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Comparative Analysis of Ventilator Days Following Dexmedetomidine Use for ICU Patients Difficult to Extubate

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Background

- The 15-bed intensive care unit (ICU) at Sentara Northern Virginia Medical Center (SNVMC) provides care to a diverse population of adult patients requiring mechanical ventilation (MV). Traditional sedation for mechanically ventilated patients causes delirium, increasing ventilator days.
- When extubation is attempted, traditional sedation must be discontinued due to the side effect of respiratory depression, leaving patients anxious and agitated, delaying extubation, and prolonging the need for mechanical ventilation.
- Dexmedetomidine is an alternative to traditional sedation that includes both sedative and analgesic properties and does not cause respiratory depression or delirium.
- During the weaning process, dexmedetomidine can be continued allowing the patient to remain calm and successfully extubated.

Significance

- Balancing sedation during extubation is critical to quality, safe patient care.
- Under-sedation can be psychologically traumatic, cause fatal self-extubation, delirium, and increased oxygen consumption. Over-sedation can lead to prolonged MV and increased risk of ventilator-associated pneumonia.
- Failure to achieve balance may increase the need for nursing and respiratory care, increasing the total cost of care delivery.
- Dexmedetomidine may decrease ventilator days, ICU length of stay (LOS), and incidence of acute compromise of long-term cognitive functioning.

Objective

This study aims to explore differences in mean ventilator days following implementation of a dexmedetomidine protocol for ICU patients difficult to extubate during the weaning process.

Population

- ICU patients on MV receiving traditional sedation that became anxious, tachycardic or tachypneic when medications were held for weaning trials were considered potential candidates for prolonged intubation due to difficulty with extubation.
- Patients assessed by the pulmonologist as potentially difficult to extubate or who failed an initial weaning trial were identified as potential candidates for the dexmedetomidine protocol.

Study Protocol

- The pulmonologist, clinical nurse specialist (CNS), registered nurse (RN), or respiratory therapist (RT) identified patients who failed one weaning trial or were recognized as potentially difficult to wean. After the morning weaning trial, the pulmonologist, in collaboration with the CNS, identified patients suitable for the dexmedetomidine protocol. The pulmonologist initiated the order for dexmedetomidine and discontinued other sedatives.
- Dexmedetomidine was initiated as an infusion of 0.2 mcg/kg/hr.; then titrated after 30 minutes at 0.1 mcg/kg/hr. to maintain a Richmond Agitation Sedation Score (RASS) score of 1 to -2 (maximum dose 1 mcg/kg/hr.). Vital signs, including BP, heart rate, respirations, oxygen saturation (SpO₂), and cardiac rhythm, were assessed every 15 minutes at initiation for the first hour and while titrating the infusion.
- Once the optimum level of sedation was achieved, standard hourly vital signs were resumed. The ICU nurses validated the vital signs in the EMR and entered the dose and rates of all sedatives given. The RASS score was documented hourly until the target range was met and then every four hours or whenever the dosage changed.
- Any adverse reactions including fever, chills, nausea, vomiting, dry mouth, dysrhythmias, hyperglycemia, atelectasis, or agitation were brought to the immediate attention of the pulmonologist. For severe adverse effects, such as symptomatic bradycardia despite treatment, hypovolemia, hypoxia, or at the physician's discretion, dexmedetomidine was discontinued. Additional sedatives and analgesic were not excluded. When the patient required further sedation or pain relief after a dexmedetomidine maximum dose had been achieved, the physicians had the option to order supplementary medications.

Method

- A pretest posttest study design was used to compare differences in MV mean ventilator days following implementation of a dexmedetomidine protocol for ICU patients difficult to extubate during the weaning process.
- SPSS was used to analyze secondary patient data. Descriptive statistics were presented for study variables. Mean and standard deviation were reported for continuous variables. Categorical variables were summarized by frequencies and proportions.
- The *Mann-Whitney U* test was used to examine between group differences in MV mean ventilator days.

