patients in acute respiratory failure who were nonintubated and spontaneously breathing are limited.

AVAILABLE KNOWLEDGE

A search of the literature conducted in OVID MEDLINE at the end of March 2020 using terms "PP" and "non-intubated patients" yielded 3 articles, which guided this study. Published in 2003, Valter et al⁵ reported a case series of 4 patients in severe respiratory distress who were nonintubated in whom PP resulted in improved oxygenation and reduced oxygen requirement. After PP, on average, the fraction of inspired oxygen (FIO₂) was reduced by 23% (from 68% to 45%), respiratory rate decreased from 31 per minute to 19 per minute, PaO₂ increased by 14 mm Hg (from 58 to 72), PCO₂ decreased by 1 mm Hg (from 52 to 51), and pH increased by 0.06 (from 7.34 to 7.40). Published in 2015, Scaravilli et al⁶ retrospectively reviewed the effectiveness of PP on 15 patients in the intensive care unit (ICU) who were hypoxemic and nonintubated, 13 with pneumonia.⁶ The PaO₂/FIO₂ significantly improved during prone periods. The mean PaO₂/FIO₂ increased from 127 (SD = 49) mm Hg to 186 (SD = 72) mm Hg while prone, decreasing to 141 (SD = 64) mm Hg after resuming the supine position ($P < .05$). The PaO₂ increased from 89 (SD = 28) mm Hg to 124 (SD = 53) mm Hg, decreasing to 91 (SD = 42) mm Hg after being placed supine. There was no change in the PCO₂, bicarbonate, heart rate (HR), or

blood pressure. In a prospective study, Ding et al¹ proned 19 patients with moderate to severe ARDS who were nonintubated. Etiologies were influenza, other viruses, and other pneumonias in 9 (47%), 2 (11%), and 8 (42%) patients, respectively. All patients received HFNC and/or noninvasive ventilation treatment: 3 HFNC, 8 noninvasive ventilation treatment, and 8 both. The median PaO₂/FIO₂ increased from 94 (IQR, 79-115) to 130 (IQR, 95-152) mm Hg after PP. The median difference was 32 (IQR, 6-60) mm Hg ($z = -3.15$, $P < 0.001$). After PP, 9 patients were intubated, of whom 3 required extracorporeal membrane oxygenation; 1 patient died.

There have been 7 meta-analyses on PP in patients who were intubated. In the meta-analysis of 9 randomized controlled trials of PP in patients with respiratory failure who were intubated, Bloomfield et al⁴ (2015) found a nonstatistically significant trend in mortality overall (relative risk [RR] of 0.84; 95% confidence interval [CI], 0.69-1.02). However, the subgroup analysis revealed a statistically significant benefit for those recruited within 48 hours of meeting entry criteria (5 trials; 1024 participants showed an RR of 0.75 [95% CI, 0.59-0.94]); those treated with PP for 16 or more hours per day (5 trials; 1005 participants showed an RR of 0.77 [95% CI, 0.61-0.99]); and participants with more severe hypoxemia at trial entry (6 trials; 1108 participants showed an RR of 0.77 [95% CI, 0.65-0.92]). The study also showed an improvement in oxygenation. The mean difference in the PaO₂/FIO₂ between PP and supine positioning was 24.6 mm Hg (95% CI, 13.9-35.2). PP reduced ventilator-associated pneumonia and days on the ventilator but appeared to have increased the length of ICU and hospital stays.

PURPOSE

The primary aim of this pandemic disaster practice improvement project was to measure changes in pulse oximetry associated with PP on adult patients with ARDS with COVID-19 infection who were awake, alert, spontaneously breathing, and nonintubated. The secondary aim was to analyze changes in respiratory rate and HR associated with proning in these patients.

Methods

DESIGN

This study was a pandemic disaster practice improvement initiative using retrospective chart review.

SETTING

The practice site was a suburban hospital emergency department in northern New Jersey with an annual volume of 90 000. The hospital was a level 1 trauma center and had several residencies, including one in emergency medicine.

