The Efficacy of Interruption of Daily Sedation for Patients Requiring Invasive Mechanical Ventilation

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Abstract

There are various sedation techniques utilized when managing patients requiring mechanical ventilation. In this study we perform a mini review of literature analyzing the use of sedation on ventilated patients. This serves as an important tool to nurse managing these patients to avoid complications and provide the highest quality in patient care.

Keywords: Mechanical Ventilation; Sedation; Nursing

Introduction

There are differences in sedation practice observed during clinical experiences while working with intubated patients. Although the mechanics of artificial ventilation are similar, the practice is different depending on the setting. In the Post Anesthesia Care Unit, ventilator settings and sedation are managed by protocol based on type of procedure, patient age, underlying conditions, and depth of anesthetic clinical scales [1]. In the Neurological Intensive Care Unit, nurses manage mechanical ventilation and sedation by practice parameters and PRN medications in conjunction with intracranial pressure therapy, targeted temperature management, vital sign assessment, and seizure control. In the Neonatal Intensive Care Unit, nurses manage mechanical ventilation and sedation with an emphasis on pain, stress, with special consideration of the effects on neurodevelopment and neurobehavior.

This is an important topic. Providing appropriate sedation is a significant aspect of nursing care for patients receiving mechanical ventilation. In all settings, sedation is required to prevent painful experiences and avoid complications. Nurses must assess patient status and titrate sedation according to patients' needs and their conditions to optimize recovery [1].

This topic is crucial because nurses ensure high-quality care for patients requiring mechanical ventilation. Critical care nurses have special expertise to provide safe and effective sedation while minimizing complications and promoting the return to health.

Materials and Methods

The goal of this analysis is to understand more about the research that is being conducted and how it will impact nursing practice for patients requiring mechanical ventilation. Specifically,

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to examine the role of daily interruption of sedation compared to no daily interruption of sedation.

The following graph summarizes our PICOT question.

PICOT	Definition	Research Question
P	Population to be studied Sample of subjects	Patients who are receiving mechanical ventilation
I	Intervention refers to the treatment that will be provided to the subjects	Daily interruption of sedation during mechanical ventilation
C	Comparison identifies the reference group to compare with the treatment subjects	Compare the patients who are receiving mechanical ventilation who do not receive daily interruption of sedation with those who do receive daily interruption of sedation.
O	Outcome represents effectiveness of the treatment	Duration of mechanical ventilation Mortality Intensive care length of stay Hospital length of stay Adverse outcomes Total doses of sedative medication administered. Quality of life
T	Time describes the duration off data collection	2000-2024

Table 1: PICOT Question.

The key words used in the search of the literature will be "mechanical ventilation AND sedation interruption AND nursing".

CINAHL, MEDLINE, and Cochrane databases were searched to find relevant research articles. Searches were limited to 2000-2024 (inclusive). Searches were limited to key words "mechanical ventilation AND sedation interruption AND nursing". Only English language studies were included. Studies were also limited to free access and full text available through the Internet. Results were sorted by relevancy, number of citations, peer reviewed, and journal reputation. Studies with specific medications in the title were excluded. In the goal of maximizing learning, research articles were further stratified for selection to include articles in which both qualitative and quantitative research were used. Three studies that were selected for this assignment were De Wit [2], Burry [1] and Hetland [3].

Database	Number of articles found	Years searched
CINAHL	9	2000-2024
MEDLINE PUBMED NIH National Library of Medicine	12	2000-2024
Cochrane Library	1	2000-2024

Table 2: Databases Utilized.

