Implementing a Nurse-Driven Sedation Weaning Protocol and Safety Screening to Increase Daily SATs and SBTs in the ICU: A Quality Improvement Initiative

Emily Guild
ejz55@wildcats.unh.edu

Follow this and additional works at: https://scholars.unh.edu/thesis

Recommended Citation
https://scholars.unh.edu/thesis/1603

This Thesis is brought to you for free and open access by the Student Scholarship at University of New Hampshire Scholars' Repository. It has been accepted for inclusion in Master's Theses and Capstones by an authorized administrator of University of New Hampshire Scholars' Repository. For more information, please contact Scholarly.Communication@unh.edu.
Implementing a Nurse-Driven Sedation Weaning Protocol and Safety Screening to Increase Daily SATs and SBTs in the ICU: A Quality Improvement Initiative

Emily Guild RN, CNL
University of New Hampshire

Faculty Mentor: Dr. Elizabeth Evans DNP, RN, CNL
Practice Mentor: Diane Newcomb MSN, RN, CNL
Date of Submission: July 29, 2022
# TABLE OF CONTENTS

ABSTRACT .......................................................................................................................... 3
INTRODUCTION .................................................................................................................. 4
PROBLEM DESCRIPTION
  GLOBAL PROBLEM ..................................................................................................... 4
  LOCAL PROBLEM ........................................................................................................ 4
LITERATURE REVIEW ..................................................................................................... 5
GLOBAL AIM .................................................................................................................... 9
SPECIFIC AIM .................................................................................................................. 9
METHODS .......................................................................................................................... 9
  CONTEXT ......................................................................................................................... 9
  DESCRIPTION OF THE INTERVENTION ....................................................................... 10
  STUDY OF THE INTERVENTION .................................................................................. 11
  MEASURES .................................................................................................................... 11
  THEORETICAL FRAMEWORK AND RATIONALE ...................................................... 12
  ANALYSIS ..................................................................................................................... 12
  ETHICAL CONSIDERATIONS ....................................................................................... 13
RESULTS ............................................................................................................................ 13
DISCUSSION ..................................................................................................................... 17
LIMITATIONS .................................................................................................................... 20
CONCLUSION ................................................................................................................... 21
REFERENCES .................................................................................................................... 22
APPENDIX A: PRISMA CHECKLIST ............................................................................. 25
APPENDIX B: SAT/SBT SAFETY SCREENING ............................................................... 26
APPENDIX C: RASS SCORE ............................................................................................ 27
APPENDIX D: SEDATION WEANING PROTOCOL ......................................................... 28
Abstract

BACKGROUND: Spontaneous awakening trials and spontaneous breathing trials are completed with patients receiving mechanical ventilation who have passed the safety protocols for initiation and involve a daily trial of turning off sedation and ventilator settings to allow the patient to wake up and breathe spontaneously (Marra et al., 2016). These trials ultimately assist in the weaning of both sedation dosages and ventilator settings over time, leading to eventual extubation for the patient. For the best clinical outcomes, the current recommendations for implementation in practice include the combination of a daily SAT and SBT. Patients who received both an SAT and SBT daily, spent four fewer days in the ICU and had a 14% reduction in 1-year mortality when compared with those who received the SBT only (Stollings et al., 2019).

METHODS: Retrospective chart audits were completed for the three-month time period prior the implementation of the intervention in order to collect the baseline data and determine the current rate of daily SATs and SBTs in mechanically ventilated patients in the ICU. A descriptive statistical analysis was completed to identify the percentage increase or decrease of the post-intervention data when compared to the established baseline data.

INTERVENTIONS: An online, educational PowerPoint training was assigned to all nurses on the unit for their completion prior to the initiation of the new processes. This PowerPoint included images directly from Meditech in order to maximize nurses’ understanding and implementation of the process and documentation. The training also included information highlighting the impact of daily SATs/SBTs on patient outcomes and the evidence supporting the implementation of nurse driven sedation weaning protocols. A laminated educational sheet was posted at the computer workstation in each patient room in the ICU to serve as a reminder to complete the SAT/SBT safety screen and sedation weaning, if deemed safe and clinically appropriate by the nurse.

RESULTS: The baseline rate of daily completion of SATs was 52.3% and the baseline rate of completion of SBTs was 66.6%. In total, over the course of the data collection time period, there was a mean increase of 24.9% in the completion of both SATs and SBTs in the ICU.

CONCLUSION: The combined implementation of nurse education, an SAT/SBT safety screening, and a nurse-driven sedation weaning protocol contributed to an increase in the daily rates of completion of both SATs and SBTs for patients receiving mechanical ventilation in the ICU, surpassing the specific aim of a 10% increase.

