2021

THE ROLE OF REHABILITATION SERVICES IN MANAGING DELIRIUM IN THE ICU: A RETROSPECTIVE CHART REVIEW

Veronique MUNIER
Eastern Kentucky University, veronique_munier@yahoo.com

THE ROLE OF REHABILITATION SERVICES
IN MANAGING DELIRIUM IN THE ICU:
A RETROSPECTIVE CHART REVIEW

Presented in Partial Fulfillment of the

Requirements for the Degree of

Doctor of Occupational Therapy

Eastern Kentucky University

College of Health Sciences

Department of Occupational Science and Occupational Therapy

EASTERN KENTUCKY UNIVERSITY

COLLEGE OF HEALTH SCIENCES

DEPARTMENT OF OCCUPATIONAL SCIENCE AND OCCUPATIONAL THERAPY

This project, written by Veronique Munier under direction of Dr Dana Howell, Faculty Mentor, and approved by members of the project committee, has been presented and accepted in partial fulfillment of requirements for the degree of

DOCTOR OF OCCUPATIONAL THERAPY

CAPSTONE COMMITTEE

Dana Howell 12/2/2021

________________________________ ____________

Date

Faculty Mentor

Renee Causey-Upton 12/3/2021

________________________________ ____________

Date

Committee Member

EASTERN KENTUCKY UNIVERSITY

COLLEGE OF HEALTH SCIENCES

DEPARTMENT OF OCCUPATIONAL SCIENCE AND OCCUPATIONAL THERAPY

CERTIFICATION OF AUTHORSHIP

Submitted to (Faculty Mentor's Name): ______Dr Dana Howell________________

Student's Name: __________________Veronique Munier______________________

Title of Submission: ___ The Role of Rehabilitation Services in Managing Delirium in the ICU: A Retrospective Chart Review ______________________________________

Certification of Authorship: I hereby certify that I am the author of this document and that any assistance I received in its preparation is fully acknowledged and disclosed in the document. I have also cited all sources from which I obtained data, ideas, or words that are copied directly or paraphrased in the document. Sources are properly credited according to accepted standards for professional publications. I also certify that this paper was prepared by me for this purpose.

Student's Signature: ______________________________________

Date of Submission: 12/02/2021

EASTERN KENTUCKY UNIVERSITY

COLLEGE OF HEALTH SCIENCES

DEPARTMENT OF OCCUPATIONAL SCIENCE AND OCCUPATIONAL THERAPY

Certification

We hereby certify that this Capstone project, submitted by Veronique Munier conforms to acceptable standards and is fully adequate in scope and quality to fulfill the project requirement for the Doctor of Occupational Therapy degree.

Approved:

Shirley P. O'Brien ____________________ 12- 02-2021_____

Shirley O'Brien, PhD, OTR/L, FAOTA Date

Program Coordinator, Doctor of Occupational Therapy

Dana Howell 12/2/2021

____________________ ____________

Dana Howell, PhD, OTD, OTR/L, FAOTA Date

Chair, Department of Occupational Science and Occupational Therapy

Executive Summary

Background: The onset of delirium during a stay in the intensive care unit (ICU) is considered a sign of complication and is associated with increased risk of mortality and longer stays. Monitoring for delirium and incorporating early rehabilitation services (occupational therapy and physical therapy) are considered promising, evidence-based strategies to manage delirium.

Purpose: The purpose of this study was to assess current practices for 1) delirium monitoring and 2) rehabilitation intervention as part of delirium management. The study verified the rate of delirium monitoring using standardized assessments, prevalence of delirium, the interval between admission to the ICU and first rehabilitation intervention ("early engagement"), the length of stay in the ICU, the number of days of therapy (occupational and physical), the reasons for delay of therapy, the content of therapy services (mobility, cognitive and/or ADLs), in a 12-bed intensive care unit in a community hospital in Lexington, Kentucky.

Theoretical Framework. This project utilized strategies and tools from the Quality Improvement Model as well as principles of evidence-based practice.

Methods. For this retrospective chart review, patient data was extracted from medical charts. Participants included all individuals admitted in the ICU from September 1st, until the maximum number of 100 participants was reached. Institutional Review Board approval was obtained until 6/1/2021. For the purpose of this report, data from the first 35 charts were analyzed to describe rate of monitoring, prevalence of delirium, length of stay, amount and content of rehabilitation services (occupational and physical therapy), reasons for delay in rehabilitation service delivery.

Results. For the initial sample (n=35), delirium monitoring was completed in the ICU at a rate slightly lower than recent studies document (94% versus 100%). Both delirium and subsyndromal delirium were associated with a longer hospital length of stay (26, 17 respectively versus 10 days for patients with normal consciousness). The prevalence of delirium was lower than expected for this sample (20% versus 30%), which could suggest insufficient monitoring and/or wrong categorization. The rate of subsyndromal delirium was higher than expected (46% versus 36%). The mean interval between admission into the ICU and first attempt by an occupational or physical therapist was 5 days, within the interval recommended in systematic reviews (4 to 7 days). The content of occupational therapy sessions does not specifically address delirium or cognition, but did address mobility and self-care.

Conclusions: Occupational therapy could increase its role in monitoring and managing delirium, to assist with proper categorization, provide specialized treatment, and possibly decreasing duration of delirium as well as length of stay.

Acknowledgements

The author wished to thank her advisor, Dr. Dana Howell, for her unfailing support, patience, and intellectual acuity, as well as Dr. Renee Causey-Upton for her guidance and encouragement. Dr. Shirley O'Brien and Dr. Camille Skubik-Peplaski also demonstrated kind support throughout the program. Finally, my husband Jonathan deserves special recognition for putting up with me during this time, and taking care of everything in our lives.

Table of Contents

List of Tables

List of Figures

Section 1: Problem Identification and Nature of Project

Delirium in the ICU: Significance of Problem

Definition, health impact.

Delirium is a behavioral syndrome characterized by an abrupt onset of inattention, decreased awareness of the environment, changes in cognitions and/or perception. In addition to those changes in attention, a patient with delirium may have delusions, emotional lability, disorganized speech, anxiety, and sleep-wake disturbances (American Psychiatric Association, 2013). This syndrome develops over hours or days, and can fluctuate during the day.

The intensive care unit (ICU) hosts the most acutely ill patients, and a significant portion of these patients will develop delirium during their stay. In inpatient settings, the reported rate of delirium varies from 9% to 32% (Koirala et al., 2020). Because delirium may be underreported (Casey et al., 2019), it has been hypothesized that the wide range in prevalence is due to failure to screen and report, in particular for patients on ventilator support (Neufeld, 2020). Large prevalence studies have estimated the prevalence of delirium in the ICU at 30% (Krewulak et al., 2018; Salluh et al., 2010).

There are two types of delirium: hypoactive and hyperactive. A person experiencing hypoactive delirium will appear lethargic, drowsy, with slow reactions and/or attention deficits. By contrast, a person experiencing hyperactive delirium may be agitated, anxious, and actively hallucinating. A person can experience both types of delirium at different times during their ICU stay, which is sometimes called mixed type. In the general ICU population, the hypoactive type is most common (Krewulak et al., 2018). There is also a distinct criteria for subsyndromal delirium (Serafim et al., 2017), a score received by individuals who display some of the elements of delirium (such as decreased attention, for example), but do not meet the full criteria for delirium. A lesser form of delirium, subsyndromal delirium is not known to progress towards delirium.

Delirium is both a syndrome and a symptom of critical illness. It generally indicates a systemic deterioration (Luetz et al., 2016a), and has been known to indicate the development of sepsis (Martin et al., 2010). It is associated with increased risk of death and increased ICU/hospital length of stay (Brummel et al., 2014). Although it is generally temporary, delirium is believed by some researchers to have longer-term impact in proportion to its duration (Brummel et al, 2014; (Hayhurst et al., 2020). Its presence compounds other negative effects of a stay in the ICU, particularly the development of ICU-acquired weakness. (Needham et al., 2010). Its detection is important to ensure best outcomes for patients.

Risk factors.

Knowledge of risk factors for delirium is still developing. Barr et al. (2013) identified four categories of "baseline risk factors" (p.685) for delirium: underlying dementia, history of hypertension, history of alcoholism, and high severity of illness on admission. The most recent systematic review for risk factors of delirium found strong evidence that age, dementia, hypertension, pre-ICU surgery or trauma, mechanical ventilation, delirium on the prior day, and metabolic acidosis are risk factors for ICU delirium (Zaal et al., 2015a). A review of predictive models for delirium found that the most commonly reported tool susceptible of predicting delirium is the Acute Physiology and Chronic Health Evaluation II (APACHE-II;(Chen et al., 2020). This tool is used by hospitals to assign an objective measure of acuity to newly admitted patients. Finally, a 2020 systematic review (Krewulak et al., 2020) attempted to establish risk factors by subtypes (hypoactive, hyperactive and mixed), but was unable to reach conclusions due to the variations in methodology of the different studies evaluated. The role of sedation is also currently being explored, with at least one recent single-center prospective study showing an association between drowsiness and the development of delirium (Boettger et al., 2017).

Guidelines for the management of delirium.

In 2013, the American College of Critical Care Medicine issued the first guidelines for the management of sedation, pain, and delirium (Barr et al., 2013). Those guidelines were updated in 2018 (Devlin et al., 2018) as the Clinical Practice Guidelines for the Prevention and Management of Pain, Agitation/Sedation, Delirium, Immobility, and Sleep Disruption in Adult Patients in the ICU (PADIS Guidelines). They include the following recommendations for the treatment of delirium:

1) No pharmaceutical intervention is recommended
2) No “single-component” non-pharmaceutical intervention is recommended
3) Multi-component non-pharmaceutical interventions are recommended in the following terms: “We suggest using a multicomponent, nonpharmacologic intervention that is focused on (but not limited to) reducing modifiable risk factors for delirium, improving cognition, and optimizing sleep, mobility, hearing, and vision in critically ill adults. Remarks: These multicomponent interventions include (but are not limited to) strategies to reduce or shorten delirium (e.g., reorientation, cognitive stimulation, use of clocks), improve sleep (e.g., minimizing light and noise), improve wakefulness (i.e., reduced sedation), reduce immobility (e.g., early rehabilitation/mobilization), and reduce hearing and/or visual impairment (e.g., enable use of devices such as hearing aids or eye glasses)” (Devlin et al., 2018a).

At least one study also suggests that monitoring for delirium, in itself, can significantly decrease its severity and duration (Luetz et al., 2016a). This monitoring has been recommended in the PADIS Guidelines (Devlin et al., 2018a), and integrated into its implementation program: the ICU Liberation Bundle (Balas et al., 2014).

Delirium and rehabilitation services.

There is currently no known, effective pharmaceutical treatment for delirium (Herling et al., 2018a). There is, however, promising evidence available on rehabilitation intervention for the mitigation of delirium. In particular, early mobility and the incorporation of occupational therapy (OT) in inpatient rehabilitation protocols has been shown to decrease the duration and severity of delirium (Álvarez et al., 2017a; Schweickert et al., 2009a; Weinreich et al., 2017). Occupational therapists have been at the forefront of the movement to mitigate the effects of delirium and have used strategies such as monitoring/assessment, purposeful object use, environmental modification, cognitive stimulation, self-care, and reminiscing. One of the methods likely to promote early patient engagement is OT participation in early awakening trials, which is considered an emerging practice (Laxton & Morrow, 2020b). Other practices, such as the implementation of an ICU diary, and the use of education tools (such as "family engagement menu") are considered best practices. These interventions are thought to decrease the risk of delirium and prepare patients for active engagement.

Early mobility has become a preferred strategy for physical therapists (PTs) and OTs working in teams. Studied independently, mobility shortly after admission to the ICU is believed to reduce the severity of delirium, decrease the number of days on mechanical ventilation, improve muscle strength, decrease the risk of ICU-acquired weakness, improve quality of life (Zhang et al., 2019). There is considerable debate, however, on the best timing for rehabilitation services and its effects. This debate is addressed fully in the literature review section of this Capstone report.

Although there is growing evidence that early engagement in activities of daily living (ADLs), mobility, and cognitive stimulation prevents delirium, and that OTs can contribute significantly, these strategies are not always implemented in ICUs. There are guidelines available to support activity in the ICU (Devlin et al., 2018; Hodgson et al, 2014), but practitioners sometimes fear adverse events (Nydahl et al., 2017a), have poor knowledge of OT's contributions (McClellan, 2018), or are not sufficiently trained (Evangelist & Gartenberg, 2016). Add to this hospital practices regarding heavy sedation, lack of interprofessional support, low prioritization, and scheduling conflicts (Costa et al., 2017; Hodgson et al., 2014) and rehabilitation services in the ICU can become limited.

A team-based, quality-improvement approach to delirium management.

Because of the multi-disciplinary nature of treatment in the ICU, a concerted effort across disciplines is required to adhere to current guidelines for delirium management. For example, OTs and PTs can contribute significantly to early engagement in activity, but cannot proceed without nursing approval and support (Laxton & Morrow, 2020a). Inpatient programs that have successfully improved patient outcomes, such as the one at Johns Hopkins Medical Center, have used a team approach (Needham, 2020). The architects of the Johns Hopkins program highlight the importance of involving all stakeholders, including managers, in a strategic plan for quality improvement in the ICU (Needham, 2020).

This project uses some of the processes and methods used in quality improvement approach to healthcare concerns (see end of chapter for additional information on theoretical orientation). Using the Cause and Effect Diagram from the Quality Improvement Toolkit (Institute for Healthcare Improvement, 2017), the investigator outlined some of the contributing factors to delirium in the ICU. This diagram (commonly called a fishbone diagram) is presented as Appendix A in the current document. As can be seen in the diagram, many factors can impact delirium, in various categories. This project focuses on two of those factors, both in the "Methods" category of the fishbone diagram: monitoring for delirium and providing early engagement in activity. Although these elements are single-out for the purpose of this research project, they should not be thought of as isolated in practice. Rather, they are part of a broader system of actions and physical elements, just like OT intervention is integrated into the greater healthcare system.

Setting

This practitioner's research site is a 12-bed Medical ICU housed in a 217-bed community hospital in central Kentucky. It provides care for patients with the following active diagnoses: respiratory failure (multiple etiologies, including pneumonia and chronic obstructive pulmonary disease [COPD] exacerbation), heart failure, cardiac events, acute kidney injury or kidney failure, pulmonary embolism, alcohol withdrawal, and stroke. This ICU does not currently treat patients with severe trauma or highly complex neurological conditions. At the time of the study, the principal investigator was employed at this hospital as a full-time staff OT and had legal access to the electronic medical records system.

Problem Statement

Delirium occurs at a rate of 30% in the ICU and is considered both a symptom of critical illness as well as a precipitating factor for longer term complications (such as neuromuscular weakness). Guidelines for managing delirium in the ICU and evidence suggests that the following strategies are effective at decreasing the rate and/or severity of delirium: 1) monitoring for delirium and 2) early engagement in activity (Barr et al., 2013; Devlin et al., 2018). Current best evidence supports these strategies (Álvarez et al., 2017b; Balas et al., 2014; Luetz et al., 2016a; Menges et al., 2021; Schweickert et al., 2009b; L. Zhang et al., 2019). Rehabilitation services, including OT, can play an important role in this implementation.

Based on a preliminary needs assessment and on anecdotal evidence collected through her work as an OT in this practice setting, the principal investigator suspected that delirium monitoring and early engagement in activity were not performed systematically or according to best practice. If this was true, OTs could modify their intervention to help bridge this gap in service and facilitate the implementation of helpful delirium management methods. If this was not true, OTs could still improve their services, but might focus on other helpful strategies.

Delirium monitoring and early engagement in activity are two strategies described in guidelines and other evidence as promising in the management of delirium in the intensive care unit. The hospital used as the setting for this study may not be implementing these strategies as often as recommended. In addition, OT services may be under-utilized in this implementation and in delirium management in general. To improve the quality of services delivered in the ICU in general, and to patients at risk for delirium in particular, it is necessary to first assess the current state of service delivery.

Study Objectives

The study's main objectives are listed below. For the time frame assigned in the study, the investigator established:

1) Rate of delirium monitoring: Estimate the number of patients that have a documented risk for delirium and are monitored for delirium using a standardized assessment.
2) Length of stay: Estimate the number of days in the ICU and the number of days on mechanical ventilation.
3) Rate and content of early engagement in rehabilitation:

a. Establish the interval between admission in the ICU and provision of physical and occupational therapy services.

b. Estimate the number of patients in the ICU that received at least one session of occupational therapy/at least one session of physical therapy.

c. Estimate the number of days of occupational therapy and physical therapy received by ICU patients.

d. Describe the content of rehabilitation services based on categories (mobility, cognitive stimulation, activities of daily living).