PROTOCOL

Site guidelines were implemented for PP of patients suspected to be infected with COVID-19 who were awake, alert, and spontaneously breathing with hypoxic respiratory distress ([Supplementary Appendix](#)). Included were positioning recommendations and contraindications consistent with those described in The Prone Severe ARDS Patients (PROSEVA) trial.⁷ Beginning March 30, 2020, emergency nurses and physicians were encouraged to prone position this patient population. Guidelines were communicated to nurses staffing the emergency department at the multiple shift change huddles and by e-mail. Staff assisted the patient in assuming a prone position, with the stretcher positioned in mild reverse Trendelenburg. The patient was asked to remain prone for at least 2 hours or as long as tolerated, and no clinical deterioration was noted. Patients were provided with pillows and/or blankets to position comfortably and to cushion bony prominences and were encouraged to move frequently while maintaining PP. Providers were asked to enter a nursing communication “Keep Prone” in the electronic medical record (EMR) for ease of data extraction.

DATA SOURCE AND INCLUSION CRITERIA

A report was run in the EPIC (Epic Systems Corporation, Verona, WI) EMR system to identify all adult patients with COVID-19 admitted through the emergency department between March 30, 2020, and April 30, 2020. Patients who met the following criteria were included: assuming PP by themselves and tolerating it for at least 30 minutes, documented room air pulse oximetry (peripheral capillary oxygen saturation [SpO₂]) < 90% and pre-PP SpO₂ ≤ 94% despite supplemental oxygen.

DATA EXTRACTION AND VARIABLES

The following data from the EMRs of the patients meeting inclusion criteria were extracted: length of time from arrival to PP, SpO₂ on room air, HR and respiratory rate, SpO₂ before and after PP, and length of time proned. Although these data are repeated measures on the clinical record, only 1 measure for each variable was extracted. The

