Assessing the Clinical Characteristics and Ventilator Parameters of COVID-19 Mechanically Ventilated Patients at Lehigh Valley Health Network

Andrew Kelly

Kenneth Miller MEd, RRT-NPS
Lehigh Valley Health Network, Kenneth.Miller@lvhn.org

Published In/Presented At

Kelly, A., Miller, K. (2021, August). *Assessing the Clinical Characteristics and Ventilator Parameters of COVID-19 Mechanically Ventilated Patients at Lehigh Valley Health Network.* Poster Presented at: LVHN Research Scholar Program Poster Session, Lehigh Valley Health Network, Allentown, PA.

Assessing the Clinical Characteristics and Ventilator Parameters of COVID-19 Mechanically Ventilated Patients at Lehigh Valley Health Network

Andrew Kelly, Kenneth Miller MEd, MSRT, RRT-ACCS, NPS, AE-C, FAARC

Lehigh Valley Health Network, Allentown, Pennsylvania

Introduction

- During the COVID-19 pandemic, the utilization of mechanical ventilation has been a commonplace intervention for patients who develop organizing pneumonia and/or Acute Respiratory Distress Syndrome (ARDS).
- Often, high oxygen concentrations and high Positive End-Expiratory Pressure (PEEP) levels are required to maintain stable oxygenation. Often these patients require prolonged mechanical ventilation and their outcomes are less than favorable.
- From March 14, 2020 to June 30, 2021 we assessed the patients who were placed on mechanical ventilation with the diagnosis of COVID-19 at Lehigh Valley Health Network (LVHN).

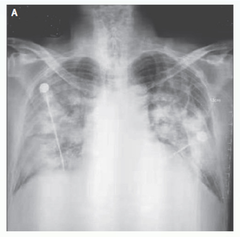

Figure 1: COVID-19 Lung X-Ray 3-5 Days after Respiratory Symptoms Begin

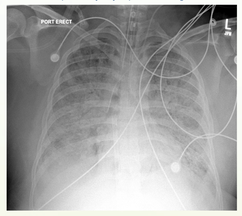

Figure 2: COVID-19 Lung X-Ray in Patient with End-Stage COVID-19

Objective

The key objective of our project was to identify specific clinical characteristics and ventilator parameters that affected survivorship for COVID-19 patients who required mechanical ventilation at LVHN.

Methods

- Utilizing retrospective chart review of 512 mechanically-ventilated COVID-19 patients, as well as data collected while patients were admitted, specific demographic and clinical characteristics, as well as ventilator parameters were collected for each patient.
- Each specific variable was then analyzed with basic statistics including range, mean, median and mode in an effort to identify significant differences between survivors and deceased patients.
- The variables studied include:
  - Age
  - Gender
  - Ethnicity
  - Hospital of Admission
  - Body Mass Index (BMI)
  - Date of Intubation
  - Time of Intubation
  - Tidal Volume (TV)
  - TV/kg (Ideal Body Weight)
  - Initial PEEP (Positive End-Expiratory Pressure)
  - Initial Static Compliance

Results

Variable of Interest	Survivors (Mean, Median)	Deceased (Mean, Median)
Age (Years)	63.26, 64.00	67.17, 68.00
Body Mass Index	32.71, 31.17	33.22, 31.79
Tidal Volume (cc)	416.98, 400.00	412.24, 400.00
TV/IBW (cc/kg)	6.60, 6.44	6.57, 6.28
Initial PEEP	11.78, 12.00	11.38, 10.00
Initial Static Compliance	30.86, 29.00	28.87, 27.00

Table 1: Basic Statistics for Survivors vs. Deceased Patients

Variable of Interest	Percent Survived	Number Survived	Percent Deceased	Number Deceased	Sample Size
Gender					
Male	35.91%	116	64.09%	207	323
Female	36.51%	69	63.49%	120	189
Ethnicity					
White	29.45%	96	70.55%	230	326
Latino	46.32%	63	53.68%	73	136
Black	51.43%	18	48.57%	17	35
Other	57.14%	8	42.68%	6	14

Table 2: Patient Gender and Ethnicity Survival Statistics

Figure 3: Box-and-Whisker Plot for Patient Age, Survivors (Left) vs. Deceased (Right)

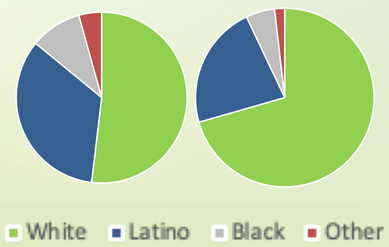

Figure 4: Pie Charts Representing Patient Ethnicity of Survivors (Left) vs. Deceased (Right)

LVHN Hospital	Total Patients	Percent Survived	Percent Deceased
Cedar Crest	295	38.60%	61.40%
Pocono	64	39.10%	60.90%
Muhlenberg	95	29.50%	70.50%
Hazleton	41	41.50%	58.50%
Schuylkill	17	5.90%	94.10%

Table 3: Breakdown of LVHN Hospitals Analyzing Percentage Survived vs. Deceased

Conclusions and Future Directions

- The variable that seemed to show the greatest statistical significance at LVHN was patient age, with the average deceased patient being 6.2% older than the average survivor, or roughly four years.
- Additionally, it is worth noting that there was an observed 6.45% difference in Initial Static Compliance of the lungs at the time of ventilation. This greater compliance in the survivor group shows that the survivors had less stiff lungs, on average, than the group of patients who are deceased at LVHN.
- Another variable of interest was ethnicity. Patients who identified as white were nearly 20% less likely to survive mechanical ventilation at LVHN. However, it should be noted that white patients represented nearly two-thirds of the patient population, so this result could be skewed by sample size.
- Some of the variables that were most surprising to have little to no significance were BMI and TV/kg.
  - Patients with higher BMI tend to have more co-morbidities, making them more prone to COVID-19. Surprisingly, the data showed that there was little difference (less than 2%) between the average BMI of survivors and deceased individuals at LVHN.
- Going forward, the results shown from this project could be compared to other hospital systems with both similar and different patient population demographics.
- Additionally, further statistical analysis could be performed on this data in an attempt to look for more intricate statistical relationships between the variables.
- Finally, treatment methods across the different LVHN hospitals could be compared in order to identify cause for differentiation in survivorship between hospitals.

Acknowledgements

- It is important to note that the record for one infant was excluded from all data in an attempt to prevent the data from being skewed by the significant outlier, the next youngest patient was 21.
- I would like to acknowledge the healthcare workers who collected much of the data necessary for this project to be conducted, while also caring for patients throughout COVID.

LVHN.org

Lehigh Valley Health Network