4) Challenges to early engagement: Based on documentation of missed rehabilitation visits, and medical progress notes, propose a partial explanation for the delay of rehabilitation services or absence of rehabilitation services.

Theoretical Orientation

Quality Improvement Model.

This project used some of the tools and methods suggested in the Quality Improvement Model. This model is described by Bonnel and Smith (2017) as "projects that analyze a system's performance and ways to improve using a formal approach with systematic methods". To help systematize her approach, the investigator used some of the resources available through the Institute for Healthcare Improvement (Institute for Healthcare Improvement, 2021). Appendix A presents a Cause and Effect (fishbone) diagram that was borrowed from the Institute's toolkit. It features multiple elements that can influence the incidence of delirium in the ICU, and situates this project's problem statement in a broader context. Although not the only factors to impact delirium, monitoring and early engagement were chosen because they are supported by evidence, and of special concern to OT. Therefore, not only do they act as potential "drivers" (Institute for

Healthcare Improvement, 2017) for delirium management, but could also form the basis of an action plan for quality improvement within the OT department of this hospital.

Evidence-based Practice.

This project also rests on principles from evidence-based practice (EBP), or the utilization of research and expert analysis to guide practice (Bonnel & Smith, 2014, p. 7). This model and its rationale are stated in the simplest terms by Law and MacDermid (2014): “The argument for EBP is simple: If there is a better way to practice, therapists should find it” (p. 3). For this project, what is particularly crucial in this model is the ability to incorporate expert consensus or guidelines in the appreciation of evidence. This is a pragmatic principle: in the absence of conclusive and definite evidence concerning a clinical problem, practitioners should still search for the best available practice strategies. Delirium management does not benefit from a definitive set of standards (Herling et al., 2018a), but rather from guidelines and promising strategies. Although preliminary research supports OT as effective (Álvarez et al., 2017a), it cannot be said that this evidence is conclusive. More research will be necessary, in years to come, to solidify OT’s role in managing delirium.

Significance of the Study

This study can help provide a model for a systematic evaluation of services within the OT department and the hospital, in the context of future quality improvement efforts. It yielded useable information on the rate of delirium monitoring, management, and the integration of rehabilitation services. For example, a rate of delirium lower than 30% for the general population suggested that delirium was under-reported or insufficiently monitored. In addition, the documented content of occupational therapy services suggested that delirium in not addressed systematically or using recommended practices. The data on length of stay was useful to establish a baseline of current practices, with the hope of improving those statistics with the implementation of specific programming.

Section 2: Literature Review

Search History

A preliminary search was conducted using the following databases: CINAHL Complete, MEDLINE, Academic Search Ultimate with the key title word: “delirium” and key word “ICU or intensive care unit or critical care”, with limiters: 2010-2021, English language, peer reviewed. It yielded 5638 titles. A cursory look at the list suggested that some titles were less relevant to the study, because they addressed post-surgery delirium (not applicable to study site), or sleep intervention (not addressed in study). The following limiters were added: NOT surgery or postoperative in title; NOT sleep in title, to bring down the list to 4072 titles.

Because of the high number of articles on delirium in the past 10 years, separate searches were conducted on topics relevant to the study. The following topics were chosen: prevalence (TI= prevalence or incidence); risk factors for delirium (TI=risk), impact on outcomes (mortality, length of stay, cognitive impairment) (TI=outcome), assessment/monitoring (TI= detect or detection or monitoring or monitor or assessment or assess), and the role of rehabilitation services (TI=occupational or physical therapy or rehabilitation or nonpharmaceutical or mobilization).

The titles and most abstracts of articles obtained through each search were reviewed. Final retention of the articles was based on using the best available evidence, and articles were ordered using the Oxford Center for Evidence-Based Medicine Standard Levels of Evidence (Law & MacDermid, 2014, p.142).

1. Meta-analysis and systematic review
2. Large multi-center studies
3. Expert consensus

4. Single center studies with large sample

The following additional criteria were used when deciding to include a study in this literature review. 1) Relevance to the study site: For example, interventions that feature sophisticated technologies that are not available at the study site, or that focus on a patient population not currently seen were omitted. 2) Date of publication: More recent studies were preferred. 3) Exploring new aspects: Some studies featuring patients with COVID-19, or innovative interventions were added to indicate new directions in delirium research.

Prevalence and Incidence

The importance of delirium in the intensive care unit (ICU) is often presented in the literature by estimating its prevalence[1] and expressing it as a percentage of the general ICU population. The point-prevalence methodology is a practical research strategy used to estimate rates of delirium in a hospital system: a single day or a small range of several consecutive days are selected, and delirium is assessed in multiple hospitals for that day (Geriatric Medicine Research Collaborative, 2019). In 2010, an important international study used a point-prevalence method to assess the percentage of ICU patients with delirium in 104 ICUs from 11 countries in South and North America and Spain (Salluh et al., 2010). It established the prevalence of delirium at 32.3%.

This estimate concurs with other studies using a different methodology. A systematic review using meta-analytic methodology was conducted in 2018 to establish the rate of delirium in the intensive care unit for all patients (Krewulak et al., 2018). This review included

[1] Prevalence differs from incidence by indicating the presence in time of a specific condition, rather than indicating its development over a period of time.

international studies of prevalence and incidence, for all diagnoses, for a total of 48 studies or 27,342 patients. The overall pooled prevalence of delirium was 31% with a majority of hypoactive type. Another study conducted in 2018 (Rood et al., 2018) estimate incidence of delirium with a meta-analysis of systematic reviews found a similar result: The mean incidence of delirium in the ICU across multiple hospitals, in multiple countries was 29%. Furthermore, the screening frequency or methods used for screening did not affect this rate.

Attempts have also been made to estimate the rate of delirium in patients who are considered at increased risk for delirium. For example, patients that experience mechanical ventilation (MV) or who have a diagnosis of COVID-19 pneumonia. Systematic reviews were not available. However, a pre-COVID, multi-center study (16 North-American ICUs and 430 patients) that compared two groups of patients on mechanical ventilation found that 53% of all patients on MV developed delirium (Mehta et al., 2015). A multi-center study of patients with COVID-19 (69 ICUs, 14 countries, 2088 participants), found that 55% of patients were delirious for a median of 3 days (Pun et al., 2021). This estimate does not include patients that were comatose, and with a previous history of dementia (they were excluded from the study).

Overall, these studies suggest that among the general ICU population, the rate of delirium has been recently established at 30%. Some higher-risk populations such as those with mechanical ventilation or with COVID-19 may demonstrate a rate of 53%-55%. Nursing documentation that suggests a much lower rate might indicate insufficient assessment. For subsyndromal delirium, recent studies have suggested an overall prevalence of 36% in the ICU (Serafim et al., 2017).

Risk Factors

The 2013 guidelines from the American College of Critical Care Medicine (Barr et al., 2013) identifies four categories of "baseline risk factors" (p.685) for delirium: underlying dementia, history of hypertension, history of alcoholism, and high severity of illness at admission. However, recent literature reviews offer a different conclusion. A 2020 systematic review of 20 studies on risk factors and outcomes for patients with delirium delivered inconclusive results (Krewulak et al., 2020). It proved difficult to establish risk factors, according to the authors, become of inconsistencies in methodologies across studies. Therefore, the association between incidence of delirium and perceived risk factors such as APACHE-II score and mechanical ventilation was deemed inconsistent.

The authors of a 2017 systematic review were less circumspect (Jacob et al., 2017). They highlighted several factors presenting risk for the development of delirium, and categorized them as predisposing factors (age, dementia) and precipitating factors (acuity of illness as reported by the APACHE-II score, use of sedatives, organ failure). A prior systematic review of risk factors which included 33 studies also expressed confidence in determining risk factors based on evidence (Zaal et al., 2015b). They ranked those risk factors according the strength of evidence provided, and concluded that age, dementia, hypertension, pre-ICU emergency surgery or trauma, APACHE-II score, mechanical ventilation, metabolic acidosis, delirium on the prior day and coma were strongly associated with delirium. On the other hand, multiple organ failure was only moderately associated with delirium. Gender was not a factor.

A review of predictive models for delirium found that the most commonly reported tool susceptible of predicting delirium was the Acute Physiology and Chronic Health Evaluation II (APACHE-II) (Chen et al., 2020). Large prevalence/incidence studies (Krewulak et al., 2018;

Mehta et al., 2015; Pun et al., 2021) seemed to indicate that populations during the first wave of COVID-19 or experiencing mechanical ventilation were at increased risk.

Taken together, these studies suggest that although there are a number of factors that suggest increased risk for delirium in the general ICU population, the research community does not seem to agree on methodology or conclusions in determining risk factors.

Impact of Delirium on Outcomes

Delirium is generally believed to impact health and functional outcomes. The 2020 systematic review that found inconsistent evidence on risk factors also found discrepancies in the description of outcomes, except for mortality (Krewulak et al., 2020): mortality was consistently associated with hypoactive delirium in a majority of studies. The DECCA international prevalence study (Salluh et al., 2010) also found a correlation between presence of delirium and mortality, increased length of ICU stay, as well as increased hospital length of stay.

It has been hypothesized that the severity of delirium may be a determining factor. A recent systematic review of articles associating delirium severity with outcomes (Rosgen et al., 2020) found that delirium severity was strongly associated with increased ICU length of stay, and a decreased chance of being discharged home. However, there was not strong enough evidence to determine the impact of severity on mortality, functional ability, cognitive ability and quality of life.

Other and slightly older systematic on outcomes of patients with delirium also reveal an increased risk of death and longer length of stay (Salluh et al., 2015; Zhang et al., 2013). Two separate one-center studies of the impact of delirium on outcomes for patients with COVID-19 found a similar (but more severe) correlation with mortality (Kotfis et al., 2021; Marengoni et al., 2020). Of interest to this Capstone, one interesting and recent systematic review sought to determine the impact of delirium on participation in rehabilitation services (Johnson et al., 2020). It was not able to draw conclusions, however, due to the lack of available research on this topic.

In general, the strongest evidence suggests that delirium indicates a risk for mortality and increased length of stay. There is not yet strong evidence to correlate delirium with long-term decrease in physical or cognitive function, although the link has been suggested in some reviews (Salluh et al., 2015). There is too little evidence to determine the impact of delirium on participation in rehabilitation services, an interesting perspective for future research. Subsyndromal delirium is associated with longer length of stay, though not increased risk for mortality (Serafim et al., 2017).

Monitoring/Assessment

Routine monitoring of delirium has been shown in at least one study to correlate with improved outcomes (Luetz et al., 2016b). It was also a strategy recommended by experts in the field, and specified in several guidelines such as the Society for Critical Care Medicine's *ICU Liberation* guidelines (Balas et al., 2014) and the *Clinical Practice Guidelines for the Prevention and Management of Pain, Agitation/Sedation, Delirium, Immobility, and Sleep Disruption in Adult Patients in the ICU* (Devlin et al., 2018b).

There are a number of tools available to assess delirium in the ICU. According to a 2018 systematic review of properties (Gélinas et al., 2018), the following standardized assessments were the most valid and reliable: the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU) and the Intensive Care Delirium Screening Checklist (ICDSC). The authors of this study caution, however, that there might be insufficient validation data for using these tools on patients with neurological disorders or at various levels of sedation. The CAM-ICU was the preferred tool in another recent systematic review (Ho et al., 2020) for its diagnostic accuracy following the criteria for delirium in the Diagnostic and Statistical Manual of Mental Disorders (DSM). This study reports following psychometric properties for each tool, and they are featured here in Table 1. A 2012 systematic review suggested that the CAM-ICU remains accurate in the context of pre-existing dementia (Morandi et al., 2012). However, a separate search might be necessary to verify the applicability of delirium assessment tools to this population.

Table 1.

Psychometric Properties for the CAM-ICU and ICDSC

Confusion Assessment Method for the ICU (CAM-ICU)
• Sensitivity: 0.85
• Specificity: 0.95
• Diagnostic odds ratio (DOR): 99
Intensive care delirium screening checklist (ICDSC)
• Sensitivity: 0.87
• Specificity: 0.91
• Diagnostic odds ratio (DOR): 65

(Ho et al., 2020)

Nursing is usually responsible for the assessment of delirium in the ICU, although delirium assessment fits within the scope of practice of other professionals, such as occupational therapists (Laxton & Morrow, 2020b). Some reviewers have sought to ascertain the barriers to assessing delirium assessment, and have found the following themes among nurses: time constraints, and lack of education on delirium (Rowley-Conwy, 2018). Implementation strategies include the diffusion of guidelines (Trogrlić et al., 2015), such as those provided through the Society for Critical Care Medicine: the ICU Liberation bundle. Other strategies focus on the participation of caregivers in the assessment of delirium (Rosgen et al., 2018), a promising strategy for monitoring delirium in the ICU. Of note, the presence of delirium can complicate other assessments, such as pain. A systematic review of tools for assessing pain in the presence of delirium found insufficient evidence to guide practice (Fischer et al., 2019).

Non-Pharmaceutical Intervention

At this time, it is difficult to obtain clarity when seeking rigorous evidence to support non-pharmaceutical interventions. A recent review from the Cochrane Library of systematic reviews found insufficient evidence to recommend non-pharmaceutical interventions, including occupational and physical therapy, for the prevention of delirium (Herling et al., 2018b). In addition to the discrepancies in research methods, there are a variety of outcome measures that make it more difficult to assess the value of rehabilitation services in systematic reviews. For example, the Cochrane review considered "prevention" as the main outcome, and the CAM-ICU as the preferred assessment tool, which excluded studies that sought to decrease duration/severity or used other assessment tools (such as the ICDSC). The reviewers suggested that non-pharmaceutical interventions, including rehabilitation services showed promise, but that more research is needed.

Other systematic reviews drew similar conclusions regarding inconsistency of methods and outcomes. A 2020 systematic review on early cognitive intervention was unable to draw conclusions useful for practice due to the high risk of bias and protocol variability among the studies included (Deemer et al., 2020). A description of the types of cognitive interventions was not included in the study report. Other studies on specific non-pharmaceutical interventions state as obstacles the flaws in study protocols and inconsistencies in measured outcomes (Bannon et al., 2019; Burry et al., 2021).

Reviews that attempt to integrate various outcomes appear to provide more encouraging news for non-pharmaceutical interventions. A 2018 review of 35 studies on non-pharmaceutical delirium management concludes that interventions to prevent delirium are more effective at shortening its duration than prevention its occurrence, and that they mostly focus on presumed risk factors (Kang et al., 2018). Examples of such interventions include daily interruption and reduction of sedation, exercise, patient education, cerebral hemodynamics improvement, and family participation. A review published in 2021 integrated both quantitative and qualitative studies, and their effect on one of several “delirium-related outcome” (Sahawneh & Boss, 2021). The interventions were described differently than in other reviews as: early mobilization, environmental modifications to promote sleep (earplugs, blinds at night), environmental modifications for alertness (music and natural sunlight during the day), continuous reorientation, increase visitation and family participation. Those interventions were very much in line with current expert recommendations for occupational therapists interested in delirium management in the ICU (Laxton & Morrow, 2020b). Some of the outcomes of the study were described as reducing incidence and duration of delirium, and family/patient satisfaction, a different set of outcomes than “prevention”. Multi-component programs are considered the most effective (Souza et al., 2018).

An interesting and developing area of research looked at material and technological support for delirium intervention. A systematic review included 31 studies featuring various aids such as music, light, video, sleeping aids, and communication aids (Kim et al., 2021). The outcomes measured were less specific than in other studies, and described as contributions to a healing environment in the ICU or providing psychological soothing.

In the absence of conclusions from systematic reviews, expert consensus provides provisory guidance for practice, until more evidence can be gathered. After a systematic review of the evidence, a panel of geriatric experts issued 12 recommendations (Abraha et al., 2016) for managing delirium. For example, a re-orientation protocol was recommended, although the evidence for its efficacy was weak; in issuing this recommendation, the panel took into consideration that design flaws affected the strength of the evidence, but that since at least one study demonstrated a statistically significant reduction in delirium incidence for patients who received the protocol, it was worth implementing. In doing so, the experts were applying the principle of evidence-based practice of using the best available evidence to guide practice.

Occupational Therapy.

A systematic review (Weinreich et al., 2017) examined 10 studies of occupational therapy in the ICU to determine safety and effectiveness. The criteria for inclusion in the review required early intervention to be within 24-48 hours of admission. 6 of the 10 studies demonstrated some level of improvements, either in improved delirium, less sedative use, improved strength, improved function, and/or shorter ICU length of stay.