Keywords: spontaneous breathing trial, spontaneous awakening trial, intensive care unit, sedation-weaning protocol, nurse-driven protocol, SAT safety screening, SAT/SBT
Introduction

Patients in the intensive care unit (ICU) receiving mechanical ventilation and sedating medications are at an increased risk of developing multiple complications including pneumonia, delirium, and other cognitive and neurological changes (Marra et al., 2016). One of the identified methods of decreasing the prevalence of ICU delirium and ventilator-associated pneumonia is to complete spontaneous awakening trials (SATs) and spontaneous breathing trials (SBTs) for patients on mechanical ventilation and sedating medications. This process involves a daily trial of weaning the patient off sedation and ventilator support in order to allow the patient to wake up and then assess the patient’s cognitive and respiratory status.

Problem Description

Global Problem

ICU delirium is defined as a sudden onset of a disturbance in consciousness accompanied by a change in perception and cognition (Kotfis, Marra, & Ely, 2018). Research has identified a causation relationship between ICU delirium and increased mortality rates, prolonged mechanical ventilation and hospital stays, increased treatment costs, and long-term cognitive disturbances (Kotfis, Marra, & Ely, 2018). To address this problem, an evidence-based ICU liberation bundle, including daily SATs and SBTs for clinically appropriate patients, has been identified as best practice in preventing ICU delirium and minimizing complications for patients on mechanical ventilation (Pun et al., 2019).

Local Problem

While the established research supports the daily performance of SATs and SBTs in mechanically ventilated patients in the ICU setting, they are completed in just 40% of eligible
patients (Balas et al., 2022). Increased implementation of daily SATs and SBTs would increase adherence to the ABCDE protocol for ICU liberation and is likely to improve outcomes such as decreased mortality rates, decreased days on mechanical ventilation, and decreased long-term cognitive deficits for ICU patients (Kotfis, Marra, & Ely, 2018). Despite the evidentiary support, at the site of this quality improvement project, daily SATs are completed, on average, in 52.3% of established opportunities and SBTs are completed in 66.6% of opportunities (Diane Newcomb, personal communication, June 2022), thus, negatively impacting quality of patient care in the ICU.

Literature Review

Available Knowledge

This literature review was conducted via a database search of CINAHL, PubMed, and Cochrane Library utilizing the keywords of SAT/SBT, intensive care unit, nurse-driven protocol, and sedation weaning (Appendix A). Studies were excluded based on year of completion and publication, duplicate results, and the quality of results. In total, ten studies were utilized for analysis, which provided valid and reliable results supporting the implementation of daily SATs and SBTs within the ICU.

Annually in the United States, approximately 5.7 million people will be admitted to the intensive care unit (ICU) with roughly 30% requiring mechanical ventilation (Lancaster et al., 2022). While mechanical ventilation may be a lifesaving intervention, it can also cause unfavorable comorbidities for patients with prolonged use. For example, patients receiving prolonged mechanical ventilation are at a higher risk for developing ventilator-associated pneumonia, sedation-related neurological and cognitive changes, extended hospitalizations, and mortality (Marra et al., 2017). Therefore, optimizing patient outcomes is crucial, not only for the
patient’s long term cognitive and physical status, but to reduce hospitalizations and associated costs as well.

Patients receiving invasive mechanical ventilation require pharmacological sedation to maintain synchronicity with the ventilator, decrease agitation and pain, and promote patient comfort. Prolonged exposure to these medications can have detrimental effects on the patient’s cognitive and neurological status and increases the patient’s likelihood of developing acute brain dysfunction and delirium (Green & Staffileno, 2021). Delirium is characterized by alterations in consciousness and disorganized thinking that develop quickly and fluctuate over time. Studies estimate that delirium affects up to 80% of patients within the ICU setting (Lancaster et al., 2022).

