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Does Earlier Cannulation With VV-ECMO in Patients With ARDS Decrease Duration of AMV?

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Acute respiratory distress syndrome (ARDS) is defined as acute onset of hypoxemia resistant to oxygen therapy alone (Linden et al., 2000). Primary treatment for acute respiratory failure is artificial mechanical ventilation (Wu, Huang, Wu, Wang, & Lin, 2016). Given recent advances in technology, the use of VV-ECMO to treat severe acute respiratory failure, is growing rapidly (Combes et al., 2014). Unfortunately, criteria for the initiation of VV-ECMO in adult patients with ARDS differs among healthcare organizations.

"Acute respiratory failure is both the most common and most lethal single-organ failure in intensive care units" (Wu et al., 2016, p. 1). There are over 140,000 cases of ARDS each year in the United States (Tulman et al., 2014). The mortality rate in these patients range from (22 to 41%) (Tulman et al., 2014). The timing of VV-ECMO initiation remains controversial. "Historically, patients are transitioned to VV-ECMO later in the course of severe refractory hypoxia after multiple rescue modalities have been exhausted" (Bosarge et al., 2016, p. 240). Two randomized control trials (RCT) reviewed by Combes et al. (2012), have shown that prolonged mechanical ventilation, greater than seven days, is linked to higher mortality rates. Many organizations do not follow an algorithm or protocol when it comes to the treatment of ARDS (Sharma et al., 2015). A study conducted by Sharma et al. (2015) found that there are significant variations in treatment modalities among providers when treating adult patients diagnosed with ARDS. Many facilities do not have the infrastructure to support VV-ECMO for patients who require it; therefore, it is not a plan- of-care option (Sharma et al., 2015).

This 49-month quantitative, retrospective study utilizing inpatient electronic medical record (EMR) chart review compared if adult patients 30-65 years of age diagnosed with ARDS and cannulated with VV-ECMO up to and within 48 hours of admission and diagnosis, decreased duration on AMV, as compared to participants who were cannulated after 48 hours of admission and diagnosis with ARDS. A total of 305 participants were identified as receiving ECMO during the date range of study. Of the 305 participants who received ECMO, 110 of those participants received VV-ECMO. Of the 110 participants identified as receiving VV-ECMO during the date range of study, 49 participants were excluded due to age requirements and three were excluded due to non-diagnosis of ARDS. Of the total 110 participants, 58 participants met all inclusion and exclusion criteria during the time period queried and were then compared for length of time on AMV. Group 1 were identified as the participants cannulated for VV-ECMO up to and including 48 hours of admission and diagnosis with ARDS and Group 2 was identified as the participants cannulated for VV-ECMO greater than 48 hours after admission and diagnosis with ARDS.

Comparison of ages between the two groups queried identified no clinically significant variance ($p = 0.87$). The mean age of Group 1 was 50.65 and the mean age of Group 2 was 51.08. The next variable compared was gender of participants in each group. Using Fisher's Exact test to compare the gender of the two groups, there was not a statistically significant difference between genders ($p = 0.397$).

Comparison of length of days on artificial mechanical ventilation between the two participant groups did not produce a statistically significant difference ($p = 0.579$). There was a six-day difference in median days on artificial mechanical ventilation between the two comparison groups, although this did not show a statistically significant difference, the data are trending positively, showing that a larger sample size could potentially produce statistical significance. Future studies with larger volumes of participants, comparing the timing of VV-ECMO cannulation in adult participants with ARDS, would be beneficial to determine if the lack of statistical significance in this study is due to small sample size.

The data was then compared using hours on AMV, as opposed to days. The date and time of intubation and extubation were broken down by hours on AMV and then compared between the two study groups. In addition, the length of hours participants were cannulated on VV-ECMO were compared amongst the groups. The mean hours on AMV in Group 1 was 573 hours, while the mean hours on AMV in Group 2 was 628 hours. Although Group 2 showed an increase in the amount of time on AMV, this did not show a statistical significance. A two-tailed independent samples t-test between the two groups produced (p=.574).

The comparison between the hours in which the participants were cannulated with VV-ECMO showed that Group 2 had less time cannulated on VV-ECMO than Group 1. The cannulation time was calculated based on the time VV-ECMO was initiated and the time of VV-ECMO de-cannulation. The two groups were cannulated for similar hours with a mean in Group 1 of 307 hours and a mean in Group 2 of 287 hours. Again, a two-tailed independent samples t-test between cannulation times amongst the two groups compared produced ($p = .733$), which did not show statistical significance.

The remaining data collected were then analyzed to compare survival at discharge and rescue therapies utilized between the two comparison groups. During data collection, it was documented whether or not the participants received any additional rescue therapies prior to or during VV-ECMO therapy. Other rescue therapies utilized included prone positioning, nitric oxide, VDR (high frequency percussive ventilation), and Flolan (inhaled vasodilator). Data findings demonstrated that (33%) of participants in Group 1 received rescue therapies, while (42%) of participants in Group 2 received rescue therapies. Comparing the utilization of rescue therapies among the two groups, did not demonstrate that utilization of additional rescue therapies were statistically significant ($p = .514$). An increased number of participants in Group 1 received rescue therapies, which may have contributed to the improved survival seen in the data.

The final factor analyzed was survival at discharge. During data collection, it was identified if participants expired prior to discharge. Eight of the 39 Group 1 participants expired prior to discharge, while seven of the 19 participants in Group 2 expired prior to discharge. Although there was a larger percentage of participants that expired in Group 2 compared to Group 1 (21% vs 37%), Fischer’s Exact test did not demonstrate a statistical significance between the two groups ($p = .213$).

Although the findings in this study were not statistically significant, there was a decrease in the duration of AMV when participants were cannulated within 48 hours. Earlier liberation from AMV has benefits to both the organization as well as the patients. Decreased length of stay and therefore decreased cost can positively impact the financial aspects of healthcare organizations who perform VV-ECMO. Further studies are needed to determine if earlier initiation of VV-ECMO in adult patients with ARDS decrease time on AMV.

Title:
Does Earlier Cannulation With VV-ECMO in Patients With ARDS Decrease Duration of AMV?

Keywords:
Acute Respiratory Distress Syndrome, Artificial Mechanical Ventilation and Veno-venous extracorporeal membrane oxygenation

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Abstract Summary:
A scholarly project completed by a Doctor of Nursing Practice student at DeSales University who completed a 49-month quantitative, retrospective study utilizing inpatient electronic medical record (EMR) chart review to compare the clinical outcomes related to the timing of VV-ECMO in adult patients with Acute Respiratory Distress Syndrome (ARDS).

Content Outline:
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1. Introduction

2. Statement of Problem
3. Aims and Objectives
4. Background and Significance
5. Literature Review
6. Study Design
7. Data Collection Methods
8. Data Analysis Methods
9. Ethical Considerations
10. Data Analysis
11. Strengths and Weaknesses

III. Conclusion

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