Single-center studies of occupational therapy intervention suggest promising results in decreasing the incidence of delirium. For example, one study on the effects of an occupational therapy protocol including cognitive stimulation in the ICU on non-ventilated patients decreased the duration and incidence of delirium (Álvarez et al., 2017b). It should be noted that this study was excluded from the Cochrane systematic review due to its outcome measurement tool: the researchers used the CAM rather than the CAM-ICU. Another study added an occupational therapy component to a standard protocol that included multisensory stimulation, positioning, cognitive stimulation and basic activities of daily living (BADLs) training (Tobar et al., 2017) and reduced the incidence of delirium. A landmark 2009 study on the role of physical and occupational therapy demonstrated that rehabilitation services help decrease the number of days of delirium (Schweickert et al., 2009a). Although the study does not differentiate between the two services, it is considered foundational to supporting occupational therapy intervention in the ICU.

Some of the barriers in integrating occupational therapy in the ICU include lack of expertise and visibility of the clinicians. A study on the perceptions of occupational therapists regarding their role in the ICU revealed a lack of confidence in their own contribution as well as lack of recognition from other team members for their role in delirium management (Strecker & Hitch, 2020). There is also a perception of occupational therapists as specialists of discharge planning, rather than providing remedial intervention (Kingston et al., 2019)

This may be changing, as occupational therapists are gaining recognition for their contribution to the prevention and management of delirium in the ICU as well as in other areas of the hospital (Laxton & Morrow, 2020b; Lee et al., 2020).

Early mobility and timing of intervention.

Early mobility was recommended in the two most important guidelines for critically-ill patients : The ICU Liberation bundle (Balas et al., 2014) and the PADIS Guidelines (Devlin et al., 2018b), and has been a topic of discussion for the last 10 years. Initial studies showed a strong positive effect on mortality, function and quality of life as well as delirium reduction (Schweickert et al., 2009b). It was hypothesized then that the timing of occupational and physical therapy was crucial for outcomes and that mobility should be attempted as soon as possible after medical stabilization. Since then, efforts have been made to define early rehabilitation and ascertain its effect.

Mobility is almost always defined as activities that go beyond passive range of motion (Barr et al., 2013). There is less consistency with the term “early”. A 2019 systematic review on early mobilization (Zhang et al., 2019) reported various statements from research protocols, for example: “within five days of admission to critical care” or “within 48 hours of the diagnosis of sepsis” or “no more than 48 hours of invasive MV”. Other research protocols included in that same review simply stated “early” but with no clear definition, with the experimental group receiving services at some earlier point than the control group. At least one, separate systematic review sought to determine optimal timing for intervention in the ICU (Ding et al., 2019) and suggested placing it between 48h-72h. Two years later, the authors of a systematic review (Menges et al., 2021) reported that experts in the field were increasingly defining early mobilization as starting within 72h of ICU admission (although the authors of that review themselves defined “early” as within 7 days of admission to the ICU). The difficulty in establishing a clear definition of early might come in part from clinical challenges, since medical stabilization is a necessary condition of mobilization, and can vary with health conditions and individual patients.

Beyond its definition, the effect of early mobilization is also a subject of debate. Although initial research such as the Schweickert et al. (2009) randomized controlled trial (RTC) was very promising, recent systematic reviews of RCT were conflicting. Part of the problem resided in methods. A 2019 review (Zhang et al., 2019) found positive effects of early mobilization on function (ability to stand), number of ventilator-free days, incidence of ICU acquired weakness, and discharge-to-home rate. They also reported a moderate but not statistically significant effect on mortality. However, the authors warned that most of the evidence is of poor quality due to heterogeneity of methods and outcomes, as well as insufficient safeguards against bias (in the studies included).

A separate 2021 systematic review (Menges et al., 2021) presented an interesting perspective. It suggested that a determining factor in finding a positive effect is the interval between what a study considers “early” versus standard care (rather than initiation point). The longer the interval, the more positive the effect. The reviewers defined “early” as within 7 days of ICU admission, a rather broad definition. They reported that across studies, patients mobilized within that definition of “early” mobility could expect a positive effect on muscle strength and physical function when compared to “late” mobilization (after 7 days). However, within that timeframe of 7 days post-admission, the evidence was not strong enough to suggest a positive effect. The landmark Schweickert et al. (2009) study that helped establish the role of physical and occupational therapy in the ICU set an intervention group at 3 days (72 hours) post-admission compared to a control group who would receive no services for the first two weeks of mechanical ventilation. Their interval was rather large and no longer reflects the standard of practice in most ICUs. It is possible that culture changes in the ICU have worked in favor of earlier mobilization as part of standard care, and made it more difficult to show positive effect in experimental studies[2].

As early mobilization became implemented, there was a genuine concern for safety. There have been several studies to assess the safety of early mobilization in the past 10 years. A landmark article has created the foundation for a safety criteria, based on the consensus from a panel of experts (Hodgson et al., 2014). A recent systematic review (Nydahl et al., 2017b)

---

[2] In the study site for this current project, patients on mechanical ventilation are not mobilized. The standard of care are is therefore similar to the one presented as control in the Schweickert et al. study.

established that mobilization in the ICU is safe, and that safety events are rare. The authors, however, advised that more consistency should exist in defining adverse events.

In summary, although expert definitions of "early mobilization" sometimes set the proper interval between admission to the ICU and intervention as 72 hours, the strongest evidence available (a systematic review) suggested that an interval of 4-7 days was reasonable. Early intervention within that interval was safe, even for clients that are receiving mechanical ventilation, as long as safety criteria are applied. Neither of the most recent systematic review on early mobilization addressed delirium as an outcome, although practice guidelines for the ICU emphasize the relationship between mobilization in the ICU and delirium reduction (Devlin et al., 2018).

Section 3: Methods

IRB Approval

The protocol for this study described here was approved by the Eastern Kentucky University's Institutional Review Board (IRB) on October 6th, 2021.

Main Objectives

This retrospective chart review study had main objectives that are listed below.

1) Rate of delirium monitoring: Estimate the number of patients that have a documented risk for delirium and are monitored for delirium using a standardized assessment.
2) Length of stay: Estimate the number of days in the ICU and the number of days on mechanical ventilation.
3) Rate and content of early engagement in rehabilitation:
    a. Establish the interval between admission in the ICU and provision of physical and occupational therapy services.
    b. Estimate the number of patients in the ICU that received at least one session of occupational therapy/at least one session of physical therapy.
    c. Estimate the number of days of occupational therapy and physical therapy received by ICU patients.
    d. Describe the content of rehabilitation services based on categories (mobility, cognitive stimulation, activities of daily living).
4) Challenges to early engagement: Based on documentation of missed rehabilitation visits, and medical progress notes, propose a partial explanation for the delay of rehabilitation services or absence of rehabilitation services.

These objectives were predicated on the evidence-based assumptions that 1) monitoring for delirium and 2) providing early rehabilitation services are promising strategies for the management of delirium in the ICU (Devlin et al., 2018b). They were also chosen as the basis for quality improvement in the ICU, as indicators of current state of care and current level of involvement of OT services.

Inclusion and Exclusion Criteria, and Time Frame

The principal investigator included all individuals 18 and older who were admitted to the ICU of the research site from September 1st through June 1st, 2022 (end of the IRB approval) until a sample number of 100 was reached. For the purpose of this report, the data for the first 35 participants was collected and analyzed. The investigator obtained approval from her advising committee to continue data collection on the remaining 65 participants after presentation of the final requirement for the Capstone, in preparation for a projected publication.

The participants included may have been admitted directly to the ICU, transferred from another floor of the hospital, or from another hospital in the network of care. All diagnoses were included. Some data pertained to individuals who had impaired decision-making capacity. Although unlikely, incarcerated or institutionalized individuals may have been incidentally included in the study, if they were receiving care in the ICU at the time of the study. The principal investigator may or may not have been aware that an individual whose chart information was included in the study was a prisoner.

Since this study aimed to measure rate of monitoring and early rehabilitation for delirium patients, it might seem as though it should have included only patients most at risk for delirium. Risk factors could have been used for this selection. There is some evidence to suggest that certain demographic and health factors increase the likelihood of delirium. For example, the first set of Guidelines for the treatment of pain, sedation and delirium (PADIS Guidelines) (Barr et al., 2013) identified four categories of “baseline risk factors” (p. 685) for delirium: underlying dementia, history of hypertension, history of alcoholism, and high severity of illness at admission. The most recent systematic review for risk factors of delirium found strong evidence that age, dementia, hypertension, pre-ICU surgery or trauma, mechanical ventilation, delirium on the prior day, and metabolic acidosis are risk factors for ICU delirium (Zaal et al., 2015a).

However, if as some evidence suggests (Barr et al., 2013) acuity of illness is considered a valid risk factor, then all patients in the ICU are at risk. Patients are directed towards the ICU precisely because they are more acutely ill than others and need increased monitoring. In addition, hypertension is very common in the hospital population. It could be said that simply entering the ICU puts patients at an increased risk for developing delirium. It therefore seemed prudent and consistent with evidence to consider all ICU patients at risk for delirium.

Informed Consent

No consent was sought during the study, as outlined in the IRB proposal. There was no direct contact with patients, since the study consisted of chart reviews exclusively. The study’s data was recorded by the investigator in an anonymous manner such that subjects cannot be identified directly or through identifiers linked to the subject. Additional precautions are described under the subheading “Ethical considerations”.

Data Collection

Access to the chart and patient room allocation data for research purpose was granted by special permission from hospital administration (see letter of support). In preparation for data collection, the principal investigator created two forms: 1) a recruitment form for the purpose of locating information in the chart; 2) a data extraction tool to be used as the main form for the study and contain only de-identified information.

1) Recruitment form.

   To identify the proper charts (recruitment), the investigator used an electronic board available to all staff therapists. The recruitment form contained medical record numbers and randomly assigned case numbers. It was handwritten and kept in a locked box in the rehabilitation department. Only the principal investigator had access to this form. This form was necessary to locate charts in the electronic medical records system.

2) Data extraction form

   An excel file was used to compile de-identified information from the charts. This file was necessary to collect and organize the study's data. The charts were mined for information 2-3 times a week, and information was analyzed once sufficient data had been collected. A copy of the collection form is provided as Appendix B. In the Results section of this report, additional information was provided on the type of information gathered.

Analysis

Analysis of the data consisted in simple descriptive statistics and a discussion commentary based on those statistics. The statistics were performed by the investigator using formulas in the Excel form, such as mean, sum, etc. Some of the information was converted to a graphic form to be included in this report and increase readability.

Communication Plan

Once the study is completed, the following communication activities are planned:

1) In-service to rehabilitation staff on the results and the proposed role of OT in the ICU
2) Presentation of a summary of the study and results to the Director of Rehabilitation Services, and the Nursing Director for the ICU.
3) Preparation of a publication in collaboration with committee members
4) A poster or one-page handout on OT best practices for the ICU for the rehabilitation department at the study site.
5) Presentation of results to the Committee on Early Progressive Mobility.

Ethical Considerations

The following precautions were taken to preserve confidentiality, as outlined in the IRB.

- No identifiers were included on the data extraction form for the study. Name, date of birth, date of admission, medical records number, admission number, gender, were not recorded.
- The identifying form used to locate chart information was kept in a locked box in the rehabilitation department during the study.
- No “verbatim” comment from the chart was included in the study. The information was paraphrased or categorized to prevent identification of participants.
- In reports and communications, the dates of collection will be stated as “4 weeks during the fall of 2021” to avoid the identification of specific admission dates.
- At the end of the study, all materials including data collection forms will be handed to the principal investigator’s advisor for safeguard.

Section 4: Results and Discussion

Description of Results

For the purpose of this Capstone report, the investigator included the first 35 individuals admitted to the ICU during the collection period. This project is ongoing, and the collection period outlined in the IRB extends beyond the final presentation date for the Capstone. In agreement with her academic advisors, the investigator plans to analyze the rest of the sample (100 individuals) at a later date for a proposed publication.

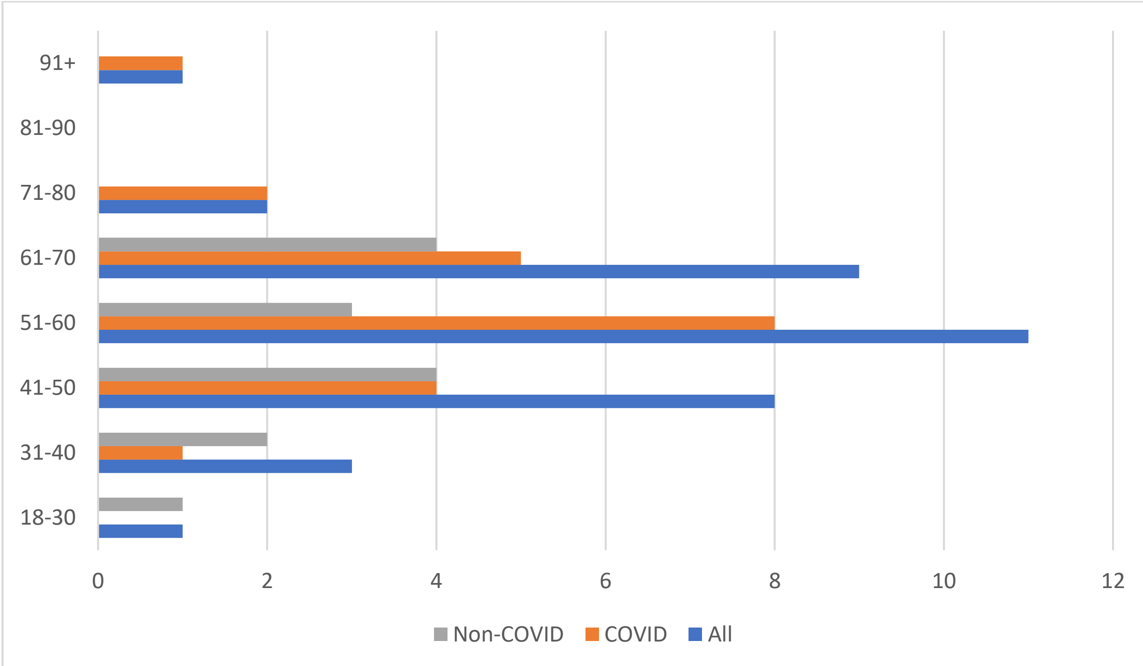
The collection period coincided with a wave of patients entering with ICU with a diagnosis with COVID-19. They constituted a sub-category of individuals within the general ICU population, with special characteristics such as a longer intubation, longer length of hospital stay and higher mortality. To highlight the differences between the groups, the investigator presented three results for each category: 1) all participants, 2) participants with COVID-19 and 3) participants without COVID-19.

The results are organized according to the following categories: Age, diagnosis, length of stay, mechanical ventilation, delirium monitoring, Early Progressive Mobility (EPB) screen, rehabilitation services.

Age

The participants' age on the day of admission was included in one of the following categories: 18-30; 31-40; 41-50; 51-60, 61-70, 71-80, 81-90, 91+. The following bar graph represents the frequency by category.

Figure 1. Age on Admission



For all three sections of participants, the median age very likely falls within the 51-60 years old category. The exact median and mean were not calculated, as this would require actual numbers. The project was designed to limit identifiable information, and used age categories rather than actual numbers. The oldest categories (71-80 and 91+) contain only individuals with COVID-19.

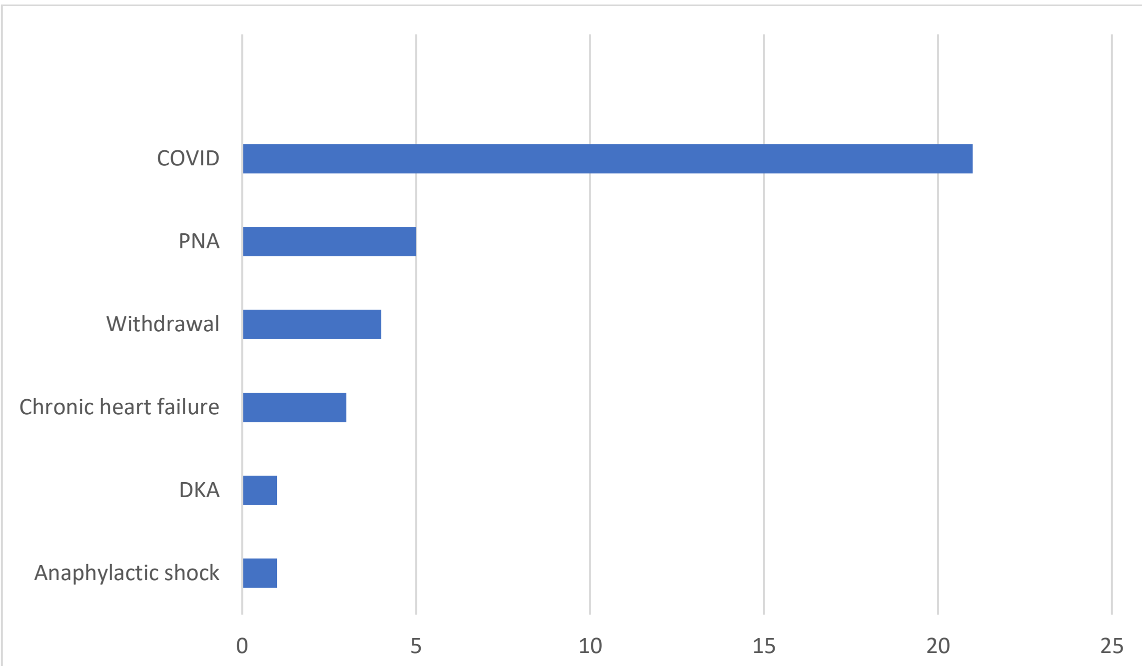
Diagnosis

Only one admitting diagnosis was included for each participant. It was mined from the hospitalist's initial history and physical note (H & P) at admission in the hospital. It should be noted that, in a few cases, the patient was not admitted directly to the ICU, but to another floor of the hospital, and transferred to the ICU later because of a worsening of the original condition. In all cases, the diagnosis for hospital admission (not strictly ICU admission) was collected.