De Wit (2008)	Randomized Study comparing sedation algorithm with daily interruption
Discuss why study was conducted (purpose). Include the problem that led to the study.	The goal of this study was to directly compare daily interruption of sedation with sedation algorithms for patients receiving mechanical ventilation. Both strategies have been shown to decrease mechanical ventilation duration. The goal of this study was to directly compare these two strategies to compare the time to a successful extubation.
Identify variables being studied (independent and dependent variables).	The dependent variable was sedation algorithms. The independent variable was using daily interruption of sedation.
Identify hypothesis and/or research question.	Does daily interruption of sedation lead to a shorter length of time to achieve extubation during mechanical ventilation when compared with sedation provided by algorithm.
Identifies design of study and discuss if appropriate to the question. Why or why not?	The study was designed as a randomized study. The participants were divided by chance into two groups to compare a specific outcome to measure the effectiveness of different interventions. It is an appropriate design to compare measured outcomes. Institution Review Board approval was obtained. The study was funded by the National Institute of Health and the American Lung Association, two entities that are free from commercial bias and provide careful oversight.
Discuss sampling strategy used. Identify sample size and discuss how sample size was determined *Identify sample characteristics as well as the inclusion and exclusion criteria*	Sample size calculation determined that 268 patients would need to be enrolled to find a meaningful difference between the two groups. Power calculations were conducted using a log-rank test with 80% power and a two-sided test.
What were the inclusion and exclusion criteria? How did they collect the data?	Inclusion criteria included patients older than 18 years, admission to the Intensive Care Unit, mechanical ventilation, and informed consent. Exclusion criteria included neuromuscular blockade, neuromuscular dysfunction, tracheostomy, and inability to obtain consent. Data was collected daily at the bedside.
Identify statistical tests conducted (data analysis)	To make sure the two groups were equivalent, statistical tests were applied including ANOVA model. Results were compared using ANOVA, Kaplan-Meier analysis, log-rank test, and RASS variable score.
Accurately discuss the results and limitations of the study.	75 patients were enrolled. There was no demographic difference between the two groups. 36 patients exited the study because of death, withdraw from the study, reintubation, or tracheostomy placement. It was found that use of a sedation algorithm was superior to daily interruption of sedation. A limitation of the study the authors considered high incidence of underlying drug addiction and alcoholism which may have impacted responses to sedation. Another limitation was many uncontrolled comorbidities, severity of illness, organ failure in the study population. Another limitation discussed was the lack of a research coordinator available daily at the bedside.
Are there other limitations other than those identified by the author/s?	Too few patients were enrolled to meet the power determination. However, their careful documentation of results would allow their data to be used by other researchers in a meta-analysis. The authors acknowledged the nurses with gratitude but did not include any nurses in the authorship of the paper. The absence of nursing input into study design, implementation, and data collection may have hampered optimal results.

Table 3: Appraisal of Evidence for Use in Practice.

Burry (2014)	Meta-analysis of daily sedation interruption literature
Discuss why study was conducted (purpose). Include the problem that led to the study.	The goal of this review was to compare patients receiving mechanical ventilation who received no daily sedation interruption with those who did receive daily interruption of sedation in patients with mechanical ventilation. An extensive search of the literature was performed to retrieve all relevant studies. Authors identified controlled trials that compared sedation interruption with other sedation strategies. This meta-analysis combined data from multiple studies to achieve sufficient statistical power to answer research questions. The Cochrane Data Library is a well-established organization that presents credible conclusions that are widely trusted. They are funded by governments, global organizations, academic institutions, hospitals, and foundations. They avoid funding from commercial and corporate entities.
Identify variables being studied (independent and dependent variables).	The dependent variable was sedation strategies that did not include sedation interruption. The independent variable was daily interruption of sedation.
Identify hypothesis and/or research question.	Daily sedation interruption is thought to decrease sedation drug exposure and allow a more awake state during mechanical ventilation. The goal of this meta-analysis was to compare the duration of mechanical ventilation in the two groups and to see if there was an impact on mortality, hospital length of stay, adverse events, quality of life, and total amount of sedative used.
Identifies design of study and discuss if appropriate to the question. Why or why not?	Nine databases, trial registration websites, and reference lists were searched to find all available randomized controlled trials. There were no language restrictions. Authors also contacted primary sources for additional information. Nine studies were identified to be used for meta-analysis.
Discuss sampling strategy used. Identify sample size and discuss how sample size was determined.	Two authors independently extracted data from the nine accepted randomized controlled studies. Three other authors assessed the data for bias risks.
What were the inclusion and exclusion criteria? How did they collect the data?	Nine random controlled trials were included in the analysis. Irrelevant studies were excluded.
Identify statistical tests conducted (data analysis)	Data was combined in forest plots using random-effects modeling. Subgroup and sensitivity analysis was done.
Accurately discuss the results and limitations of the study. Are there other limitations other than those identified by the author/s?	Authors did not find strong evidence that daily sedation interruption reduced duration of ventilation. Daily interruption of sedation also did not improve secondary results including mortality, length of ICU stays, length of hospital stays, adverse event rates, total drug consumption or quality of life. Meta-analysis is limited because combining data from independent studies depends on the validity and methodological quality of the included studies.

Table 4: Appraisal of Evidence for Use in Practice.

