Examining Associations Between Prone Position and Hospital Outcomes During the COVID-19 Pandemic

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Background

- Due to the disease progression of COVID-19, a hospital management challenge has been availability of intensive care unit (ICU) beds and respiratory ventilators.[8]
- To help combat this challenge, prone positioning has been implemented for patients with COVID-19.[1,2,6,7,10]
- Prone positioning in patients with acute respiratory distress syndrome has been shown to improve oxygenation and decrease mortality.[3,4,5]
- During the 1st wave of the COVID-19 pandemic, there was limited evidence examining the effectiveness of the prone positioning intervention being led by a physical therapy (PT) team.
- Thus, Lehigh Valley Health Network (LVHN) nursing and rehabilitation departments collaborated to assemble an interprofessional prone positioning team.[9]

Aim and Hypothesis

- **Aim:** To examine the associations between ICU transfer and death for patients with COVID-19 relative to their ability to achieve the prone position
- **Hypothesis:** ICU transfer and death would not be associated with the ability to prone in patients with COVID-19 in a tertiary hospital.

Methods

- Design: Retrospective chart review
- Inclusion criteria: ≥18 years old, PT consult, admitted to the medical-surgical ward at LVHN between 3/1/2020 – 6/30/2020, (+) COVID-19 test via nasal swab, receiving supplemental oxygen, definitive discharge location
- Exclusion criteria: Children, pregnant women, prisoners
- Protocol:
  – Of those included, patients were stratified into one of three groups
    - Independent   - Assistance   - Special Considerations
  – The patients' outcomes were tracked throughout hospitalization.
- Statistical analysis: Descriptive statistics, Kruskal Wallis, Chi Square, Fisher's Exact

Initial data collection, n=205

64 patients did not have a positive COVID nasal swab, n=141

18 patients did not have a PT evaluation n=123

5 patients were intubated prior to the study period, n=118

8 patients were on the unit, n=110

INDEPENDENT
- Patient able to achieve and maintain prone position without assistance
- **Plan of Care:** Patient Education, Therapeutic Exercise, Progressive Mobility Training if needed

ASSISTANCE
- Patient able to achieve and maintain prone position with assistance
- **Plan of Care:** Remediation of Mobility Deficits, Patient Education, Therapeutic Exercise, Rom Exercise Program, Progressive Mobility Training

SPECIAL CONSIDERATIONS
- Patient unable to achieve and/or maintain prone position despite assistance. Patient may have achieved alternative positioning in 1/4 side lying, side lying, or 3/4 prone.
- **Plan of Care:** Remediation of Mobility Deficits, Patient Education, Therapeutic Exercise, Rom Exercise Program, Progressive Mobility Training

Results

PRONE POSITIONING GROUP

Characteristics	Total Sample (n=110)	Independent (n=50)	Assistance (n=21)	Special Considerations (n=39)	p-value
DEMOGRAPHIC DESCRIPTIVE STATISTICS					
Age, years median (IQR)	66.0 (49.0-82.0)	49.0 (41.0-66.0)	72.0 (61.0-83.0)	79.0 (67.0-86.0)	<0.0001[a]
Sex n(%)					0.1818[b]
Male	58 (52.7)	29 (58.0)	13 (61.9)	16 (41.0)	
Ethnicity n(%)					0.0070[c]
American Indian or Alaska Native	0	0	0	0	
Asian	5 (4.6)	3 (6.0)	1 (4.8)	1 (2.6)	
Black or African American	6 (5.5)	4 (8.0)	1 (4.8)	1 (2.6)	
Hispanic or Latino	44 (40.0)	26 (52.0)	9 (42.9)	9 (23.1)	
Native Hawaiian or Other Pacific Islander	0	0	0	0	
White	51 (46.4)	14 (28.0)	9 (42.9)	28 (71.8)	
Other	4 (3.6)	3 (6.0)	1 (4.8)	0	
BMI, kg/m2 median (IQR)	29.7 (25.0-33.6)	31.2 (26.4-35.5)	25.3 (21.9-32.0)	29.5 (25.0-33.4)	0.0398[a]
Prior Level of Function n(%)					
Independent in Community	70 (63.6)	49 (98.0)	12 (57.1)	9 (23.1)	<0.0001[c]
HOSPITAL DESCRIPTIVE STATISTICS					
Hospital LOS, days					
median (IQR)	8.0 (4.0-14.0)	6.5 (3.0-11.0)	10.0 (5.0-15.0)	8.0 (5.0-16.0)	0.2113[a]
ICU Transfer n(%)					
Yes	28 (25.5)	10 (20.0)	11 (52.4)	7 (18.0)	0.0069[b]
ICU LOS, days					
median (IQR)	4.0 (2.0-8.5)	6.0 (3.0-20.0)	3.0 (2.0-7.0)	3.0 (3.0-5.0)	0.2847[a]
Ward LOS, days					
median (IQR)	6.0 (4.0-11.0)	6.0 (3.0-10.0)	6.0 (3.0-12.0)	7.5 (5.0-14.0)	--
PRONE POSITIONING INTERVENTION DESCRIPTIVE STATISTICS					
Number of Prone Positioning Sessions					
median (IQR)	2.0 (2.0 – 3.0)	2.0 (2.0-3.0)	3.0 (2.0-6.0)	2.0 (1.0-4.0)	0.0261[a]
Patient Achieved Prone Position n(%)					
Yes	71 (64.5)	47 (94.0)	17 (81.0)	7 (18.0)	<0.0001[b]
O2 Required at Discharge n(%) NOTE: n=103					--
Yes	26 (25.2)	7 (14.3)	6 (33.3)	13 (36.1)	
Discharge Destination n(%)					<0.0001[c]
Home	41 (37.3)	34 (68.0)	3 (14.3)	4 (10.3)	
Home w/assist	24 (21.8)	10 (20.0)	7 (33.3)	7 (18.0)	
Assisted living	6 (5.5)	0	2 (9.5)	4 (10.3)	
Inpatient rehab	5 (4.6)	1 (2.0)	2 (9.5)	2 (5.1)	
Skilled nursing facility	15 (13.6)	2 (4.0)	3 (14.3)	10 (25.6)	
Death	11 (10.0)	3 (6.0)	4 (19.1)	4 (10.3)	
Other including IP Hospice	8 (7.3)	0	0	8 (20.5)	