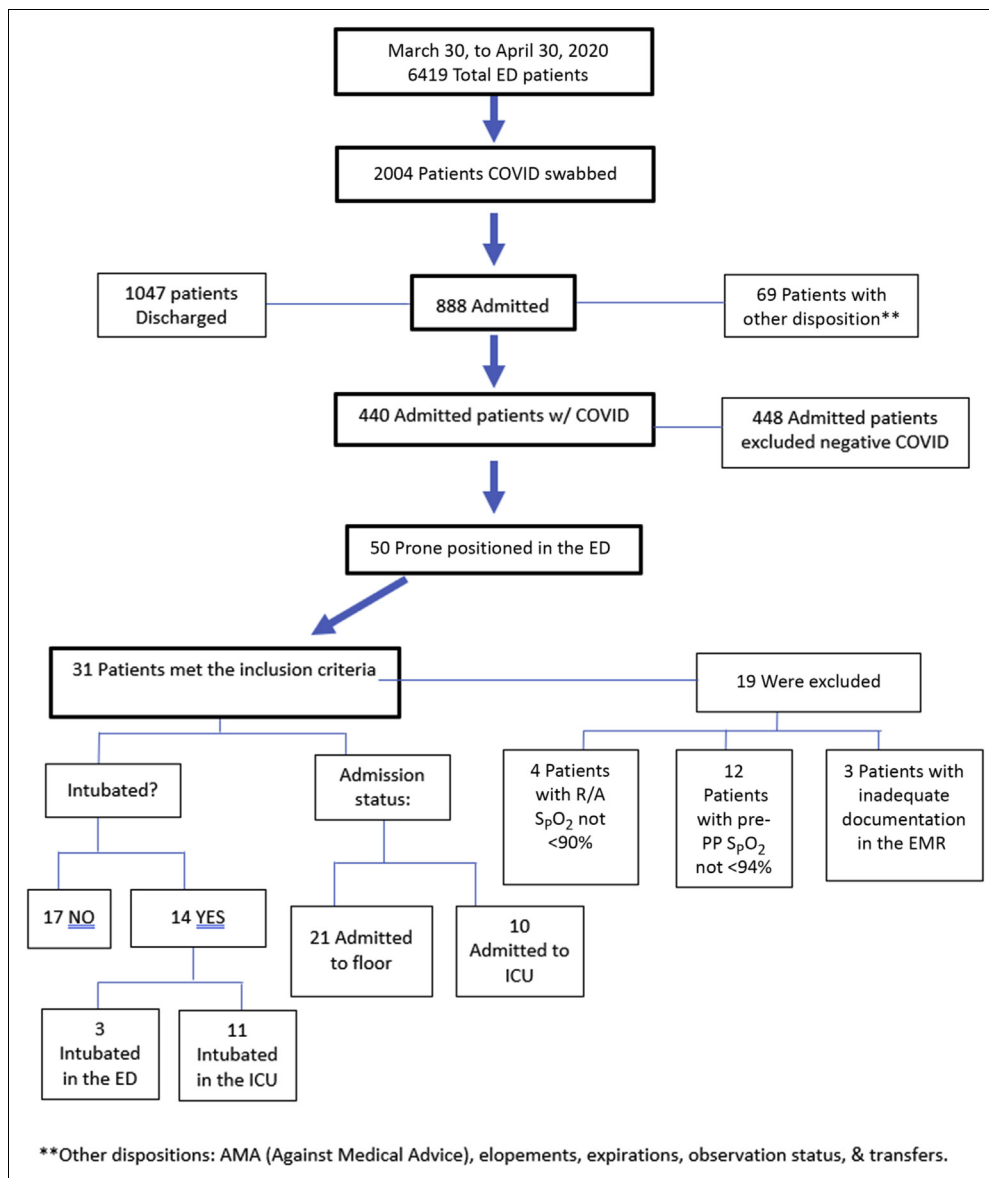


FIGURE 1

Sample description. ED, emergency department; COVID, coronavirus disease; SpO₂, peripheral capillary oxygen saturation; PP, prone positioning; R/A, room air; EMR, electronic medical record; ICU, intensive care unit.

post-PP measure closest to 30 minutes after the onset of proning was recorded. Demographic data, level of care on admission, intubation during hospitalization (including the length of time from ED arrival to intubation), the existence of a “do not intubate order,” length of hospital stay, and disposition on discharge were collected. The primary outcome was the pre- to postproning change in SpO₂. Pre- to postproning changes in respiratory rate and HR were analyzed as secondary measures. Two of the authors

abstracted data from the EMR. The 2 data abstracters examined 10 charts together, with excellent agreement. The rare circumstance of uncertainty was resolved by consensus.

DATA ANALYSIS

Data are presented as means and SDs or medians with IQRs. We compared medians and means with the Wilcoxon signed-rank test and paired *t* test, respectively,

TABLE 1
Comparison of demographics of patients in 2019 to study group 2020*

| Demographic | 2019 n = 6419 | | 2020 n = 31 | |
|------------------------|---------------|---------|-------------|---------|
| | Mean or n | SD or % | Mean or n | SD or % |
| BMI, kg/m ² | 28 | 6 | 31 | 5 |
| Age, y | 56 | 21 | 62 | 12 |
| Sex, % female | 3466 | 54% | 4 | 13% |
| Race/Ethnicity | | | | |
| Hispanic | 449 | 7% | 17 | 55% |
| White | 4622 | 72% | 7 | 23% |
| Asian | 257 | 4% | 3 | 10% |
| African American | 449 | 7% | 2 | 6% |
| Unspecified | 642 | 10% | 2 | 6% |

BMI, body mass index.

* Demographics of the 6419 patients in the emergency department seen from March 30, 2019 to April 30, 2019 and the 31 study patients in 2020.

using Statistical Package for the Social Sciences version 27 (SPSS Inc, Chicago IL.). Missing data were excluded from each individual analytic test. To replicate this study, to detect a change in pulse ox of 5%, with $\alpha = 0.05$ and power = 0.8, an empirical sample size of 13 is needed.