Research has shown that patients who develop ICU delirium as a result of prolonged use of sedative medications have poorer outcomes in the short and long term. Specifically, maintenance of a deeply sedated state within the patient’s first 48 hours of admission to the ICU contributes to delayed extubation, increased instances of tracheostomy placement, and higher overall mortality rates (Marra et al., 2016). In fact, for every Richmond Agitation-Sedation Scale (RASS) score in the deep sedation category within the patient’s first 48 hours, the patient’s time to extubation was delayed by 12.3 hours, there was a 10% increased risk of mortality within the hospital, and an 8% increased risk of mortality within 6 months (Marra et al., 2016). As a result of these staggering statistics, the Society of Critical Care Medicine established an ABCDEF bundle for ICU liberation that provides evidence-based guidelines for implementing interventions with the goal of reducing comorbidities and mortality for patients on mechanical ventilation in the ICU (Lancaster et al., 2022).
The ABCDEF bundle includes six elements of care: “Assess, prevent, and manage pain; Both spontaneous awakening trials (SATs) and spontaneous breathing trials (SBTs); Choice of sedation and analgesia; Delirium assessment, prevention and management; Early mobility and exercise; and Family communication and involvement” (Pun et al., 2019, pg. 163). Daily implementation of the ABCDEF bundle in the ICU has been shown to have significant, positive impacts on the clinical outcomes for critically ill patients including reductions in mortality, delirium, and use of physical restraints (Pun et al., 2019). More specifically, a recent study found that patients spent three more days breathing on their own without mechanical ventilation and experienced nearly a 50% reduction in the instances of delirium as a result of daily ABCDEF bundle implementation (Balas et al., 2022).

The main component of the ICU liberation bundle that is related to managing patients’ prolonged sedation is B (both SATs and SBTs). Spontaneous awakening trials and spontaneous breathing trials are completed with patients receiving mechanical ventilation who have passed the safety protocols for initiation and involve a daily trial of turning off sedation and ventilator settings to allow the patient to wake up and breathe spontaneously (Marra et al., 2016). These trials ultimately assist in the weaning of both sedation dosages and ventilator settings over time, leading to eventual extubation for the patient. For the best clinical outcomes, the current recommendations for implementation in practice include the combination of a daily SAT and SBT. Patients who received both an SAT and SBT daily, spent four fewer days in the ICU and had a 14% reduction in 1-year mortality when compared with those who received the SBT only (Stollings et al., 2019).

While the current research and recommendations support the implementation of daily SATs and SBTs for patients on mechanical ventilation in the ICU, the actual performance of
these interventions remains low. In fact, a recent study concluded that performance rates were lowest for SATs/SBTs and early mobility out of the six elements of the ABCDEF bundle, with SATs/SBTs being completed in less than 40% of eligible patients (Balas et al., 2022). An additional study corroborated these findings as well, concluding that prior to the implementation of a nurse-driven sedation weaning protocol, daily SATs were performed on just 40% of eligible patients (Green & Staffileno, 2021).

There are a multitude of reasons that lead to decreased implementation of daily SATs and SBTs including concerns for patient safety related to increased agitation and aggression with sedation weaning, risk of self-extubation, asynchrony with ventilator, and need for physical restraints. However, one of the more widely studied reasons for the decreased rate of implementation of daily SATs and SBTs is the variability of (or complete lack of) screening criteria and sedation weaning protocols. Specifically, a recent preintervention-postintervention retrospective cohort study found that the use of a nurse-driven, spontaneous awakening trial protocol led to a higher SAT and SBT completion rate and resulted in a shorter duration of sedation infusion for patients in the cardiac ICU (Ketcham et al., 2022). This nurse-driven protocol included a patient safety screening to assess for clinical readiness for the trials as well as provided a sedation tapering guideline for nurses to follow (if concerned for patient’s safety) versus a sudden shut off of sedation (Ketcham et al., 2022). Within the current research, there is a need for further quality improvement studies focused on increasing the ratio of the number of SATs and SBTs completed to the number of days patients were eligible for trial in order to improve patient outcomes in the ICU setting.

Based on the available research, the performance of daily SATs and SBTs for patients who are receiving mechanical ventilation in the ICU needs improvement. Following a clinical
microsystem assessment in a twenty-bed ICU at a level two trauma center in New Hampshire, a quality improvement initiative focused on increasing performance of daily SATs and SBTs was deemed timely, clinically indicated, and feasible to complete.

**Global Aim**

The global aim of this quality improvement project was to increase the percentage of patients on mechanical ventilation who participated in daily spontaneous awakening (SAT) and spontaneous breathing trials (SBT) in the intensive care unit (ICU) at a level two trauma center in New Hampshire.

**Specific Aim**

The specific aim of this quality improvement project was to generate a 10% increase from the baseline of 52.3% of daily SATs and 66.6% of SBTs completed on medically appropriate patients receiving mechanical ventilation in the ICU by July 2022.

**Methods**

Patients were screened using the SAT/SBT readiness screening tool within the Meditech EMR system. For patients who passed the screening, a daily SAT and SBT was completed with the use of a nurse-driven sedation weaning protocol, as indicated, and was documented within the EMR. A descriptive statistical analysis was completed to identify the percentage increase or decrease of the post-intervention data when compared to the established baseline data.