COVID-19 pneumonia was by far the most common diagnosis: 21 individuals or 60% of the sample. This was followed by pneumonia (non-COVID, viral or bacterial): 5 individuals or

14% of the sample. Although 3 individuals had a dual diagnosis of COVID and bacterial pneumonia, they were accounted under the COVID category only. Additional diagnoses for this period included withdrawal syndrome (5), exacerbation of chronic heart failure (3), diabetic ketoacidosis (1), and anaphylactic shock (1). It should be noted that 2 patients had a dual diagnosis of alcohol withdrawal and 1) pneumonia, 2) COVID-19. They were included in the pneumonia or COVID category only since this was the main reason for admission to the hospital.

Figure 2. Diagnosis on Admission



Diagnosis and Delirium

Although this data anticipates on later report sections on screening and prevalence, it presents of the findings on diagnoses and delirium. Among the sample, the individuals that experienced delirium (n=7) at some point during their ICU stay based on the delirium screen, had the following diagnoses: COVID-19 (n=5), pneumonia (n=1), and withdrawal syndrome (n=1). The individuals that experienced subsyndromal delirium (n=16) had the following diagnoses:

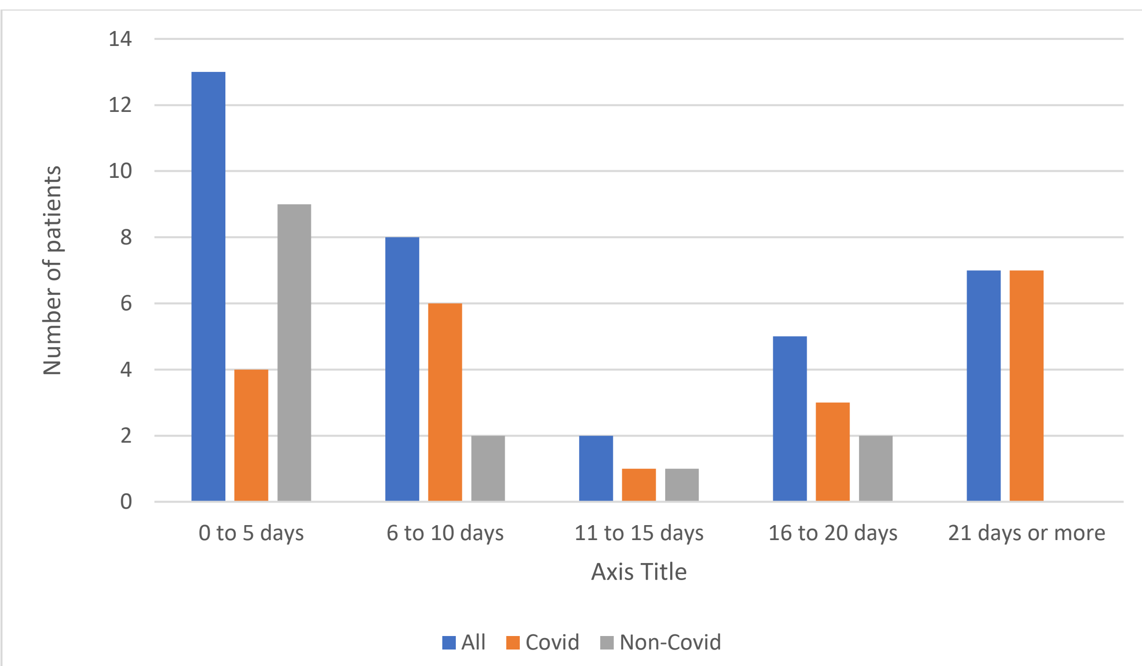
COVID-19 (n=7), pneumonia (n=4), withdrawal syndrome (n=2), COPD exacerbation (n=1), urinary tract infection (n=1), diabetic ketoacidosis (n=1).

Length of Stay

ICU length of stay. For all participants, the longest ICU stay was 34 days, while the shortest was 1 day, with a median of 8 days and a mean of 11. For individuals with COVID-19, the longest ICU stay was 34 days, the shortest was 2, with a median of 12 and a mean of 15. For individuals with a diagnosis other than COVID-19, the longest stay was 18 with a median of 3 and a mean of 6. The mean stay for individuals with COVID-19 is therefore 2 and a half times longer than for individuals without this diagnosis.

The following table and histogram present the length of stay by category, and the number of patients in each category. The data from the patients with a diagnosis of COVID-19 pneumonia is separated from the total, to highlight the differences.

Figure 3. ICU Length of Stay: Number of Patients in Each Interval



The blue bar of the graph represents the total of 35 patients, and follows a curve pattern. A higher proportion of patients experienced a short length of stay (less than 10 days) or a very long length of stay (21 days or more) than a moderate length of stay (between 6 and 20 days). The main driver of a very long length of stay was a COVID-19 diagnosis, as represented by the orange bar. In particular, 7 patients or 20% of the whole sample (35 participants), all with a diagnosis of COVID, stayed more than 20 days and they were the only individuals to stay that long. A shorter length of stay generally indicates participants without COVID-19: 13 patients or 35% of the whole sample stayed for 5 days of less, a majority without a diagnosis of COVID (9 or 25% of the sample) although there were 4 individuals with COVID-19 (11%) that stayed 5 days or less in the ICU.

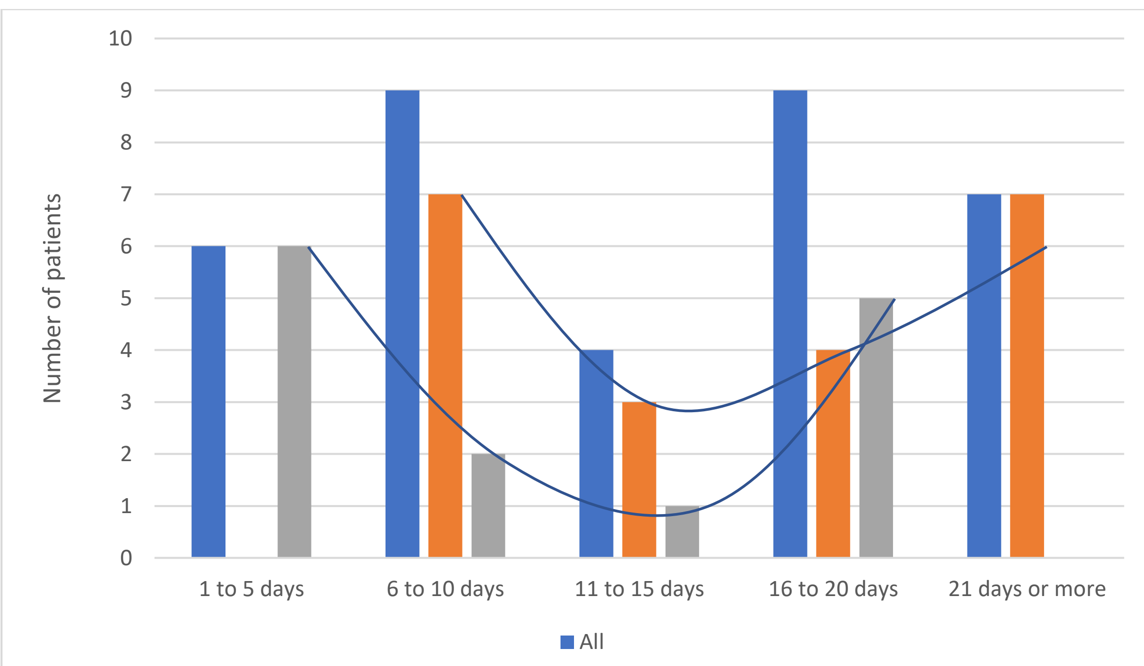
ICU Length of Stay and Delirium. Length of stay was analyzed in relationship to presence of delirium or subsyndromal delirium during ICU stay. For individuals who experienced delirium at some point in the ICU (n=7), the stay ranged from 3 days to 34 days, with a mean of 21 days. For individuals who experienced subsyndromal delirium (n=16), the stay ranged from 1 day to 29 days, with a mean of 11 days. For individuals how experienced neither delirium or subsyndromal delirium (n=5) , the stay ranged between 2 to 5 days, with a mean of 3 days.

Hospital Length of Stay. Individuals may be transferred to a lower level of care after completing a stay in the ICU, such as the telemetry floor of the hospital. It is also possible to have individuals transfer from the telemetry floor to the ICU, after a worsening of their condition. The total length of stay in the hospital includes all days spent at different levels of care from admission until the patient is discharged from the hospital.

The longest hospitalization was 53 days, and the shortest 3, with a median of 13 and an average of 15. For the individuals with COVID-19, the longest length of stay was 53 days, the shortest 6, with a median of 19 and a mean of 19. For individuals without a diagnosis of COVID-19, the longest length of stay was 19 days, the shortest 3, with a median of 8 and a mean of 10. The mean hospital stay for individuals with COVID-19 is 2 times the average length of the individual without a diagnosis of COVID-19.

The data on length of stay for patients with COVID-19 and the individuals without a diagnosis of COVID-19 follow a similar pattern as observable when comparing the diagrams. They both follow a concave curve, with two peaks: the first with lowest length of stay and the second with the longest length of stay. However, the COVID-19 curve is displaced further along both the x and the y axis: there are a greater number of patients with a longer length of stay in the COVID-19 diagnostic category. It would therefore appear that even after a long stay in the ICU, individuals with COVID-19 pneumonia continue to require long stays in acute care.

Figure 4. Hospital Length of Stay: Number of Patients for Each Interval



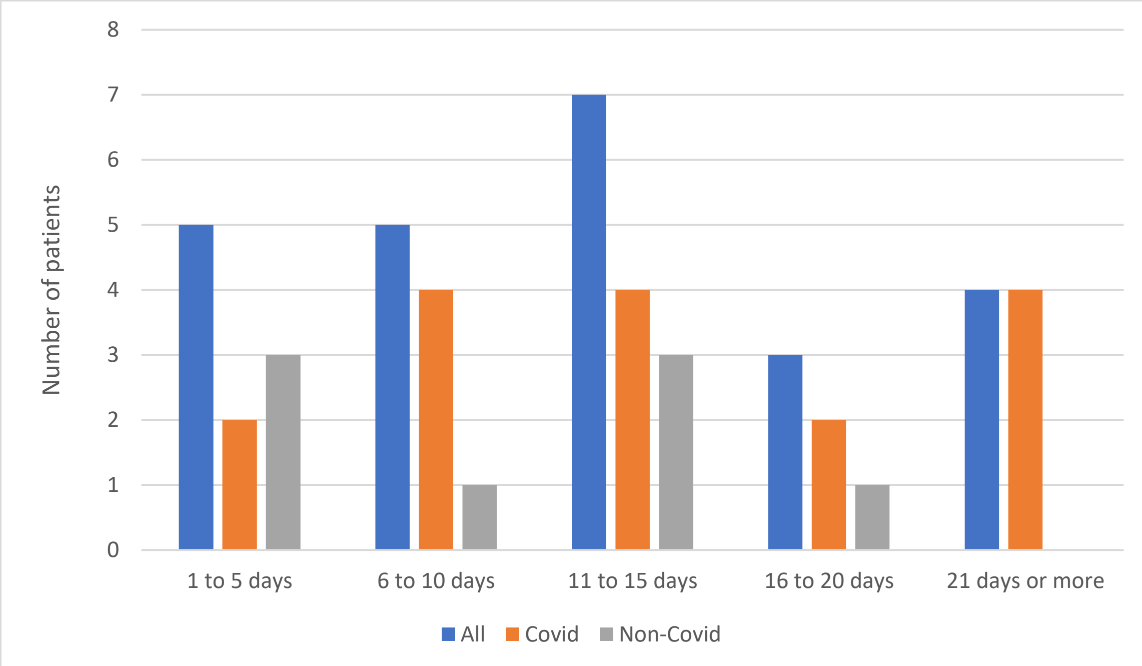
Hospital Length of Stay and Delirium. For individuals how experienced delirium (n=7) while in the hospital, the hospital stay ranged from 5 to 53 days, with a mean of 26 days. For individuals who experienced subsyndromal delirium (n=16), the hospital stay ranged between 4 and 29 days, with a mean of 14. For individuals with normal consciousness (n=5) throughout their hospital stay, the length of stay ranged between 6 and 20 days, with a mean of 10 days.

Mechanical Ventilation

In the sample, 23 participants received mechanical ventilation during their stay in the ICU (66%), usually accompanied with orotracheal intubation, although this number also includes some individuals with tracheostomies or bi-pap oxygen delivery systems. It should be noted that in terms of acuity, orotracheal ventilation is considered the most acute method, with tracheostomy as an option for patients that are stabilized but still unable to breathe on their own. A bi-pap is generally used as a step-down from the orotracheal intubation, in the process of weaning from the ventilator.

The length of mechanical ventilation varies between 2 days and 29 days, with a peak between 11 and 15 days.

Figure 5. Days of Mechanical Ventilation: Number of Patients in Each Category



Delirium and Mechanical Ventilation

Of the patients that experienced delirium during their stay (n=7), all but 1 received mechanical ventilation at some point in their stay. Of the individuals that experienced subsyndromal delirium (n=15), 11 also experienced mechanical ventilation while 5 did not. None of the individuals with normal consciousness received mechanical ventilation during their hospital stay.

Delirium Monitoring

Richmond Agitation-Sedation Scale (RASS). The RASS is an assessment of consciousness the first part of any delirium assessment. The RASS scoring criteria is provided as Appendix C. Patients can be scored from -5 to 4, with the negative numbers corresponding to sedated state, and positive numbers moving towards agitation. For reference, a score of 0 is considered a normal state (calm and alert). When receiving a score of -3, an individual is considered moderately sedated, opens eyes to voice, but does not make eye contact. A rating of -2 suggests that the individual is making brief (less than 10 seconds) eye contact. At RASS – 1, an individual is considered drowsy. An individual who receives a score of +1 is becoming restless, but not yet engaging in vigorous movement. In the data extraction tool, only one score was entered for every 24-hour period. In the event that the Delirium or RASS ratings varied in a 24-hour period, the scores entered corresponded to the most frequently entered score, with the possibility of a comment note on the variation. For example, if a patient received a score of RASS -1 for most of the 24 hours, but with one incidence of 2, followed by 4 hours of -2, then a score of -1 is entered as the main score, with a comment that the patient experienced agitation (RASS=2) with a period of sedation (4 hours of RASS = -2).

The first concern of this investigator was to verify the rate at which this assessment was being completed by nursing since it constitutes the basis of delirium assessment. The number of days of RASS assessment was compared to the total number of days spent in the ICU. With the scores of all patients combined, the rate of RASS assessment in the ICU was 90% or 360 days of RASS for 402 total ICU days.

Further analysis yields information regarding the RASS scores. These are presented in the following diagrams.