Results

SAMPLE DESCRIPTION

A total of 440 patients with COVID-19 were identified in the EMR retrospective chart review. Of the 50 patients who were prone positioned in the emergency department as part of the pandemic process improvement project, 19 were excluded, leaving 31 patients who met inclusion criteria (Figure 1). For the 19 patients who did not meet the inclusion criteria, the median levels of SpO₂ were 87% (IQR, 81%-90%) on room air, 96% (IQR, 94%-98%) before proning, and 96% (IQR, 94%-98%) during proning. Three patients did not have levels of room air SpO₂ recorded because they arrived with supplemental oxygen.

For the 31 included patients, the mean age was 62 (SD = 12) years; 13% were female. The average body mass index (weight [kg] ÷ height² [m]) was 31 (SD = 5). A total of 55% were Hispanic, 23% white, 9% Asian, 6% African American, and 6% unspecified. These demographic parameters were different from the typical patient population in this emergency department (Table 1).

PROCESS DESCRIPTION AND CLINICAL OUTCOMES

The median time from patient arrival to PP was 85 minutes (IQR, 46-174). For the 13 (42%) patients for whom the times were recorded, the duration of PP was 140 (SD = 47) minutes. For the 31 patients included in the study, the least recorded duration of PP was 51 minutes, and for that individual patient, the SpO₂ rose from 93% to 96% during PP. All but 4 (13%) patients were given supplemental oxygen (from 2 to 21 L/min by nasal cannula and/or nonrebreather mask) and then were prone. The median levels of SpO₂ were 83% (IQR, 75%-86%) on room air, 90% (IQR, 89%-93%) with supplemental oxygen, and 96% (IQR, 94%-98%) with PP. (Table 2 and Figure 2). The 5% (IQR, 4%-9%) median change from before to with PP was statistically significant ($z = -4.48$, $P < .001$).

Supplemental oxygen was increased for 7 (23%) patients when placed in the prone position. Considering only the 24 patients for whom supplemental oxygen was not increased, the median levels of SpO₂ before and with PP were 92% (IQR, 89%-93%) and 96% (IQR, 94%-98%), respectively. For these 24 patients, the 4% (IQR, 3%-6%) change from before to with PP was statistically significant ($z = -3.75$, $P < .001$).

For all 31 patients, both HR and respiratory rate showed small decreases after being placed in the prone position. The mean HR and respiratory rate before PP were 93 (SD = 18) and 31 (SD = 9) beats/min, respectively. With PP, the rates were 88 (SD = 15) and 26 (SD = 8) beats/min, respectively. These changes were statistically significant (HR change: 5 [SD = 11] beats/minutes, $t = 5.21$,

TABLE 2

Change in parameters with prone positioning for patients with coronavirus disease 2019 in the emergency department who were awake, alert, and nonintubated

| Patients | Parameter | Time period | Values* | SD or IQR | Point estimate | Change* | P value |
|--|------------------|-------------|---------|-----------|----------------|---------|---------|
| All patients | SpO ₂ | Room air | 83 | 75-86 | | | |
| | | Before PP | 90 | 89-93 | z= -4.48 | 5 (4-9) | < .001 |
| | | With PP | 96 | 94-98 | | | |
| 24 patients (no O ₂ Δ) [†] | SpO ₂ | Before PP | 92 | 89-93 | z= -3.75 | 4 (3-6) | < .001 |
| | | With PP | 96 | 94-98 | | | |
| All patients | pulse | Before PP | 93 | 18 | t= 5.21 | 5 (11) | < .001 |
| | | With PP | 88 | 15 | | | |
| | resp | Before PP | 31 | 9 | t= 2.91 | 5 (17) | .01 |
| | | With PP | 26 | 8 | | | |

resp, respiratory rate; PP, prone positioning; O₂, supplemental oxygen; SpO₂, peripheral capillary oxygen saturation; IQR, interquartile range.

* Median (IQR) or mean (SD).

[†] No O₂ Δ: 24 patients with no change in supplemental oxygen when prone.