**Context**

The project was conducted in a twenty-bed cardiac and medical intensive care unit (ICU) in a level two trauma center in New Hampshire. The patient population is primarily patients who are in critical condition due to a variety of medical diagnoses that typically result in multi-organ system failures requiring intervention. The length of stay varies based on diagnosis – cardiac
surgery patients tend to have a shorter length of stay of three to five days, while medical patients can have a length of stay of up to several months depending on medical complexity and disease severity. Most of the patients within the ICU require invasive mechanical ventilation.

An analysis of the cost to benefit ratio of this interventional study yielded that the costs were minimal, and the protocol could be printed and laminated using supplies already on the unit. The benefits of implementing a protocol and increasing nurses’ education on the importance of daily SATs and SBTs has the potential to decrease complications associated with invasive mechanical ventilation, more specifically, decrease the incidence of ICU delirium and ventilator associated pneumonia – both of which contribute to increased costs and use of resources. For example, it is estimated that a diagnosis of ICU delirium contributes to a cost increase of $600 per day (Vasilevskis et al., 2018) and a diagnosis of ventilator associated pneumonia contributes to a cost increase of approximately $17,472 due to an increased ICU length of stay and use of mechanical ventilation and sedating medications (Luckraz et al., 2017). Therefore, the potential benefits and future cost savings of implementation outweighed the costs related to this intervention.

**Description of the Intervention**

In order to achieve the intended goal of increasing the ratio of the number of SATs and SBTs completed to the number of days patients were eligible for trials, retrospective chart audits and reviews were utilized to collect the baseline data and determine the current rate of daily SATs and SBTs in mechanically ventilated patients in the ICU. A nurse-driven, sedation weaning protocol (Appendix B) was implemented on the unit and nurses were provided with education regarding the steps and documentation of the protocol within Meditech. Additionally, a copy of the protocol was posted in every ICU room for reference. Nurses were instructed to
complete the SAT and SBT readiness screening daily within Meditech, then proceed to the sedation weaning protocol as clinically indicated to complete the SAT and SBT safely.

**Study of the Intervention**

The successful implementation of the nurse-driven, sedation weaning protocol to increase the rate of completion of daily SATs and SBTs in the ICU is dependent on collaboration, communication, and coordination within the interdisciplinary care team. The team includes nurses: the treating nurse, charge nurse, clinical nurse leader (CNL), and nurse manager, physician, pharmacist, respiratory therapist (RT), and licensed nursing assistant (LNA). The impact of the intervention will be assessed by completing a descriptive statistical analysis comparing the baseline rates of completion of daily SATs and SBTs to the rates of completion of daily SATs and SBTs post-intervention utilizing retrospective chart audits.

**Measures**

The descriptive statistical analysis included determining the mean completion rate of daily SATs and the mean completion rate of daily SBTs for the three-month time period prior to the initiation of the intervention. Next, on a weekly basis, the mean completion rates for SATs and SBTs were determined and compared to the baseline mean to determine the percentage difference between the two means. This process was completed for each week of the intervention and data collection period which spanned five weeks total. Lastly, the percentage differences from each week were averaged together to produce a total mean figure that represents the mean difference of post-intervention data when compared to the baseline mean. While this descriptive statistical analysis does not define a causation relationship between the variables, it highlights a relationship between the implementation of the intervention and daily completion rates of SATs and SBTs.
Theoretical Framework and Rationale

Two theoretical frameworks were utilized for this quality improvement project: the Plan-Do-Study-Act (PDSA) framework (IHI, 2015) and the Johns Hopkins Nursing Evidence Based Practice Model. The PDSA framework involves four steps. First, in the planning phase, baseline data for the current rate of performance of daily SATs and SBTs was determined, a literature review was conducted, and a plan for data collection was established. In the doing phase, the nurse-driven sedation weaning protocol was initiated and data was collected post-intervention by conducting chart audits. In the study phase, the post-intervention data was compared to the baseline data to determine if there was an improvement in the completion of daily SATs and SBTs in the ICU. Lastly, in the act phase, conclusions and practice recommendations were made.

The second framework that was utilized was the Johns Hopkins Nursing Evidence Based Practice Model (Dang & Dearholt, 2017). This model provides the framework for incorporating evidence-based practices into direct patient care. Specifically, this model creates a detailed outline for establishing the problem, reviewing the available evidence, and then implementing the evidence-based intervention. In the context of this quality improvement project, the model was utilized to form an action plan for implementing the use of the nurse-driven sedation weaning protocol into practice on the unit in order to increase the performance of SATs and SBTs, an evidence-based intervention that is considered best practice.