Figure 6. RASS Score for All Participants (n=35)

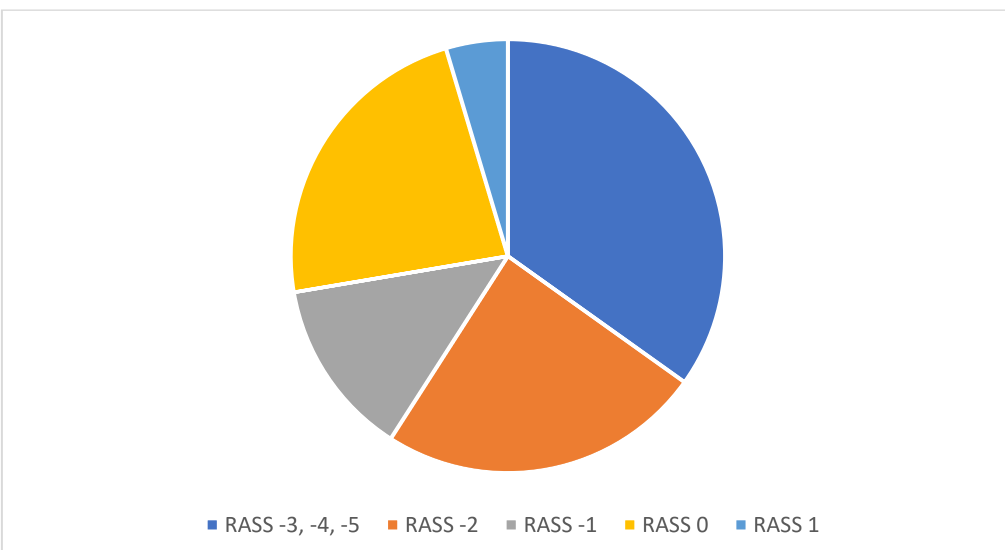


Figure 7. RASS Score for Participants with COVID-19 (n=21)

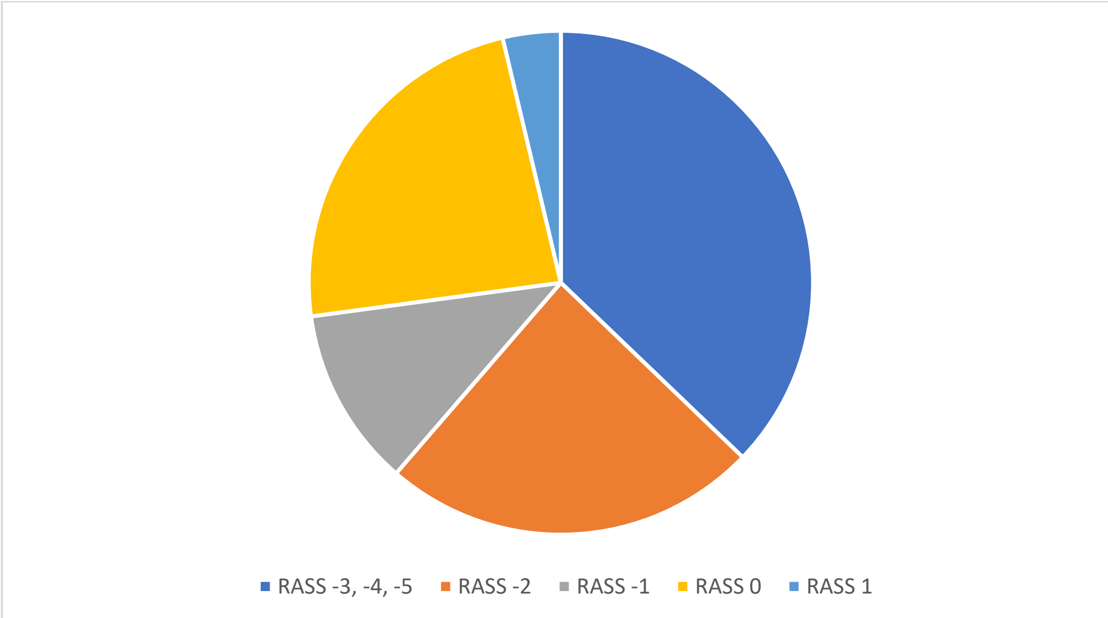
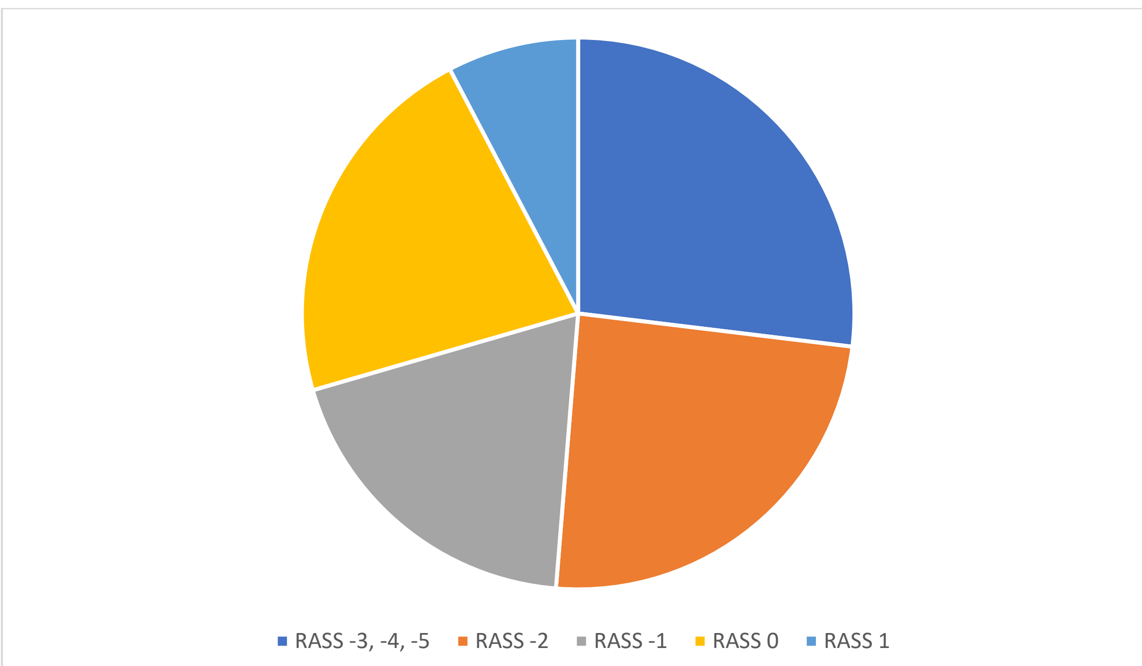


Figure 8. RASS Score for Participants without COVID-19 (n=14)



The proportion of ICU days with a RASS of -3, -4, or -5 constitute 35% of total days assessed for the whole sample (n=35), 37% of total days for individuals with COVID-19 (n=21), and 27% for individuals without a diagnosis of COVID-19 (n=14). The proportion of days at RASS -2 (mild sedation) is the same for all three groups at 24%. The proportion of days at RASS -1 (drowsy) is respectively 13%, 12% and 19%. For RASS = 0 (calm and alert), the proportion is the same for all groups at 23%. Finally, for a RASS= 1 (restless), the proportion of days with this rating for the whole sample is 5%, for individuals with COVID-19 4%, and for individuals without a diagnosis of COVID-19, 8%.

Delirium monitoring with ICDSC. The study site used the Intensive Care Delirium Screening Checklist (ICDSC) to document delirium in ICU patients. A copy of the ICDSC scoring criteria is provided as Appendix D in this report. Rather than a punctual assessment, the ICDSC is completed at least once a shift from observation from on-going assessment throughout the 12-hours period. The patient received a score from 0 to 8: a score of 0 indicates no delirium, a score between 1-4 subsyndromal delirium, while a score of 5-8 qualified as delirium. This score can only be compiled if a patient is arousable. A patient who is moderately sedated (RASS -3) or deeply sedated (RASS score is -4 or -5) cannot be assessed for delirium.

One of the objectives of the study was to assess the rate of delirium monitoring in the ICU. There are different ways of expressing this rate. One method is to count the number of individuals who were evaluated for delirium at least once during their ICU stay. In the sample studied, 33 of the 35 patients were assessed at least once using the ICDSC, which represents 94% of the sample. Only two individuals did not get an assessment for delirium during their stay.

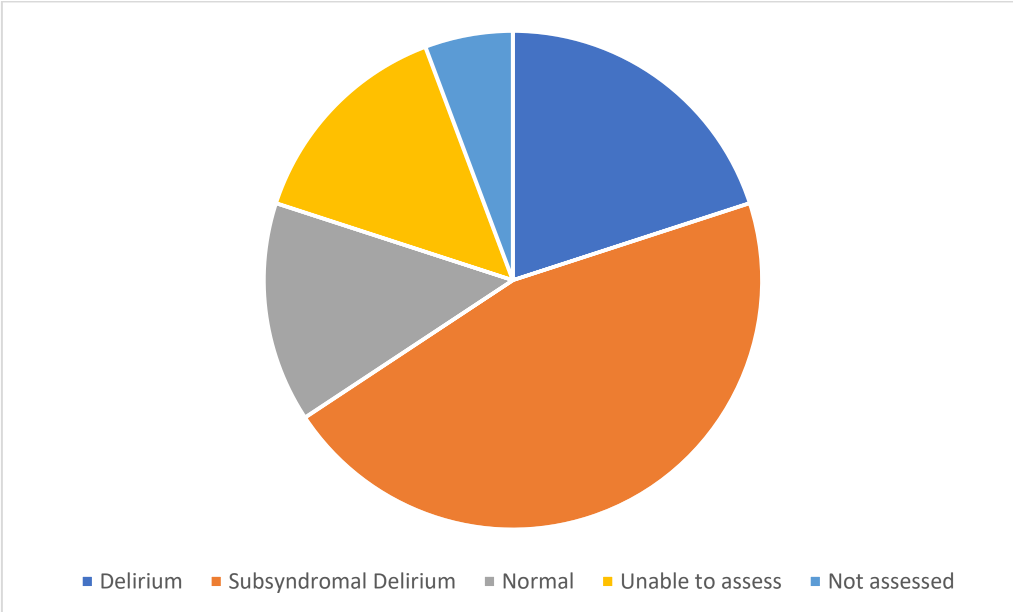
However, since best practices recommend screening for delirium each day, another method for expressing rate of monitoring is to calculate how many days of screening are performed while patients are in the ICU. A rate of 100% would mean that patients are screened for delirium every day that they are in the ICU (a rate of 50% would mean that they are assessed every other day on average). If we pool all the patients of the sample together, and add up the numbers of days that each patient spent in the ICU, we obtain a total number of ICU days for this sample: 402 days. If we calculate the number of days when the ICDSC was administered, we obtain a total number of delirium screening days for this sample: 296. The rate of daily monitoring for this sample is 74%.

Prevalence of Delirium

The ICDSC is composed of 10 items. To be scored as delirium, a presentation must have at least 4 of the 10 positive signs. If an individual has 1-4 positive signs, then the presentation is rated as subsyndromal delirium. If an individual as 0 positive signs, his presentation is considered “normal”. On the other hand, and as stated previously, if an individual is sedated (RASS -3, -4, -5) or unresponsive, the practitioner will select “unable to assess” and will not obtain a delirium score. An individual, therefore, can receive one of the following scores for each daily delirium assessment: normal, subsyndromal delirium, delirium, or unable to assess. If patients experienced both subsyndromal and delirium, they are included in both categories. In the category “unable to assess”, the investigator only included patients who were deemed unratable during their entire stay.

Again, we can use two different methods to calculate prevalence of delirium. We can either look at the number of patients who were affected or the number of ICU days marked by delirium. Figure…. Presents results using the first method, number of patients.

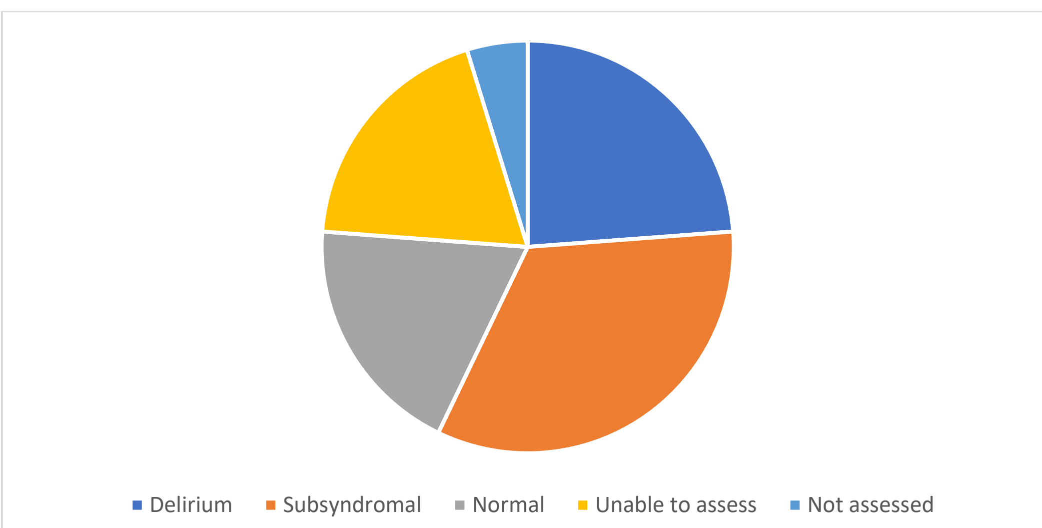
Figure 9. Prevalence of Delirium: All Participants (n=35)



Of the initial sample (n=35), 20% (n=7) experienced delirium during their stay, whereas 46% (n=16) only experienced subsyndromal delirium, 14% (n=5) never met the criteria for either delirium or subsyndromal delirium and were considered of normal consciousness, 14% (n=5) were too sedated to obtain a score, and 5% (n=2) were not assessed.

The population with COVID-19 is isolated in the following diagram.

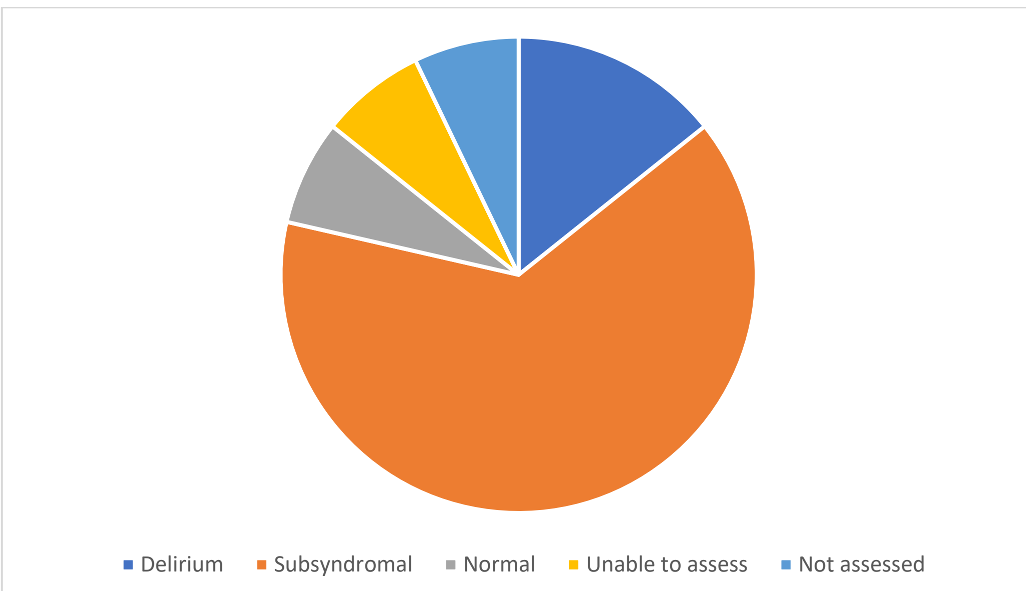
Figure 10. Prevalence of Delirium – Patients with COVID-19 (n=21)



For the group of individuals with COVID-19, 24% (n=5) experienced delirium, 33% (n=7) only experienced subsyndromal delirium, 19% (n=4) were assessed at normal consciousness, 19% (n=4) were too sedated for a score, and 5% (n=1) was not assessed. 10 or 43% of all individuals with COVID-19 experienced subsyndromal delirium at some point in their ICU stay, whereas 5 or 22% of the sample experienced delirium. 4 or 17% were rated as normal during their entire ICU stay, 4 or 17% were deemed unable to assess due to sedation, and 1 or 4% was not assessed.

The following graph isolates the general non-COVID-19 population of the sample, 14 patients in total.