Results

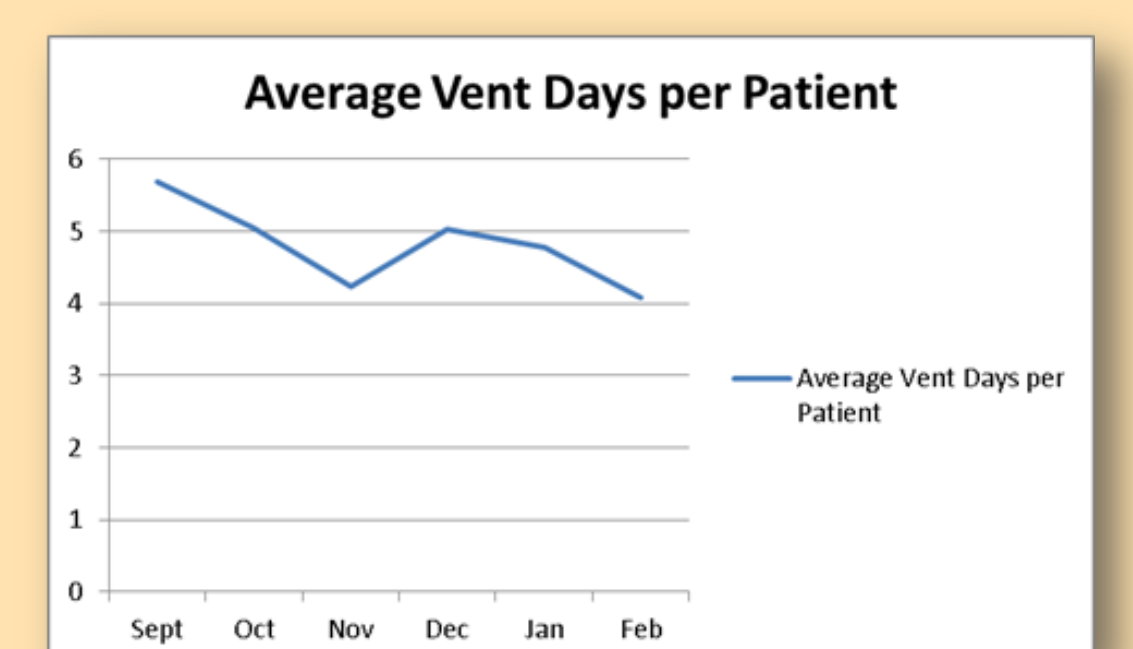
- Over the three-month implementation, approximately 12.5% ($n=15$) of ICU patients were placed on the dexmedetomidine protocol. Most of the patients ($n=9$) were female. The average age of patients was 60.13 years.
- None of the patients experienced adverse reactions while on dexmedetomidine. The RASS score was maintained between 1 and -2 for most (86.7%) of the patients. Only two patients were kept at a RASS score of -3.
- Study results revealed a decreasing trend in MV mean ventilator days during the post-implementation period (Table 1). However, the *Mann-Whitney U* test revealed the differences were not statistically significant ($Z = -1.091$, $p = .400$).

Table 1. Mechanical Ventilator Days for ICU Patients

	Pre Implementation	Post Implementation	Dexmedetomidine Protocol
<i>n</i>	94	118	15
Total MV Ventilator Days	471	543	118
Mean MV Ventilator Days	4.99 (<i>SD</i> = 0.726)	4.63 (<i>SD</i> = 0.498)	8.06 (<i>SD</i> = 5.56)

Conclusions and Implications

- Preliminary results support previous literature in that dexmedetomidine reduced ventilator days without cardiopulmonary instability.
- Although the sample size in this study was small, dexmedetomidine was successfully implemented in the SNVMC ICU for patients difficult to extubate during the weaning process. Dexmedetomidine was found to be a safe, effective alternative to traditional sedation.
- The MV mean ventilator days trend, though not statistically significant, was noted to decrease following implementation of the dexmedetomidine protocol. Further studies with longer periods of data collection or a larger sample size would be beneficial for determining if the trend is significant.
- The SNVMC mechanical ventilator sedation order set was adjusted to remove the bolus dose option and to include instructions not to titrate dexmedetomidine for the first 30 minutes after initiation. The protocol was integrated into the institution's medication prescribing system to stabilize the medication administration process.



Contact Information

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