PRONE POSITIONING GROUP

Characteristics	Total Sample (n=110)	Independent (n=50)	Assistance (n=21)	Special Considerations (n=39)	p-value
Death n=103					
Yes	21 (20.4)	3 (6.4)	4 (20.0)	14 (38.9)	0.0013[b]
Days to Death					
median (IQR)	14.0 (7.0-26.0)	23.0 (21.0-26.0)	10.5 (7.0-13.0)	16.5 (6.0-32.0)	--
Death within 28 Days n=103					
Yes	16 (15.5)	3 (6.4)	4 (19.1)	9 (25.7)	0.0507[b]
Mechanical Vent.					
Yes	7 (6.4)	4 (8.0)	1 (4.8)	2 (5.1)	0.8818[c]
Days to Mech. Vent.					
median (IQR)	10.0 (3.0-13.0)	6.5 (2.5-11.5)	10.0 (10.0-10.0)	13.0 (12.0-14.0)	--
Vent Free within 28 Days n=82					
Yes	71 (86.6)	39 (88.6)	13 (92.9)	19 (79.2)	0.4542[c]
Hospital Readmission n=103					
Yes	15 (14.6)	3 (6.1)	2 (10.0)	10 (29.4)	0.0108[c]
Days to Hospital Readmission					
median (IQR)	18.0 (11.0-49.0)	49.0 (10.0-63.0)	27.0 (12.0-42.0)	15.5 (11.0-43.0)	--
Hospital Readmission within 60 Days n=103					
Yes	13 (12.6)	2 (4.1)	2 (10.0)	9 (26.5)	0.0111[c]
ICU Readmission n=95					
Yes	4 (4.2)	1 (2.1)	1 (5.6)	2 (6.7)	0.5161[c]
Days to ICU Readmission					
median (IQR)	19.0 (10.0-48.5)	24.0 (24.0-24.0)	6.0 (6.0-6.0)	43.5 (14.0-73.0)	--
ICU Readmission within 28 Days n=95					
Yes	3 (3.2)	1 (2.1)	1 (5.6)	1 (3.3)	0.7657[c]

Abbreviations: IQR=interquartile range. SD=standard deviation.

Notes: Categorical variables are presented as n(%), and continuous variables are presented as either the mean and standard deviation or median and interquartile range. Percentages are calculated based upon the column totals.

[a] Kruskal Wallis test   [b] Chi Square test   [c] Fisher's Exact test

Odds Ratios for Effects of Age, Ability to Prone, and First AMPAC Score on ICU Admission

	ICU Admission= β+Age (n=110)	ICU Admission= β+Ability to Prone (n=110)	ICU Admission= β+First AMPAC (n=75)
Odds Ratio (95% CI)	1.027 (1.002-1.054)	1.015 (0.415-2.487)	0.989 (0.915-1.070)

Abbreviations: 95% CI=95% Confidence Interval
Notes: Odds ratios that are significant at the a=0.05 level (p<0.05) are in red.

Discussion

- The odds of ICU transfer were higher for patients unable to achieve the prone position than patients who achieved the prone position.
- The odds of patients expiring were significantly higher for patients who are unable to achieve the prone position.
- Limitations:
  – Patients' time spent in prone was not captured. Recent evidence indicates that greater than 8 hours in prone reduces risk of mechanical ventilation.[10]
  – An unequal sample of convenience resulted in unequal group sizes.
  – Data was collected from one institution via retrospective, manual chart review with multiple reviewers.

Clinical Relevance

- By engaging in a PT-driven prone positioning intervention, physical therapists facilitated education and assistance of patients into the prone position.
- The results of the study identify the potential importance of the role of PT in the skilled mobilization of patients with COVID-19 to reduce their odds of death.
- Subsequent surges in patient volume have brought new challenges due to return to pre-pandemic staffing and patient prioritization.
- While current evidence aligns with this study regarding the benefits of prone position, factors such as patient selection, the skill of support required to achieve prone position and dosing of the prone intervention require further investigation. A larger sample size across multiple settings would strengthen future research.

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