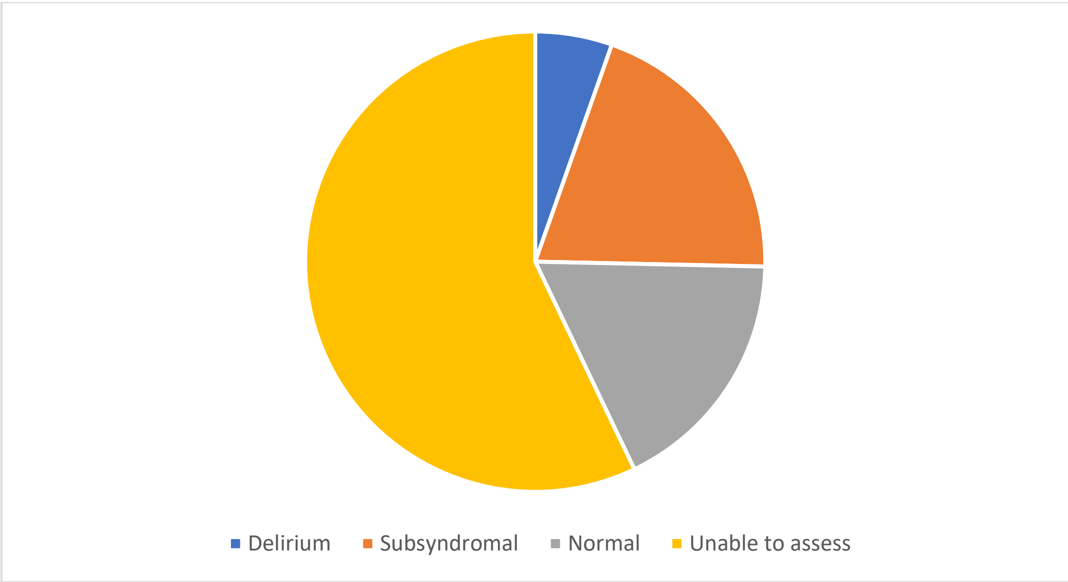
Figure 11. Prevalence of Delirium: Patients without COVID-19 (n=14)



In the category of individuals without COVID-19, 14% (n=2) experienced delirium, 64% (n=9) experienced only subsyndromal delirium, 7% (n=1) remained with normal consciousness, 7% (n=1) was too sedated to receive a score, and 7% (n=1) was not assessed.

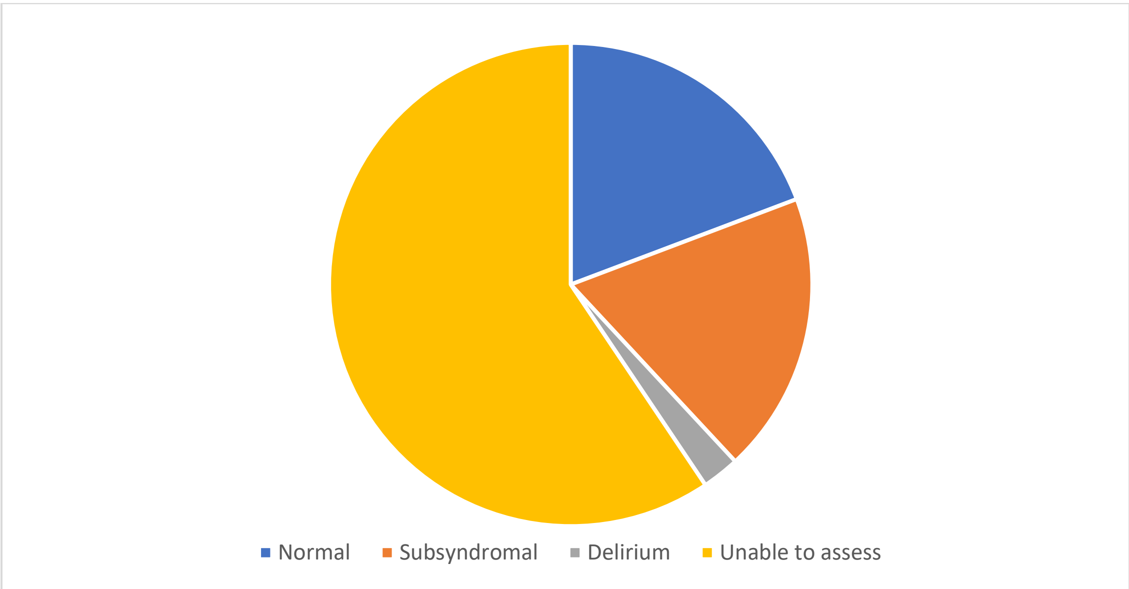
The second method for assessing delirium is to calculate the number of days of delirium for the sample. The following graph represents a distribution of ICU days according to the score received on the ICDSC. Note that only days that received an assessment are included, which amounts to 73% of the total ICU days.

Figure 12. Days of Delirium – Whole sample (n=35)



For the entire sample (n=35), there were 5% (n=16) of days with a delirium score, 20% (n=59) of days with subsyndromal delirium, 18% (n=52) of days with normal consciousness, and 57% (n=169) of days too sedated to receive a score.

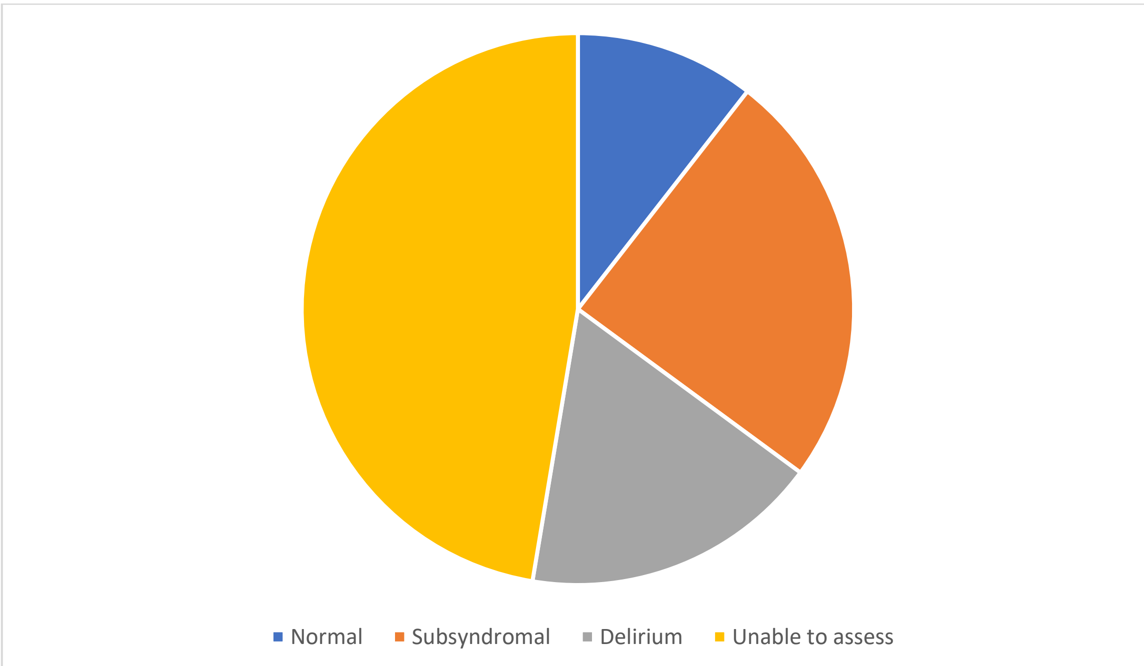
Figure 13. Days of Delirium-COVID-19 (n=21)



For the category of individuals with COVID-19, (n=21), there were 3% (n=6) of days with a delirium score, 19% (n=45) of days with subsyndromal delirium, 19% (n=46) of days with normal consciousness, and 59% (n=142) of days too sedated to receive a score.

A third graph presents the population with a diagnosis other than COVID-19.

Figure 14. Days of Delirium. Non-COVID-19 (n=14)



For the category of individuals without COVID-19, (n=14), there were 18% (n=10) of days with a delirium score, 25% (n=14) of days with subsyndromal delirium, 11% (n=6) of days with normal consciousness, and 47% (n=27) of days too sedated to receive a score.

Early Progressive Mobility Assessment

The American Association of Critical Care Nurses, following the guidelines of the Society for Critical Care Medicine recommends that all patients on mechanical ventilation be assessed for mobility. A standardized assessment tool has been integrated into the nursing documentation, under the ICU Liberation section, alongside the RASS and ICDSC assessments.

The Early Progressive Mobility (EPM) screen and corresponding levels are provided as Appendix E. For reference, the EPM screen prompts nursing to assess a patient on the following criteria: myocardial stability, oxygenation stability, vasopressor use, engagement to voice and neurological stability. This screen yields a score that corresponds to a level of engagement from Level 1 to Level 4, with Level 1 recommending in-bed activities, Level 2 sitting at the edge of the bed, Level 3 standing, Level 4 walking. It represents the minimum requirement for engaging in mobility for patients on mechanical ventilation, although additional contraindications can exist such as femoral lines or internal bleeding (Hodgson et al., 2014). Generally speaking, a patient that meets all criteria listed above should be considered suitable for Level 2, and receive rehabilitation (OT and PT) services.

This score has implications for the integration of rehabilitation services into the ICU. It is designed to facilitate decision-making and encourage mobility for patients with orotracheal intubation, the highest level of care. The investigator's first concern was to assess the rate of completion of this screen by nursing.

When considering only the patients who received mechanical ventilation, all but 2 of the patients were assessed using the EPM at least once, 21 of the 23 possible, a rate of 91%. In addition, several of the patients that were not receiving mechanical ventilation but had shortness of breath were also evaluated using this tool. If considering the entire ICU population, 83% (n=29) were evaluated with the EPM.

Most of the patients evaluated with the EPM received a score of Level 1 (n=20) and we never deemed suitable for Level 2 (sitting edge of bed). Of the patients that were deemed at level 1, all but one of them received mechanical ventilation.

Rehabilitation Services

Rate of services. For this study practice settings, rehabilitation services can be ordered for occupational therapy (OT), physical therapy (PT) or both. The most common scenario is to issue orders for both disciplines. In addition, critically ill patients are most often seen by both disciplines at the same time, due to the complexity of their condition. It is also the therapists' practice to document attempts to treat as well as sessions where services where performed. For example, if an order is issued for a patient whose sedation is too deep to engage in therapy, the therapist would receive the order, inquire about the patient, and then document a short note explaining why the patient couldn't be seen for therapy.

For the entire sample (n=35), 48% (n=17) received rehabilitation services, either OT, PT or both. If isolating services, then 46% (n=16) of clients received OT services, since one of the participants in the sample only received PT while in the ICU. An additional number of individuals (n=5) or 14% of the sample received an order for rehabilitation services (both OT and PT), but were never seen during sessions. For those patients, therapists documented attempts notes only. To obtain the proportion of individuals who had a doctor's order for rehabilitation services while in the ICU, we can combine the patients who received services (n=17) with the ones attempted (n=5) for a total of 22 individuals or 63%.

The sample was too small to calculate rates on distinct diagnostic groups, such as COVID-19.

Interval between Admission and Rehabilitation Services. One of the objectives of this research project was to calculate the interval between an individual's admission to the ICU and the first attempt by an occupational therapist or a physical therapist to provide services. This relates to the literature on early mobility, and the stated importance of providing rehabilitation services as soon as possible after stabilization (Ding et al., 2019; Menges et al., 2021).

For occupational therapy, the smallest interval was 1 days and the longest 15 days, with a mean of 5. For physical therapy, the smallest interval was 1 day and the longest 15 days, with a mean of 5. Since most interventions in the ICU are planned as co-treatments, and since orders are often issued at the same time, it is not surprising that statistics would be similar between the two services. The average length of all OT and PT sessions was 24 minutes. This is consistent for patients with a diagnosis of COVID and those who do not have it.

Content of OT Services. A brief analysis of the content of OT sessions using therapy notes reveals an emphasis on ADLs, whether through doing (such as dressing, sponge bathing, etc) or explaining, alongside mobility training. There were also a few instances of re-orientation, teaching of breathing techniques and one instance of home safety education. There were no documented instances of rote exercises. A brief analysis of the PT notes showed an emphasis on mobility training and breathing technique, with a few instances of ADLs (toileting), some gait training, and 2 instances of therapeutic exercises. There were no instances of patients receiving OT treatment in a gym environment, all patients were treated in the hospital room.

Reasons for Attempts. As stated above, a number of patients did not receive services although they had been ordered. In addition, some patients only received some of the sessions that were planned. In both situations, the therapist documented attempts notes to explain why the service was not performed. The following analysis is preliminary, as it may not account for the total number of attempt notes entered. Based on preliminary analysis, the most common reason for services not being performed was intubation and sedation combined (n=9), followed by instability or poor prognosis (n=7), refusal by the patient (n=5), unavailability of individual because of procedure or care being provided by someone else (n=4), or agitation (n=3).

Discussion

Delirium

The sample used for this analysis is relatively small (n=35) and with a concentration of patients with a second wave of COVID-19 (n=21). This yields a picture of the site's ICU that may be unusual, since the disease had particular acuity at the time, with a high rate of respiratory instability and mortality. This discussion is preliminary, until a larger sample (n=100) can be analyzed.

The median age for the entire sample was situated in the 51-60 category. It is remarkable, however, that the highest age categories (71-80 and 91+) only contained individuals with COVID-19. This could suggest that the disease affected elderly individuals particularly, but this remains to be verified and beyond the scope of this study. The data was not analyzed to reveal patterns between age and occurrence of delirium, although this might be relevant for a larger sample.

The most common diagnoses for the entire sample were, in order of frequency: COVID-19, pneumonia (other), withdrawal syndrome, heart failure. This data was further analyzed to find patterns related to delirium. The individuals with delirium (n=7) had one of only three diagnoses: COVID-19, pneumonia or withdrawal syndrome, with a predominance for COVID-19. Whereas individuals who experience subsyndromal delirium had a wider variety of diagnoses: COVID-19, pneumonia, withdrawal, COPD exacerbation, urinary tract infection, diabetic ketoacidosis.

ICU and hospital length of stay were calculated for the entire sample (n=35) and presented similar patterns: most patients stay for shorter stays (1-10 days) or very long stays (16 + days), with a drop in frequency for patients who stay between 11 and 16 days. The patients who stayed in the ICU and the hospital for more than 21 days (n=7) all had a diagnosis of COVID-19, and none of the patients with COVID-19 stayed for less than 6 days, suggested a longer length of stay for this diagnosis.

Although no analysis was done to establish a relationship in the sample between length of stay and mechanical ventilation, a cursory look at the data suggests that mechanical ventilation might contribute to explaining the length of stay pattern. Patients exposed to high amounts of oxygen through ventilation are at risk for complications, including oxygen toxicity to organs, especially if the ventilation persists beyond 10 days. The goal of the care team was consistently, and from the first day, to decrease oxygen supplementation and to wean patients from the ventilator. However, failure to wean from the ventilator within 10 days indicates poor prognosis and seems to dramatically increase the length of stay or result in palliative consult with, in some cases, compassionate extubation.

The data suggested a correlation between delirium or subsyndromal delirium and longer lengths of stay. Individuals who were assessed as experiencing delirium during their ICU stay (n=7) remained on average 7 times longer in the ICU (21 days vs 3 days) and 2.5 times longer in the hospital (26 days vs 10 days) than the patients who were assessed at normal consciousness (n=5). Individuals with subsyndromal delirium (n=16) stayed on average 3 times longer in the ICU and 1.4 times longer in the hospital than individuals with normal consciousness.

The data also suggests an association with mechanical ventilation and delirium, since all but one of the patients that experienced delirium during their stay received mechanical ventilation (n=6). None of the individuals with normal consciousness received mechanical ventilation.

The RASS and ICDSC were performed on a majority of patients in the ICU. For the RASS, 99% of patients were monitored and 90% of days spent in the ICU received a score. For the ICDSC, 94% of patients were monitored, whereas 74% of days received a score. Recent studies on nursing documentation of delirium screens (Boehm et al., 2017; Deffland et al., 2020) suggest that other sites have obtained a score of 100%, and that delirium monitoring is a well-implemented aspect of the ICU Liberation Bundle (Balas et al., 2014; Devlin et al., 2018b). The results suggest that delirium might be insufficiently monitored.

The prevalence of delirium for the whole sample (n=25) was 20%, lower than expected based on large prevalence studies (Krewulak et al., 2018) which set the rate at 30%. Since it was already established that delirium monitoring might be insufficient, then the lower rate might reflect missed assessments. Meanwhile, the prevalence of subsyndromal delirium for the whole sample was higher than expected at 46% based on prevalence studies (Serafim et al., 2017) which set the rate at 36%. The rate of subsyndromal delirium is even higher in the portion of the sample that does not have COVID-19, at 64%. This could be due to misclassification of hypoactive delirium as subsyndromal, particularly with non-verbal patients (such as those with orotracheal intubation) or due to the high rate of sedation in the ICU.