Analysis

Both the baseline data and post-intervention data were collected using the same procedure. Within the EMR, patients who were deemed clinically appropriate for participation were identified using the SAT and SBT readiness scale within the Meditech EMR system. This data was then compared to the number of daily SATs and SBTs that were completed and
documented within Meditech. This procedure was completed both before and after the intervention. The mean of daily SAT/SBT completion pre-intervention data and the mean of daily SAT/SBT completion post-intervention data were compared using descriptive statistical analysis.

**Ethical Considerations**

An identified conflict of interest is present as a result of the author being an employee of the unit where the quality improvement project was implemented. Patient confidentiality was maintained throughout the implementation of this project as the retrospective chart audits were conducted utilizing an arbitrary numerical system. Additionally, this proposal was reviewed by the University of New Hampshire Department of Nursing Quality Review Committee for verification as a quality improvement project which is exempt from Institutional Review Board (IRB) approval.

**Results**

**Initial Steps**

Beginning in May 2022, retrospective chart reviews were completed on all patients who received mechanical ventilation in the ICU during the previous three-month period in order to determine the baseline percentage of completion of daily SATs/SBTs. An online, educational PowerPoint training was assigned to all nurses on the unit for their completion prior to the initiation of the new processes. This PowerPoint included images directly from Meditech in order to maximize nurses’ understanding and implementation of the process and documentation. The training also included information highlighting the impact of daily SATs/SBTs on patient
outcomes and the evidence supporting the implementation of nurse driven sedation weaning protocols. A laminated educational sheet was posted at the computer workstation in each patient room in the ICU to serve as a reminder to complete the SAT/SBT safety screen and sedation weaning, if deemed safe and clinically appropriate by the nurse. Lastly, retrospective chart audits were completed on every patient who received mechanical ventilation for the month of June 2022 to determine the rate at which daily SATs/SBTs were completed for comparison to the baseline data (Figure 1).

A modification that was made to the intervention included the removal of a pre-intervention survey of nurses on the unit to determine their readiness for a change in process. This was unable to be completed due to the timing of the rollout of the intervention and deemed unnecessary due to the intervention being implemented based on the significant evidentiary support.

**Process Measures**

A descriptive statistical analysis was completed comparing the baseline mean completion rate with the mean SAT/SBT daily completion rates that were collected weekly in June 2022 (Figure 2). In the first week post-intervention, there was a 22.7% increase in the daily SATs that were completed and a 33.4% increase in the daily SBTs that were completed as compared to the
baseline data. In the second week post-intervention, there was a 29.2% increase in completion of daily SATs and a 19.1% increase in the completion of daily SBTs. In the third week post-intervention, there was a 24% increase in the completion of daily SATs and a 29.4% increase in the completion of daily SBTs. In the fourth week post-intervention, there was a 16.7% increase in the completion of both daily SATs and SBTs. Lastly, in the fifth week post-intervention, there was a 31.7% increase in the completion of daily SATs and a 25.7% increase in the completion of daily SBTs. In total, over the course of the data collection time period, there was a mean increase of 24.9% in the completion of both SATs and SBTs on the unit.

**Figure 2**

<table>
<thead>
<tr>
<th></th>
<th>Vented Patients</th>
<th>Average RASS score</th>
<th>Daily SAT completion (%)</th>
<th>Daily SBT completion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline Data</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mar-June</strong></td>
<td>62</td>
<td>-2.54392421</td>
<td>52.3%</td>
<td>66.6%</td>
</tr>
<tr>
<td><strong>Week 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5/29-6/5</td>
<td>21</td>
<td>-2.378273611</td>
<td>75.0% (+22.7%)</td>
<td>100.0% (+33.4%)</td>
</tr>
<tr>
<td><strong>Week 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6/5-6/12</td>
<td>18</td>
<td>-2.2163025</td>
<td>81.5% (+29.2%)</td>
<td>85.7% (+19.1)</td>
</tr>
<tr>
<td><strong>Week 3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6/12-6/19</td>
<td>22</td>
<td>-2.394795942</td>
<td>76.3% (+24.0%)</td>
<td>96.0% (+29.4%)</td>
</tr>
<tr>
<td><strong>Week 4</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6/19-6/26</td>
<td>19</td>
<td>-1.397381143</td>
<td>69.0% (+16.7%)</td>
<td>83.3% (16.7%)</td>
</tr>
<tr>
<td><strong>Week 5</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6/26-7/3</td>
<td>18</td>
<td>-2.174432941</td>
<td>84.0% (+31.7%)</td>
<td>92.3% (+25.7%)</td>
</tr>
<tr>
<td><strong>Avg Total</strong></td>
<td></td>
<td></td>
<td>+24.9%</td>
<td>+24.9%</td>
</tr>
</tbody>
</table>