$P < .001$ and respiratory rate change: 5 [SD = 17] breaths/min, $t = 2.91$, $P = .01$).

PATIENT DISPOSITION

Patients remained in PP in the emergency department for a median time of 200 minutes (IQR, 134-363). Of the 31 patients, 14 (45%) were intubated (3 and 11 in the emergency department and ICU, respectively) after a median time of 35 hours (IQR, 11-88). A “do not intubate” decision had been made for 2 (6%) of the patients. All patients were admitted to the hospital, 10 (32%) to the ICU. As of writing this manuscript, 18 patients (58%) had been discharged home, 3 (10%) were still in the hospital, 2 (6%) were transferred to another facility, and 8 (26%) died (after a median of 8 [IQR, 5-13] days, range: 4-17 days). The median lengths of hospital stay including and excluding those still in the hospital were 11 (IQR, 7-17) and 11 (IQR, 7-15) days, respectively.

Discussion

We studied the association of PP and SpO₂ on patients with COVID-19 in the emergency department who were nonintubated. This work was a single-site, pragmatic pandemic process implementation in a real-world clinical setting that demonstrated feasibility and initial effectiveness of the intervention for the included patients and should not be interpreted as testing the efficacy of PP as a controlled clinical trial. Only one study on this patient population (ie, non-intubated ED

patients) with a total of 50 patients had been previously published when we began this work.⁸ Our results confirmed most of the findings of this study, discussed in more detail in later text, which increases confidence in the reproducibility of these findings. Our study is unique for reporting the ethnicity of the patients (most were Hispanic), in-hospital disposition (32% were admitted to the ICU), and mortality (26% died). To contextualize our findings, we found 2 previous reports on the effectiveness of PP on mortality and intubation rate, with conflicting results.^{1,6}

In 31 patients who were prone in the emergency department, SpO₂ increased by a median of 5% (IQR, 4%-9%) with PP, from a borderline oxygenation level of 90% (IQR, 89%-93%) before PP to a more clinically acceptable median of 96% (IQR, 94%-98%) with PP. There may be other explanations for changes besides assuming PP, such as change in ambient temperature, physical activity, emotional status, or FIO₂. However, there were no documented changes in any of these factors for any patients except FIO₂. With the changes in FIO₂, when 24 of 31 patients with no change in FIO₂ while being placed in PP were analyzed separately, the 4% increase in SpO₂ was similar to the 5% increase in the patients for whom FIO₂ had been increased when placed in PP. Fourteen (45%) were intubated after a median time of 35 hours (IQR, 11-88).

After the completion of our analysis, we searched for cohort studies (each with at least 3 patients) of patients with COVID-19 who were nonintubated, treated with PP to contextualize our results in the rapidly emerging published literature. Our search returned 13 such studies that included 228 (range in each study of 3-56) patients

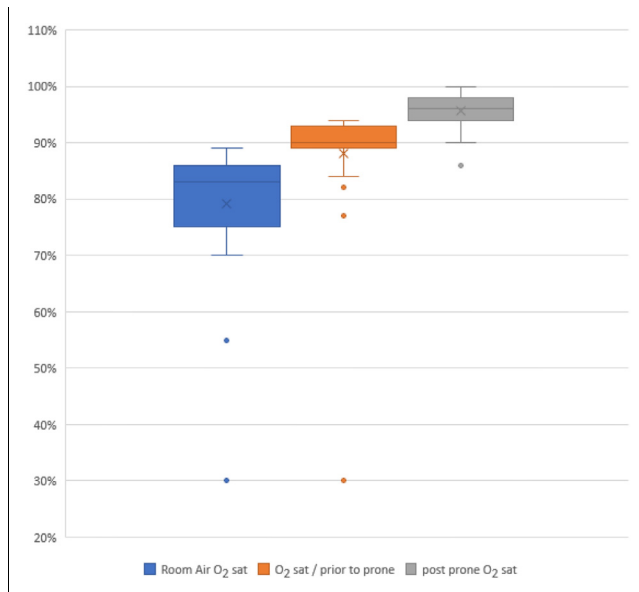


FIGURE 2

Change in SpO₂ with prone positioning in patients with coronavirus disease 2019 in the emergency department who were awake, alert, and nonintubated. SpO₂, peripheral capillary oxygen saturation; O₂, supplemental oxygen; SAT, saturation. Note: Postprone measure approximately 30 minutes after initiation of proning intervention.