An indication of the state of sedation and decreased consciousness in the ICU was provided by the data on delirium monitoring. When a patient was too sedated to receive a score on the delirium screen, this patient received a rating of “unable to assess”. For the entire sample (n=35), there were 57% of days (n=169) when a score could not be obtained due to sedation. For the portion of the sample with COVID-19 (n=21), this rate if 59% (n=142). This would mean that more than half of the days spent in the ICU were under moderate to deep sedation. This sedation rate is likely related to the rate of mechanical ventilation and orotracheal intubation, since it is common practice at this practice site to sedate for part or all of the intubated period.

Rehabilitation

For the entire sample (n=35), 83% (n=29) of patients were assessed using the Early Progressive Mobility screen, a nursing tool designed to select patients who are ready for mobility. Most of the patients assessed (n=20 or 69%) were deemed at a Level 1, which corresponds to in-bed, passive activities. This would leave 31% (n=9) of patients assessed using the Early Progressive Mobility Screen who were considered stable enough for rehabilitation services. This is below the actual rate of delivery of rehabilitation services in the ICU since 48% of all patients received either OT, PT or both (mostly both). This could suggest that nurses do not use the Early Progressive Mobility screen to direct their clinical reasoning when authorizing rehabilitation intervention, that they were assessing current level of activity rather than readiness, or that they are more conservative in their written documentation than in practice. It was also remarkable that several patients were rated as meeting the criteria for Level 2 mobility – sitting edge of bed, but were still considered at Level 1 in the final analysis by nursing.

Other data on rehabilitation services include an interval between admission to the ICU and first delivery of therapy services of 5 days for both OT and PT. This is within the interval deemed optimal by the most recent systematic review on early mobility (Menges et al., 2021) of 4 to 7 days. The interval was calculated for services performed only, excluding attempts that did not result in delivery of services. All patients received both OT and PT, except for one patient who received PT only. Most commonly, patients were co-treated by both disciplines, meaning that an occupational therapy and a physical therapist were seeing the patient at the same time, working together as a team. The average length of sessions was 24 minutes.

Challenges to Rehabilitation Services

The reasons for services not being performed, in decreasing order of importance were intubation with sedation, medical instability, refusal, unavailability, or agitation. This would suggest that sedation during intubation is one of the main obstacles to delivery of rehabilitation services, although this would have to be assessed in relationship to other factors such as instability. The rationale for providing moderate to deep sedation during intubation are not fully known to this investigator, and may have to be further understood.

Of note, this particular sample with a majority of patients with COVID-19 was remarkable for poor prognosis and high mortality. Because this was not part of the original IRB description, data on mortality was not collected. However, the data on mechanical ventilation and oxygen requirements yielded incidental information regarding prognosis. The patients that remained on mechanical ventilation with a high oxygen demand on the last day of their hospital length of stay are presumed to have expired. Based on the assumption, 13 of the 21 individuals admitted with COVID-19 have expired during the study period, while 2 of the individuals with pneumonia and one with withdrawal syndrome expired. For the entire sample, this would create a rate of mortality of 46%. For individuals with COVID-19, the mortality rate would be estimated at 62%. 100% of individuals who were on mechanical ventilation for 21 days or more (n=7) expired. This suggests a very fragile population, a high burden of care for nurses, and high risk for critical events such as cardiac codes. It is possible that this climate affected the nurses' assessment of readiness for mobility or that the acuity of patient's condition prevented delivery of rehabilitation services. Literature reports that concern for safety (Hodgson et al., 2014) is often mentioned by nurses and other practitioners when considering mobility in the ICU, despite the establishment of well-accepted safety criteria. In addition, nursing workload and strain is known to negatively affect the implementation of the ICU Liberation Bundle (Deffland et al., 2020), in particular the early mobility component.

An additional concern in terms of referrals to OT services is the documented perception that hospital-based OTs organize discharge planning rather than remedial services. The literature on OT and delirium suggests that OTs may have an impact on the course of delirium, which could be considered a remedial effect (Álvarez et al., 2017c; Kingston et al., 2019). However, this may not be known to nurses and other ICU practitioners who are gatekeepers for the delivery of rehabilitation services in the ICU.

Implications for Practice

Occupational therapists might be more effective in the ICU by promoting their role in reducing length of stay, through programs targeted at delirium and subsyndromal delirium. Length of stay is a valued measure for administrators and leaders in the hospital, and a great argument for promoting services. The small body of evidence on occupational therapy and delirium suggests that services can have an impact of the duration of delirium and length of stay (Álvarez et al., 2017c; Schweickert et al., 2009b) (Weinreich et al., 2017). However, documentation of OT services at the study site suggests that delirium is not assessed or treated specifically by OTs, although they are assisting patients with transfer training and self-care. A program and training module would be needed to implemented best practices (Evangelist & Gartenberg, 2016; Laxton & Morrow, 2020). In additional to continuing education offered by the American Occupational Therapy Association (Laxton & Morrow, 2020), a recent study by Alvarez et al., (2017) suggests a protocol for delirium intervention in the ICU.

Patients who are receiving mechanical ventilation may not be receiving rehabilitation services according to best practices, due to lack of coordination between nursing and therapists, lack of training, or failure to use the Early Progressive Mobility screen to identify candidates. This is a complex issue that requires coordinated efforts. The investigator is currently participating in an Early Progressive Mobility committee that seeks to establish a protocol for rehabilitation services of mechanically ventilated patients. The information gathered through this Capstone project may be presented in part to the committee to help advance those efforts.

Limitations

The sample (n=35) is small, and even smaller when considering the number of patients who received rehabilitation services (n=17). In collaboration with her academic advisor, the principal investigator plans to increase the sample to 100 participants and prepare an analysis for publication.

Although measures were taken to limit the implication of the investigator in the ICU during the collection period, the investigator was also one of the treating therapists. To limit contamination of the date, there was no variation in the services provided from usual care. To limit bias, the method for data collection was followed without deviation.

Further Research

In addition to increasing the sample size, the following topics could be further developed in analysis: whether or not delirium is an obstacle to delivery of rehabilitation services; whether subsyndromal delirium is associate with mechanical ventilation or a deeper state of sedation; whether delirium is mostly hyperactive or hypoactive or both.

Conclusion

Delirium represents an alteration of consciousness, sometimes accompanied by intense lethargy, sometimes with increased agitation (American Psychiatric Association, 2013). Although temporary, the condition is considered significant because it is associated with increased mortality and longer hospital stays (Krewulak et al., 2020). Because of the impact of delirium on outcomes, the Society for Critical Care Medicine has created guidelines for the management of various conditions in the ICU, including delirium (Devlin et al., 2018b). These guidelines promote non-pharmaceutical interventions that are within the scope of occupational therapy practice.

This Capstone study was based on a quality improvement approach. The investigator wished to assess current practices in the ICU regarding the management of delirium, including the integration of rehabilitation services. After IRB approval, the investigator consulted charts to gather the following information on delirium monitoring, delirium scores, and delivery of rehabilitation (occupational and physical therapy) services. The data was then analyzed to yield basic statistics.

The rate of delirium monitoring in the ICU as 94% of all patients, whereas some recent studies found rates of up to 100% for delirium monitoring in the ICU by nursing. The prevalence of delirium for the sample was 20%, below the expected prevalence at 30%, based on large, multi-site studies (Salluh et al., 2010). The rate of subsyndromal delirium was higher than expected: 46% rather than 36% found in recent studies (Serafim et al., 2017). The presence of delirium predicted longer stays: individuals who experienced delirium remained 7 times longer in the ICU and 2.5 times longer in the hospital. Individuals with subsyndromal delirium stayed on average 3 times longer in the ICU and 1.4 times longer in the hospital. The first session of either occupational or physical therapy was provided, on average, within 5 days of admission to the ICU, within the interval recommended in the most recent systematic review (Menges et al., 2021). The content of OT intervention does not target delirium, but rather decreased mobility and impaired self-care.

A discussion of the findings suggested that delirium may be insufficiently monitored in the ICU, miscategorized, or assessed incompletely due to sedation. These gaps in monitoring may lead to underestimation of the prevalence of delirium, a condition that prolongs stays in the hospital and is considered a symptom of worsening condition. In addition, OT programming did not address delirium specifically, although early intervention (within 4-7 days of admission to the ICU) was provided, with a focus on mobility and self-care. Implications for practice include developing OT programming for delirium management, including programming for individuals that are receiving mechanical ventilation through orotracheal intubation, (a risk factor for delirium), as well as promoting OT's role in decreasing length of stay.

References

Abraha, I., Rimland, J. M., Trotta, F., Pierini, V., Cruz-Jentoft, A., Soiza, R., O'Mahony, D., & Cherubini, A. (2016). Non-pharmacological interventions to prevent or treat delirium in older patients : Clinical practice recommendations the SENATOR-ONTOP series. *The Journal of Nutrition, Health & Aging*, *20*(9), 927-936. https://doi.org/10.1007/s12603-016-0719-9

Álvarez, E. A., Garrido, M. A., Tobar, E. A., Prieto, S. A., Vergara, S. O., Briceño, C. D., & González, F. J. (2017a). Occupational therapy for delirium management in elderly patients without mechanical ventilation in an intensive care unit : A pilot randomized clinical trial. *Journal of Critical Care*, *37*, 85-90. https://doi.org/10.1016/j.jcrc.2016.09.002

Álvarez, E. A., Garrido, M. A., Tobar, E. A., Prieto, S. A., Vergara, S. O., Briceño, C. D., & González, F. J. (2017b). Occupational therapy for delirium management in elderly patients without mechanical ventilation in an intensive care unit : A pilot randomized clinical trial. *Journal of Critical Care*, *37*, 85-90. https://doi.org/10.1016/j.jcrc.2016.09.002

Álvarez, E. A., Garrido, M. A., Tobar, E. A., Prieto, S. A., Vergara, S. O., Briceño, C. D., & González, F. J. (2017c). Occupational therapy for delirium management in elderly patients without mechanical ventilation in an intensive care unit. A pilot randomized clinical trial. *Journal of Critical Care*, *40*, 265. https://doi.org/10.1016/j.jcrc.2017.03.016

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (5th ed.)*.

Balas, M. C., Vasilevskis, E. E., Olsen, K. M., Schmid, K. K., Shostrom, V., Cohen, M. Z., Peitz, G., Gannon, D. E., Sisson, J., Sullivan, J., Stothert, J. C., Lazure, J., Nuss, S. L., Jawa, R. S., Freihaut, F., Ely, E. W., & Burke, W. J. (2014). Effectiveness and Safety of the Awakening and Breathing Coordination, Delirium Monitoring/Management, and Early Exercise/Mobility Bundle*: *Critical Care Medicine*, *42*(5), 1024-1036. https://doi.org/10.1097/CCM.0000000000000129

Bannon, L., McGaughey, J., Verghis, R., Clarke, M., McAuley, D. F., & Blackwood, B. (2019). The effectiveness of non-pharmacological interventions in reducing the incidence and duration of delirium in critically ill patients : A systematic review and meta-analysis. *Intensive Care Medicine*, *45*(1), 1-12. https://doi.org/10.1007/s00134-018-5452-x

Barr, J., Fraser, G. L., Puntillo, K., Ely, E. W., Gélinas, C., Dasta, J. F., Davidson, J. E., Devlin, J. W., Kress, J. P., Joffe, A. M., Coursin, D. B., Herr, D. L., Tung, A., Robinson, B. R. H., Fontaine, D. K., Ramsay, M. A., Riker, R. R., Sessler, C. N., Pun, B., … Jaeschke, R. (2013). Clinical Practice Guidelines for the Management of Pain, Agitation, and Delirium in Adult Patients in the Intensive Care Unit: *Critical Care Medicine*, *41*(1), 263-306. https://doi.org/10.1097/CCM.0b013e3182783b72

Boehm, L. M., Dietrich, M. S., Vasilevskis, E. E., Wells, N., Pandharipande, P., Ely, E. W., & Mion, L. C. (2017). Perceptions of Workload Burden and Adherence to ABCDE Bundle Among Intensive Care Providers. *American Journal of Critical Care*, *26*(4), e38-e47. https://doi.org/10.4037/ajcc2017544

Boettger, S., Nuñez, D. G., Meyer, R., Richter, A., Fernandez, S. F., Rudiger, A., Schubert, M., & Jenewein, J. (2017). Delirium in the intensive care setting and the Richmond Agitation and Sedation Scale (RASS) : Drowsiness increases the risk and is subthreshold for delirium. *Journal of Psychosomatic Research*, *103*, 133-139. CINAHL Complete. https://doi.org/10.1016/j.jpsychores.2017.09.011

Bonnel, W., & Smith, K. (2017). *Proposal Writing for Clinical Nursing and DNP Projects* (Springer).

Brummel, N. E., Jackson, J. C., Pandharipande, P. P., Thompson, J. L., Shintani, A. K., Dittus, R. S., Gill, T. M., Bernard, G. R., Ely, E. W., & Girard, T. D. (2014). Delirium in the ICU and Subsequent Long-Term Disability Among Survivors of Mechanical Ventilation*: *Critical Care Medicine*, *42*(2), 369-377. https://doi.org/10.1097/CCM.0b013e3182a645bd

Burry, L. D., Cheng, W., Williamson, D. R., Adhikari, N. K., Egerod, I., Kanji, S., Martin, C. M., Hutton, B., & Rose, L. (2021). Pharmacological and non-pharmacological interventions to prevent delirium in critically ill patients : A systematic review and network meta-analysis. *Intensive care medicine*, *47*(9), 943-960. MEDLINE. https://doi.org/10.1007/s00134-021-06490-3

Casey, P., Cross, W., Mart, M. W., Baldwin, C., Riddell, K., & Dārziņš, P. (2019). Hospital discharge data under-reports delirium occurrence : Results from a point prevalence survey of delirium in a major Australian health service. *Internal Medicine Journal*, *49*(3), 338-344. CINAHL Complete. https://doi.org/10.1111/imj.14066

Chen, J., Yu, J., & Zhang, A. (2020). Delirium risk prediction models for intensive care unit patients : A systematic review. *Intensive & critical care nursing*, *60*, 102880. MEDLINE. https://doi.org/10.1016/j.iccn.2020.102880

Costa, D. K., White, M. R., Ginier, E., Manojlovich, M., Govindan, S., Iwashyna, T. J., & Sales, A. E. (2017). Identifying Barriers to Delivering the Awakening and Breathing

Coordination, Delirium, and Early Exercise/Mobility Bundle to Minimize Adverse Outcomes for Mechanically Ventilated Patients. *Chest*, *152*(2), 304-311. https://doi.org/10.1016/j.chest.2017.03.054

Deemer, K., Zjadewicz, K., Fiest, K., Oviatt, S., Parsons, M., Myhre, B., & Posadas-Calleja, J. (2020). Effect of early cognitive interventions on delirium in critically ill patients : A systematic review. *Canadian Journal of Anesthesia/Journal Canadien d'anesthésie*, *67*(8), 1016-1034. https://doi.org/10.1007/s12630-020-01670-z

Deffland, M., Spies, C., Weiss, B., Keller, N., Jenny, M., Kruppa, J., & Balzer, F. (2020). Effects of pain, sedation and delirium monitoring on clinical and economic outcome : A retrospective study. *PLOS ONE*, *15*(9), e0234801. https://doi.org/10.1371/journal.pone.0234801

Devlin, J. W., Skrobik, Y., Gélinas, C., Needham, D. M., Slooter, A. J. C., Pandharipande, P. P., Watson, P. L., Weinhouse, G. L., Nunnally, M. E., Rochwerg, B., Balas, M. C., van den Boogaard, M., Bosma, K. J., Brummel, N. E., Chanques, G., Denehy, L., Drouot, X., Fraser, G. L., Harris, J. E., … Alhazzani, W. (2018a). Clinical Practice Guidelines for the Prevention and Management of Pain, Agitation/Sedation, Delirium, Immobility, and Sleep Disruption in Adult Patients in the ICU: *Critical Care Medicine*, *46*(9), e825-e873. https://doi.org/10.1097/CCM.0000000000003299

Devlin, J. W., Skrobik, Y., Gélinas, C., Needham, D. M., Slooter, A. J. C., Pandharipande, P. P., Watson, P. L., Weinhouse, G. L., Nunnally, M. E., Rochwerg, B., Balas, M. C., van den Boogaard, M., Bosma, K. J., Brummel, N. E., Chanques, G., Denehy, L., Drouot, X., Fraser, G. L., Harris, J. E., … Alhazzani, W. (2018b). Clinical Practice Guidelines for the Prevention and Management of Pain, Agitation/Sedation, Delirium, Immobility, and

Sleep Disruption in Adult Patients in the ICU: *Critical Care Medicine*, *46*(9), e825-e873. https://doi.org/10.1097/CCM.0000000000003299

Ding, N., Zhang, Z., Zhang, C., Yao, L., Yang, L., Jiang, B., Wu, Y., Jiang, L., & Tian, J. (2019). What is the optimum time for initiation of early mobilization in mechanically ventilated patients? A network meta-analysis. *PLOS ONE*, *14*(10), e0223151. https://doi.org/10.1371/journal.pone.0223151

Evangelist, M., & Gartenberg, A. (2016). Toolkit for developing an occupational therapy program in the ICU. *SIS Quaterly Practice Connections*, *1*(1), 20-22.