**Contextual Elements**

Throughout the implementation and data collection phase, there was an observed level of teamwork in order to successfully complete the daily SATs/SBTs on mechanically ventilated patients. As part of the new process that was implemented, the provider automatically placed a
standing order for the ABCDE protocol for all patients who were receiving mechanical ventilation, thus, giving the nurse the autonomy to complete the daily SAT/SBT if he or she deemed the patient was safe and the patient passed the established safety screening. This eliminated the time period of waiting for a provider’s order which delayed the completion of SAT/SBTs in the past on the unit. As a result, the coordination of the implementation could take place between the nurse and respiratory therapist with a licensed nursing assistant as needed to maintain patient safety, thus, improving coordination of care. Additionally, the clinical nurse leader (CNL) and unit educator were both involved in providing feedback to individual nurses to encourage the completion of the SAT/SBT safety screen each shift.

**Associations**

Following the implementation of the online, educational PowerPoint training, the SAT/SBT safety screening, and the nurse-driven sedation weaning protocol, there was an average total increase of 24.9% in both the daily completion of SATs and SBTs in the ICU. Additionally, there was observed collaboration specifically between nurses, respiratory therapists, and licensed nursing assistants in order to increase the completion of daily SATs/SBTs. Within the month time period of data collection, staff members were observed to be making a daily SAT/SBT more of a routine occurrence and having daily conversations in order to coordinate their efforts.

As part of the online educational training that was provided to all staff nurses on the unit, there was a section with statistics related to the benefits of daily SATs/SBTs including: decreased days spent on mechanical ventilation, decrease in instances of ventilator-associated pneumonia, decreased instances of ICU-associated delirium, decreased lengths of stay, and reduced patient mortality. There was also a slide containing the current rates of completion of
INCREASE DAILY SATS AND SBTS IN THE ICU

SATs and SBTs on the unit in order to highlight the areas for improvement. In combination, these pieces of information established increasing daily SATs/SBTs as a unit-wide goal and a priority for nursing staff.

**Unintended Consequences**

As a result of the implementation of the SAT/SBT safety screening and nurse driven sedation weaning protocol, an additional area of opportunity for improvement was identified. During the retrospective chart review process, it was noted that the average Richmond Agitation-Sedation Scale (RASS) scores were in the -2 to -3 range, which indicates a light to moderate level of sedation. A potential area of improvement would be to assess nurses’ understanding of the RASS scoring and to implement an intervention to achieve lighter average sedation scores for patients. This may increase the success of SATs and SBTs and lead to decreased ventilation days, thus, improving patient care and patient outcomes.

**Missing Data**

Patients who were intubated and placed on mechanical ventilation for a surgical procedure but extubated within 24 hours were exempt from the data collection. Additionally, if a patient was deemed unsafe or clinically inappropriate for the implementation of an SAT/SBT, for example, a failed safety screening, that patient was exempt from the data collection for that clinical day.

**Discussion**

The post-intervention results supported that the implementation of an SAT/SBT safety screen and a nurse-driven sedation weaning protocol would contribute to an increase in the daily completion rates of daily SATs and SBTs in the ICU environment. More specifically, the implementation resulted in an average increase of 24.9% in the daily completion rate of both
SATs and SBTs for patients deemed clinically safe for trial in the ICU over a 5-week time period. The baseline rate of completion of daily SATs was lower than the daily completion rate for SBTs (52.3% vs 66.6%), however, the average increase in completion rates was found to be the same at the end of the data collection phase (+24.9%). Additionally of note, the first week of the data collection phase post-intervention yielded the highest increase in completion of daily SBTs (+33.4%), whereas the last week of the data collection phase yielded the high increase in completion of daily SATs (+31.7%).

There have been other studies that have been completed that involved the implementation of a nurse-driven sedation weaning protocol and the assessment of outcomes such as daily completion rates of SATs/SBTs, days on mechanical ventilation, and patient mortality rates. For example, in a 2021 study completed in an ICU, the implementation of nurse-driven protocol resulted in an increase of 35% in daily SATs that were documented and resulted in statistically significant increase in the rate of daily SATs that were performed (Green & Staffileno, 2021). Additionally, in a 2022 study completed in a cardiac ICU, a nurse-driven protocol was implemented which resulted in a higher SAT completion rate and a decreased duration of sedation infusions (Ketchum et al., 2022). While not a focus of this quality improvement initiative, research studies have also been completed that connect an increase in daily SATs and SBTs with improved clinical outcomes for patients including spending four fewer days in the ICU and a 14% reduction in 1-year mortality rates, when compared to patients receiving mechanical ventilation who did not participate in daily SATs/SBTs (Stollings et al., 2019).