with COVID-19 who were nonintubated, but only one was done entirely on patients in the emergency department.⁹⁻¹⁸

In this study of 50 patients, the median age of 59 years (IQR, 50-68) was similar to our median age of 62 years, but a larger proportion were female (40%, compared with our 13%).⁸ The median SpO₂ on ED arrival of 80% (IQR, 69-85) increased to 84% (IQR, 75-90) after supplemental oxygen and then 94% (IQR, 90-95) with PP. This 10% increase from before to with PP was statistically significant ($P = .001$). This change was greater than the 5% change we found, although the SpO₂ with PP was similar to our 96% finding. A total of 18 (36%) patients were intubated, with the median time until intubation in the 1- to 24-hour period after ED arrival. This is slightly smaller than our 45% intubation rate, although the median time to intubation was shorter than in our study (35 hours). Mortality statistics were not reported in these other studies. The overall outcomes of the 13 previous studies mentioned previously (including the ED study just described) were reported as PaO₂ in 2 studies (33 patients), PaO₂/FIO₂ in 5 studies (78 patients), SpO₂ in 6 studies (118 patients), and “oxygenation” in 1 study (10 patients). The mean changes in PaO₂, PaO₂/FIO₂, and SpO₂ with PP were 30 (SD = 13) mm Hg, 80 (SD = 87) mm Hg and 8% (SD = 2%), respectively. The latter change was somewhat larger than

what we found (5%). In the 13 studies, 59 (26%) patients were intubated. Calculating the median rate for the individual studies yields a median intubation rate of 21% (IQR, 7-33). Only 8 studies (139 patients) reported mortality results, and in those studies, 11 (8%) died. Calculating the median rate for individual studies yields a median mortality rate of 3% (IQR, 0%-10%). Both these intubation and mortality rates are less than what we found. Although not directly comparable with our study, we did find 1 other study on PP in patients with COVID-19 who were intubated. Carsetti et al¹⁹ retrospectively reviewed 10 patients with COVID-19 who were intubated, whose median PaO₂/FIO₂ before PP was 126 mm Hg. With PP for either 16- or 36-hour cycles, PaO₂/FIO₂ increased significantly to 177 mm Hg and 394 mm Hg, respectively, and remained elevated after subsequent supine repositioning (166 mm Hg and 290 mmHg, respectively).

When our findings are contextualized in the published literature, we interpret that our results corroborate the association of PP with increased pulse oximetry outcomes. The effectiveness of PP on longer term outcomes of mortality and intubation rates are conflicting. Future study is needed to determine the required duration of PP to improve outcomes and the effect of PP on intubation and mortality in patients with COVID-19.

Limitations

Limitations included a small sample size, demographics that may have limited generalizability (87% male, 55% Hispanic), variations in time the patient remained in the prone position, along with the inability to ascertain if the patient maintained positive effects of PP once returned to supine position. Race and ethnicity were not collected using standard research categories and definitions, and no field was used for patients who were biracial or multiracial. Our results should be interpreted in light of the amount of missing data, particularly for the duration of the PP intervention. Although SpO₂ is less accurate than other invasive measures, it is the standard method to monitor oxygenation in the emergency department.

As a retrospective review, there is no assurance that all patients who met the inclusion criteria were placed in PP by the emergency staff nor that all PP intervention was accurately recorded in the EMR for inclusion in the study. Retrospective data abstraction has innate problems and shortcomings.²⁰ Although the data abstracters were not blinded to the purpose of the study, there were well defined objective data present in the same place in the EMR to limit bias. Despite these limitations, our study design demonstrates an initial feasibility and effectiveness in achieving

the intended clinical results at our site to raise SpO₂ by implementing a proning guideline for patients with COVID-19 in the emergency department.