Hetland (2018)	Qualitative content analysis of nurses' perceptions about sedation for intubated patients.
Discuss why study was conducted (purpose). Include the problem that led to the study.	Nurses are responsible for the administration of sedation to patients who are being mechanically ventilated. The goal of the study was to identify and describe the themes derived from nurses' comments regarding sedation. Nurses are the health professionals at the bedside making direct patient care decisions in real time regarding sedation of these vulnerable and fragile patients. They have a unique point of view.
Identify variables being studied (independent and dependent variables).	Examination of nurses' perceptions of sedation administration practices in mechanically ventilated patients.
Identify hypothesis and/or research question.	What are the themes that concern critical care nurses about when caring for mechanically ventilated patients and sedation administration.
Identifies design of study and discuss if appropriate to the question. Why or why not?	Text data was captured through an electronic survey completed by members of the American Association of Critical Care Nurses. 106,000 members were invited to participate.
Discuss sampling strategy used. Identify sample size and discuss how sample size was determined Identify sample characteristics	This is a qualitative research study where the study population was self-identified. It is a convenient study of participants who were selected based on their availability. They are not drawn randomly from a bigger population. There is no sample size determination in this type of study.
What were the inclusion and exclusion criteria? How did they collect the data?	The participants were included who responded to a single open-ended question at the end of a survey that evaluated nurses' perceptions of current sedation administration practices. Participants who did not respond were excluded.
Identify statistical tests conducted (data analysis)	Qualitative content analytic methods were employed to identify theses among the participants' responses. The text was read word by word to obtain a sense of the whole. Analytic process of theme was developed.
Accurately discuss the results and limitations of the study. Are there other limitations other than those identified by the author/s?	Two main themes were identified. The first theme identified by the nurses was the individual patient's needs. The subtheme was nurses' synthesis of clinical evidence and best practices. Another subtheme was personal and professional perspective. The second theme was related to resources. They wrote about a desire for additional resources for improving patient outcome, more training, better communication tools, and adequate staffing. Nurses endorse recommendations to minimize sedation when possible but encounter many challenges to reach this goal. The study discusses the logistical barriers to offering mechanically ventilated patients' daily interruption of sedation. Limitations of the study include the use of qualitative content analytic methods to examine secondary data. Only one author completed the theme abstraction process. The study material was a small sample of self-selected participants.

Table 5: Appraisal of Evidence for Use in Practice.

Discussion

The three studies presented in this document were strong studies. They were published in peer reviewed journals. The two quantitative studies had Institutional Review Board Approval. The qualitative study was deemed exempt from the requirement of Institutional Board Review approval. Sources of funding was identified in all three studies.

The three studies examined the hypothesis that daily interruption of sedation would be an advantage to mechanically ventilated patients. One of the three studies demonstrated an improvement for patients receiving daily interruption of sedation over patients receiving conventional care. The three studies arrived at similar conclusions by employing different research approaches. The randomized study did not show a statistical difference between the outcome of the two groups. The meta-analysis combining the findings from nine studies did not show a difference in outcome between the two groups. The qualitative study provided a believable explanation that no advantage could be shown by the daily sedation interruption group because the infrastructure limitations of care in current clinical settings could not support the intervention. Participants reported that there was not adequate nursing staffing to allow for interruption of sedation. There was not reliable interdisciplinary communication between members of the healthcare team to allow this practice. There was not sufficient in-service education to allow the technique to be fully optimized by professional staff. In conclusion, this research question could possibly be answered in a laboratory setting but those findings may not be generalized to the clinical setting. Until the healthcare system is committed to patients first and the financial bottom line last, this technique will not be able to be adequately studied or be implemented.

At present in current practice, daily interruption of sedation for mechanically ventilated patients is not used. Biology, pharmacology, physiology, clinical observation, and expert opinions all support the premise, but the clinical studies do not support a change in behavior [4].

Conclusion

No change in practice is supported by the research. To effectively examine if there is an advantage to daily sedation interruption, a better controlled study needs to be designed and carried out.

Nurses must be at the forefront of the study design. Some of the following questions need to be built into the study design.; How do we define and measure the benefits of daily interruption of sedation? What are the measurable patient benefits of earlier extubating and discharge? What are the detriments to this practice like anxiety, agitation, and dangerous self-extubating? What are the financial consequences for the hospital and for insurance payers? Nursing input will be required to define the parameters of length, interval, and timing of the sedation interruption and who is at the bedside keeping the patient safe. This research must be done in a setting that can be generalized to all patient care. Findings at an "ivory tower" research setting or a clinical research center may not be generalizable to care in a community hospital [5].

Nurses are critical participants in the implementation and safety of life-saving mechanical ventilation. They must be a collaborative part of the research team to improve the current practice.

Acknowledgements

Conflict of Interest

None.

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