In addition to impacting patient’s clinical outcomes, an increase in daily completion of SATs/SBTs can decrease the instances of ICU delirium, a common complication related to prolonged use of sedative medications (Marra et al., 2016). Conclusions from a 2018 study that
focused on the financial impacts of ICU delirium stated that over a 30-day period, a diagnosis of ICU delirium contributed to an $18,000 increase cumulative costs of care, averaging to approximately an additional $600 per day. However, because the mortality rate for patients diagnosed with ICU delirium is significantly higher than those without delirium, researchers estimated this total would be 20% higher (Vasilevskis et al., 2018). By increasing the implementation of SATs and SBTs, ICU delirium is reduced. Therefore, the results of this quality improvement project have the potential to contribute to significant financial savings and resource conservation.

The results of this quality improvement project impact patients’ clinical outcomes and quality of care while also impacting the nurses’ role in patient care and within the health care team. An increase in the daily rates of SATs/SBTs has been proven to have positive impacts on clinical outcomes and aligns with best nursing practice for patients on mechanical ventilation in the ICU. Additionally, by providing nurses with increased autonomy to utilize clinical knowledge and judgment, the implementation of a nurse-driven sedation weaning protocol can lead to nurses’ increased feelings of job satisfaction, independence, and confidence in clinical abilities. Furthermore, the use of a nurse-driven protocol provides nurses with the opportunity to develop clinical leadership skills by organizing the team approach to daily SAT/SBT completion.

This quality improvement project adds to the available literature regarding the implementation of nurse-driven sedation weaning protocols and further adds to the association between the implementation of the protocol and increased rates of completion of daily SATs and SBTs. Additionally, this quality improvement project aligns with evidence-based nursing practice that supports increased quality of patient care and improved clinical outcomes for patients receiving mechanical ventilation in the ICU.
Limitations

While the data collected post-intervention supports the continued use of an SAT/SBT screening tool and nurse-driven sedation weaning protocol, there were multiple limitations to this quality improvement initiative that were identified. First, the post-intervention data and conclusions are only generalizable to the population of patients on mechanical ventilation within the ICU environment, which is a relatively small population when compared to the rest of the hospital population. Specifically, the ICU population studied during this initiative included a small sample size, making accurate generalizations more difficult. Secondly, the time period for data collection during this quality improvement project was short, spanning only five weeks. In order to increase the strength of the data and establish more reliable trends, an increased data collection period is warranted. Similarly, the baseline data used for comparison included the three-month time period just prior to the initiation of the intervention, thus, analyzing data from a longer period would have increased the validity of the baseline percentages. Lastly, the author of this report of findings was hired as a registered nurse on the unit where this quality improvement project was completed prior to the initiation of the intervention, contributing to a level of bias.

In order to minimize the impact of the previously stated limitations, the author collaborated with the ICU clinical nurse leader (CNL) for all data collection and with the ICU nurse educator for the implementation of the nurse education and resources in each patient room. Additionally, a descriptive statistical analysis was completed as opposed to an inferential statistical analysis based on the short time frame of data collection and the strength of the data collected.
Conclusion

In conclusion, the combined implementation of nurse education, an SAT/SBT safety screening, and a nurse-driven sedation weaning protocol contributed to an increase in the daily rates of completion of both SATs and SBTs for patients receiving mechanical ventilation in the ICU by 24.9%, thus, surpassing the specific aim of a 10% increase. These findings add to the growing literature in the field of critical care nursing that highlights the positive impact that nurse-driven sedation weaning protocols have on increasing daily SATs/SBTs within the ICU environment. These findings should solidify the completion of daily SATs and SBTs as a priority treatment for patients receiving mechanical ventilation. Additionally, these findings should motivate further investment into educational resources regarding the clinical benefits of daily SATs and SBTs and expansion of nurse-driven protocols within the ICU. Future research studies should aim to study the impact of moderate to severe RASS scores on the success of daily SATs and SBTs, as this may be an area for improvement in ICU nurse education and clinical practice.
References


Luckraz, H., Manga, N., Senanayake, E. L., Abdelaziz, M., Gopal, S., Charman, S. C., Giri, R.,