Implications for Emergency Nurses

Emergency nurses must implement practice changes to meet the needs of patients presenting with ARDS, including those with COVID-19. As COVID-19 cases continue to occur in the US, it is essential to provide early intervention for patients presenting in respiratory failure. Management of this patient population has been challenging from a logistical as well as clinical standpoint. Considering limitations in use of noninvasive respiratory support devices, continuous positive airway pressure and HFNC, the application of PP is a potential alternative to improve patients' SpO₂ levels. The currently published evidence supports the early use of PP for patients who are intubated. Implementation of PP guidelines for patients with suspected COVID-19 who are alert arriving to the emergency department is nurse-driven and can be accomplished quickly and with little additional expense. Although some patients did not tolerate PP, this intervention appears to be safe and feasible in this patient population. Emergency nurses are pivotal in expanding the use of PP to patients who are awake, alert, and spontaneously breathing.

Conclusions

We demonstrated a single-site, pandemic practice guideline implementation of PP was feasible and associated with improved SpO₂ approximately 30 minutes after the initiation of PP for the included patients with COVID-19 who were awake, alert, and nonintubated. The PP of patients with COVID-19 who were awake and alert, not receiving noninvasive or invasive respiratory support, presenting to the emergency department with low pulse oximetry, was associated with a 5% improvement in pulse oximetry readings. Future studies are needed to determine the required duration of PP to improve outcomes and the effect of PP on rates of endotracheal intubation and long-term survival.

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Author Disclosures

Conflicts of interest: none to report.

Supplementary Data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jen.2020.12.006>.

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Supplementary Appendix

Prone positioning guidelines

- Identify awake, alert, non-intubated COVID positive or COVID patients under investigation experiencing respiratory distress and low SpO₂ (>90%)
- Patient must be capable of repositioning with or without assistance at least every 2 hours
- Collaborate with ED provider regarding the appropriateness of PP the patient and maximization of non-invasive oxygen delivery
- Provider enters a “keep prone” nursing communication in the EMR (see below)
- Describe the intervention to the patient
- Place patient in prone position with mild reverse Trendelenburg (approximately 20-30 degrees)
- Provide pillows for comfort and pressure injury prevention per National Pressure Injury Advisory Panel (NPIAP) https://cdn.ymaws.com/npiap.com/resource/resmgr/press_releases/npiap_pip_tips_-_proning_202.pdf
- Document PP in EMR
- Encourage the patient to remain in PP for as long as is tolerated and patient respiratory parameters improve (respiratory rate, effort, SpO₂)
- Continually monitor patient and communicate patient tolerance of PP to provider

Contraindications:

ABSOLUTE CONTRAINDICATIONS:

1. Shock (eg, persistent mean arterial pressure <65 mmHg)

2. Acute bleeding (eg, hemorrhagic shock, massive hemoptysis)
3. Multiple fractures or trauma (eg, unstable fractures of femur, pelvis, face)
4. Spinal instability
5. Raised intracranial pressure >30 mmHg or cerebral perfusion pressure <60 mmHg
6. Hemicraniectomy
7. Sternotomy within two weeks
8. Life-threatening arrhythmias

RELATIVE CONTRAINDICATIONS:

1. 48 hours or greater of refractory hypoxemia
2. Pregnancy
3. Tracheal surgery
4. Recent DVT treated for <2 days*
5. Anterior chest tube(s) with air leaks*
6. Major abdominal surgery
7. Recent pacemaker*
8. Clinical conditions limiting life expectancy* (eg, oxygen- or ventilator-dependent respiratory failure)
9. Severe burns*
10. Lung transplant recipient*

Atlantic Health System Patient Care Manual Prone Positioning Guidelines

* Based upon exclusion criteria from the Prone Positioning in Severe ARDS trial (PROSEVA)