Appendix A

PRISMA 2009 Flow Diagram

Records identified through database searching
Keywords: SAT/SBT, (n = 635)

Additional records identified through other sources
(n = 55)

Records after duplicates removed
(n = 394)

Records screened
(n = 156)

Records excluded
Reasons: year of publication, full text article availability
(n = 93)

Full-text articles assessed for eligibility
(n = 63)

Full-text articles excluded
Reasons: quality of evidence, repetitive results
(n = 53)

Studies included in qualitative synthesis
(n = 2)

Studies included in quantitative synthesis
(meta-analysis)
(n = 8)
### Appendix B

#### SAT FAILURE (Opt)

1. Anxiety, Agitation, or Pain
2. Resp Rate greater 35/min
3. SpO2 less 88%
4. Respiratory Distress
5. Acute Cardiac Arrhythmia
6. ICP greater 20mm Hg

<table>
<thead>
<tr>
<th>SAT Safety Screen Pass:</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>If NO - Reason:</td>
<td>still a candidate</td>
</tr>
<tr>
<td>SAT done:</td>
<td>Y</td>
</tr>
<tr>
<td>SAT Pass:</td>
<td>N</td>
</tr>
<tr>
<td>If NO - Reason:</td>
<td>X</td>
</tr>
</tbody>
</table>

#### SBT SCREENING FAILURE

1. Agitation
2. Oxygen Sat less/equal 88%
3. FiO2 greater/equal 50%
4. PEEP greater/less 7.5cm
5. Myocardial Ischemia
6. Vasopressor Use
7. No Inspiratory Efforts

<table>
<thead>
<tr>
<th>SBT Screening Pass:</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>If NO - Reason:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>PT. STILL CANDIDATE</td>
<td></td>
</tr>
<tr>
<td>SBT Pass:</td>
<td>Y</td>
</tr>
<tr>
<td>If NO - Reason:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

INCREASE DAILY SATS AND SBTS IN THE ICU
Appendix C

STEP 1

RICHMOND AGITATION-SEDATION SCALE (RASS)

<table>
<thead>
<tr>
<th>Scale</th>
<th>Label</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+4</td>
<td>COMBATIVE</td>
<td>Combative, violent, immediate danger to staff</td>
</tr>
<tr>
<td>+3</td>
<td>VERY AGITATED</td>
<td>Pulls to remove tubes or catheters; aggressive</td>
</tr>
<tr>
<td>+2</td>
<td>AGITATED</td>
<td>Frequent non-purposeful movement, fights ventilator</td>
</tr>
<tr>
<td>+1</td>
<td>RESTLESS</td>
<td>Anxious, apprehensive, movements not aggressive</td>
</tr>
<tr>
<td>0</td>
<td>ALERT &amp; CALM</td>
<td>Spontaneously pays attention to caregiver</td>
</tr>
<tr>
<td>-1</td>
<td>DROWSY</td>
<td>Not fully alert, but has sustained awakening to voice (eye opening &amp; contact &gt;10 sec)</td>
</tr>
<tr>
<td>-2</td>
<td>LIGHT SEDATION</td>
<td>Briefly awakens to voice (eyes open &amp; contact &lt;10 sec)</td>
</tr>
<tr>
<td>-3</td>
<td>MODERATE SEDATION</td>
<td>Movement or eye opening to voice (no eye contact)</td>
</tr>
</tbody>
</table>

If RASS is ≥ -3 proceed to CAM-ICU (is patient CAM-ICU positive or negative?)

<table>
<thead>
<tr>
<th>Scale</th>
<th>Label</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4</td>
<td>DEEP SEDATION</td>
<td>No response to voice, but movement or eye opening to physical stimulation</td>
</tr>
<tr>
<td>-5</td>
<td>UNAROUSEABLE</td>
<td>No response to voice or physical stimulation</td>
</tr>
</tbody>
</table>

If RASS is -4 or -5 STOP (patient unconscious), RECHECK later

Sessler, et al., Am J Respir Crit Care Med 2002; 166: 1338-1344
Bu, et al., JAMA 2003; 289: 2983-2991
Appendix D

<table>
<thead>
<tr>
<th>YES/NO</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>Yes</td>
</tr>
</tbody>
</table>

| Spontaneous Awakening Trial (SAT) Safety Screen Performed: | ✓ |
| Spontaneous Breathing Trial (SBT) Safety Screen Performed: | ✓ |
| RT-Spontaneous Breathing Trial (SBT) Vent Settings:       |   |
| RASS/CAM-ICU Assessment:                                  |   |
| Early Mobility Screening Performed:                      |   |

RASS Target Value: ≤3