Fischer, T., Hosie, A., Luckett, T., Agar, M., & Phillips, J. (2019). Strategies for Pain Assessment in Adult Patients With Delirium : A Scoping Review. *Journal of pain and symptom management*, *58*(3), 487. MEDLINE. https://doi.org/10.1016/j.jpainsymman.2019.05.020

Gélinas, C., Bérubé, M., Chevrier, A., Pun, B. T., Ely, E. W., Skrobik, Y., & Barr, J. (2018). Delirium Assessment Tools for Use in Critically Ill Adults : A Psychometric Analysis and Systematic Review. *Critical Care Nurse*, *38*(1), 38-49. https://doi.org/10.4037/ccn2018633

Geriatric Medicine Research Collaborative. (2019). Delirium is prevalent in older hospital inpatients and associated with adverse outcomes : Results of a prospective multi-centre study on World Delirium Awareness Day. *BMC Medicine*, *17*(1), 229. https://doi.org/10.1186/s12916-019-1458-7

Hayhurst, C. J., Marra, A., Han, J. H., Patel, M. B., Brummel, N. E., Thompson, J. L., Jackson, J. C., Chandrasekhar, R., Ely, E. W., Pandharipande, P. P., & Hughes, C. G. (2020). Association of Hypoactive and Hyperactive Delirium With Cognitive Function After

Critical Illness. *Critical Care Medicine*, *48*(6), e480-e488. https://doi.org/10.1097/CCM.0000000000004313

Herling, S. F., Greve, I. E., Vasilevskis, E. E., Egerod, I., Bekker Mortensen, C., Møller, A. M., Svenningsen, H., & Thomsen, T. (2018a). Interventions for preventing intensive care unit delirium in adults. *Cochrane Database of Systematic Reviews*. https://doi.org/10.1002/14651858.CD009783.pub2

Herling, S. F., Greve, I. E., Vasilevskis, E. E., Egerod, I., Bekker Mortensen, C., Møller, A. M., Svenningsen, H., & Thomsen, T. (2018b). Interventions for preventing intensive care unit delirium in adults. *Cochrane Database of Systematic Reviews*, *2019*(1). https://doi.org/10.1002/14651858.CD009783.pub2

Ho, M., Montgomery, A., Traynor, V., Chang, C., Kuo, K. N., Chang, H. (Rita), & Chen, K. (2020). Diagnostic Performance of Delirium Assessment Tools in Critically Ill Patients : A Systematic Review and Meta-Analysis. *Worldviews on Evidence-Based Nursing*, *17*(4), 301-310. https://doi.org/10.1111/wvn.12462

Hodgson, C. L., Stiller, K., Needham, D. M., Tipping, C. J., Harrold, M., Baldwin, C. E., Bradley, S., Berney, S., Caruana, L. R., Elliott, D., Green, M., Haines, K., Higgins, A. M., Kaukonen, K.-M., Leditschke, I. A., Nickels, M. R., Paratz, J., Patman, S., Skinner, E. H., … Webb, S. A. (2014). Expert consensus and recommendations on safety criteria for active mobilization of mechanically ventilated critically ill adults. *Critical Care*, *18*(6), 658. https://doi.org/10.1186/s13054-014-0658-y

Institute for Healthcare Improvement. (2017). *Quality Improvement Essentials Toolkit*. Institute for Healthcare Improvement. http://www.ihi.org/resources/Pages/Tools/Quality-Improvement-Essentials-Toolkit.aspx

Institute for Healthcare Improvement. (2021). *About IHI*. http://www.ihi.org/about/Pages/default.aspx

Jacob, C. M., Hegadoren, K., & Lasiuk, G. (2017). Risk factors associated with intensive care delirium : A systematic review. *Connect: The World of Critical Care Nursing*, *11*(1), 7-12. https://doi.org/10.1891/1748-6254.11.1.7

Johnson, D., Maylin, E., Hayes, L., Hair, C., & Sahathevan, R. (2020). A systematic review of the impact of delirium on allied health interventions : A surprising lack of data. *Neurology Asia*, 6.

Kang, J., Lee, M., Ko, H., Kim, S., Yun, S., Jeong, Y., & Cho, Y. (2018). Effect of nonpharmacological interventions for the prevention of delirium in the intensive care unit : A systematic review and meta-analysis. *Journal of Critical Care*, *48*, 372-384. https://doi.org/10.1016/j.jcrc.2018.09.032

Kim, C. M., van der Heide, E. M., van Rompay, T. J. L., Verkerke, G. J., & Ludden, G. D. S. (2021). Overview and Strategy Analysis of Technology-Based Nonpharmacological Interventions for In-Hospital Delirium Prevention and Reduction : Systematic Scoping Review. *Journal of Medical Internet Research*, *23*(8), e26079. https://doi.org/10.2196/26079

Kingston, G., Pain, T., Murphy, K., Bennett, M., & Watson, M. (2019). Perceptions of acute hospital occupational therapy services : Developing a new model of care for occupational therapy on acute medical wards. *International Journal of Therapy and Rehabilitation*, *26*(12), 1-9. https://doi.org/10.12968/ijtr.2017.0047

Koirala, B., Hansen, B. R., Hosie, A., Budhathoki, C., Seal, S., Beaman, A., & Davidson, P. M. (2020). Delirium point prevalence studies in inpatient settings : A systematic review and meta-analysis. *Journal of clinical nursing*, *29*(13-14), 2083-2092. MEDLINE. https://doi.org/10.1111/jocn.15219

Kotfis, K., Witkiewicz, W., Szylińska, A., Witkiewicz, K., Nalewajska, M., Feret, W., Wojczyński, Ł., Duda, Ł., & Ely, E. W. (2021). Delirium Severely Worsens Outcome in Patients with COVID-19—A Retrospective Cohort Study from Temporary Critical Care Hospitals. *Journal of Clinical Medicine*, *10*(13), 2974. https://doi.org/10.3390/jcm10132974

Krewulak, K. D., Stelfox, H. T., Ely, E. W., & Fiest, K. M. (2020). Risk factors and outcomes among delirium subtypes in adult ICUs : A systematic review. *Journal of Critical Care*, *56*, 257-264. https://doi.org/10.1016/j.jcrc.2020.01.017

Krewulak, K. D., Stelfox, H. T., Leigh, J. P., Ely, E. W., & Fiest, K. M. (2018). Incidence and Prevalence of Delirium Subtypes in an Adult ICU: A Systematic Review and Meta-Analysis. *Critical Care Medicine*, *46*(12), 2029-2035. CINAHL Complete. https://doi.org/10.1097/CCM.0000000000003402

Law, M., & MacDermid, J. (2014). *Evidence-Based Rehabilitation. A Guide to Practice.* (Third Edition). Slack.

Laxton, L., & Morrow, M. (2020a). The role of occupational therapy in delirium detection and management for critically ill clients. *SIS Quaterly Practice Connections*, *5*(2), 27-29.

Laxton, L., & Morrow, M. (2020b). The Role of Occupational Therapy in Delirium Detection and Management for Critically Ill Clients. *SIS Quarterly Practice Connections*, *5*(2), 27-29. CINAHL Complete.

Lee, C. D., Chippendale, T. L., & McLeaming, L. (2020). Postoperative Delirium Prevention as Standard Practice in Occupational Therapy in Acute Care. *Physical & Occupational Therapy In Geriatrics*, *38*(3), 264-270. https://doi.org/10.1080/02703181.2020.1740374

Luetz, A., Weiss, B., Boettcher, S., Burmeister, J., Wernecke, K.-D., & Spies, C. (2016a). Routine delirium monitoring is independently associated with a reduction of hospital mortality in critically ill surgical patients : A prospective, observational cohort study. *Journal of Critical Care*, *35*, 168-173. https://doi.org/10.1016/j.jcrc.2016.05.028

Luetz, A., Weiss, B., Boettcher, S., Burmeister, J., Wernecke, K.-D., & Spies, C. (2016b). Routine delirium monitoring is independently associated with a reduction of hospital mortality in critically ill surgical patients : A prospective, observational cohort study. *Journal of Critical Care*, *35*, 168-173. https://doi.org/10.1016/j.jcrc.2016.05.028

Marengoni, A., Zucchelli, A., Grande, G., Fratiglioni, L., & Rizzuto, D. (2020). The impact of delirium on outcomes for older adults hospitalised with COVID-19. *Age & Ageing*, *49*(6), 923-926. Academic Search Ultimate.

Martin, B.-J., Buth, K. J., Arora, R. C., & Baskett, R. J. (2010). Delirium as a predictor of sepsis in post-coronary artery bypass grafting patients : A retrospective cohort study. *Critical Care*, *14*(5), R171. https://doi.org/10.1186/cc9273

McClellan, E. (s. d.). *Nursing Perceptions of Occupational Therapy for Delirium Management in the Intensive Care Unit*. 85.

Mehta, S., Cook, D., Devlin, J. W., Skrobik, Y., Meade, M., Fergusson, D., Herridge, M., Steinberg, M., Granton, J., Ferguson, N., Tanios, M., Dodek, P., Fowler, R., Burns, K., Jacka, M., Olafson, K., Mallick, R., Reynolds, S., Keenan, S., & Burry, L. (2015). Prevalence, risk factors, and outcomes of delirium in mechanically ventilated adults*.

Critical Care Medicine, *43*(3), 557-566. CINAHL Complete. https://doi.org/10.1097/CCM.0000000000000727

Menges, D., Seiler, B., Tomonaga, Y., Schwenkglenks, M., Puhan, M. A., & Yebyo, H. G. (2021). Systematic early versus late mobilization or standard early mobilization in mechanically ventilated adult ICU patients : Systematic review and meta-analysis. *Critical Care*, *25*(1), 16. https://doi.org/10.1186/s13054-020-03446-9

Morandi, A., McCurley, J., Vasilevskis, E. E., Fick, D. M., Bellelli, G., Lee, P., Jackson, J. C., Shenkin, S. D., Marcotrabucchi, Schnelle, J., Inouye, S. K., Ely, E. W., & MacLullich, A. (2012). Tools to detect delirium superimposed on dementia : A systematic review. *Journal of the American Geriatrics Society*, *60*(11), 2005-2013. MEDLINE. https://doi.org/10.1111/j.1532-5415.2012.04199.x

Needham, D. (2020, novembre 5). *Designing, conducting, and sustaining a quality improvement program*. 9th Annual Critical Care, 9th Annual Critical Care Rehabilitation Conference Johns Hopkins Medical Center.

Needham, D. M., Korupolu, R., Zanni, J. M., Pradhan, P., Colantuoni, E., Palmer, J. B., Brower, R. G., & Fan, E. (2010). Early Physical Medicine and Rehabilitation for Patients With Acute Respiratory Failure : A Quality Improvement Project. *Archives of Physical Medicine and Rehabilitation*, *91*(4), 536-542. https://doi.org/10.1016/j.apmr.2010.01.002

Neufeld, K. J. (2020, novembre 5). *Sedation & Delirium Overview*. 9th Annual Critical Care Rehabilitation Conference Johns Hopkins Medical Center, Johns Hopkins.

Nydahl, P., Sricharoenchai, T., Chandra, S., Kundt, F. S., Huang, M., Fischill, M., & Needham, D. M. (2017a). Safety of Patient Mobilization and Rehabilitation in the Intensive Care

Unit. Systematic Review with Meta-Analysis. *Annals of the American Thoracic Society*, *14*(5), 766-777. https://doi.org/10.1513/AnnalsATS.201611-843SR

Nydahl, P., Sricharoenchai, T., Chandra, S., Kundt, F. S., Huang, M., Fischill, M., & Needham, D. M. (2017b). Safety of Patient Mobilization and Rehabilitation in the Intensive Care Unit. Systematic Review with Meta-Analysis. *Annals of the American Thoracic Society*, *14*(5), 766-777. https://doi.org/10.1513/AnnalsATS.201611-843SR

Pun, B. T., Badenes, R., Heras La Calle, G., Orun, O. M., Chen, W., Raman, R., Simpson, B.-G. K., Wilson-Linville, S., Hinojal Olmedillo, B., Vallejo de la Cueva, A., van der Jagt, M., Navarro Casado, R., Leal Sanz, P., Orhun, G., Ferrer Gómez, C., Núñez Vázquez, K., Piñeiro Otero, P., Taccone, F. S., Gallego Curto, E., … Pandharipande, P. P. (2021). Prevalence and risk factors for delirium in critically ill patients with COVID-19 (COVID-D) : A multicentre cohort study. *The Lancet. Respiratory medicine*, *9*(3), 239-250. MEDLINE. https://doi.org/10.1016/S2213-2600(20)30552-X

Rood, P., Huisman - de Waal, G., Vermeulen, H., Schoonhoven, L., Pickkers, P., & van den Boogaard, M. (2018). Effect of organisational factors on the variation in incidence of delirium in intensive care unit patients : A systematic review and meta-regression analysis. *Australian Critical Care*, *31*(3), 180-187. https://doi.org/10.1016/j.aucc.2018.02.002

Rosgen, B. K., Krewulak, K. D., Stelfox, H. T., Ely, E. W., Davidson, J. E., & Fiest, K. M. (2020). The association of delirium severity with patient and health system outcomes in hospitalised patients : A systematic review. *Age and Ageing*, *49*(4), 549-557. https://doi.org/10.1093/ageing/afaa053

Rosgen, B., Krewulak, K., Demiantschuk, D., Ely, E. W., Davidson, J. E., Stelfox, H. T., & Fiest, K. M. (2018). Validation of Caregiver-Centered Delirium Detection Tools : A Systematic Review. *Journal of the American Geriatrics Society*, *66*(6), 1218-1225. MEDLINE. https://doi.org/10.1111/jgs.15362

Rowley-Conwy, G. (2018). Barriers to delirium assessment in the intensive care unit : A literature review. *Intensive & critical care nursing*, *44*, 99-104. MEDLINE. https://doi.org/10.1016/j.iccn.2017.09.001

Sahawneh, F., & Boss, L. (2021). Non-pharmacologic interventions for the prevention of delirium in the intensive care unit : An integrative review. *Nursing in Critical Care*, *26*(3), 166-175. CINAHL Complete. https://doi.org/10.1111/nicc.12594

Salluh, J. I. F., Han Wang, Schneider, E. B., Nagaraja, N., Yenokyan, G., Damluji, A., Serafim, R. B., & Stevens, R. D. (2015). Outcome of delirium in critically ill patients : Systematic review and meta-analysis. *BMJ: British Medical Journal*, *350*(8011), h2538-h2538. Academic Search Ultimate.

Salluh, J. I., Soares, M., Teles, J. M., Ceraso, D., Raimondi, N., Nava, V. S., Blasquez, P., Ugarte, S., Ibanez-Guzman, C., Centeno, J. V., Laca, M., Grecco, G., Jimenez, E., Árias-Rivera, S., Duenas, C., Rocha, M. G., & The DECCA (Delirium Epidemiology in Critical Care) Study Group. (2010). Delirium epidemiology in critical care (DECCA) : An international study. *Critical Care*, *14*(6), R210. https://doi.org/10.1186/cc9333

Schweickert, W. D., Pohlman, M. C., Pohlman, A. S., Nigos, C., Pawlik, A. J., Esbrook, C. L., Spears, L., Miller, M., Franczyk, M., Deprizio, D., Schmidt, G. A., Bowman, A., Barr, R., McCallister, K. E., Hall, J. B., & Kress, J. P. (2009a). *Early physical and* *occupational therapy in mechanically ventilated, critically ill patients : A randomised controlled trial*. *373*, 9.

Schweickert, W. D., Pohlman, M. C., Pohlman, A. S., Nigos, C., Pawlik, A. J., Esbrook, C. L., Spears, L., Miller, M., Franczyk, M., Deprizio, D., Schmidt, G. A., Bowman, A., Barr, R., McCallister, K. E., Hall, J. B., & Kress, J. P. (2009b). *Early physical and occupational therapy in mechanically ventilated, critically ill patients : A randomised controlled trial*. *373*, 9.

Serafim, R. B., Soares, M., Bozza, F. A., Lapa e Silva, J. R., Dal-Pizzol, F., Paulino, M. C., Povoa, P., & Salluh, J. I. F. (2017). Outcomes of subsyndromal delirium in ICU : A systematic review and meta-analysis. *Critical Care*, *21*(1), 179. https://doi.org/10.1186/s13054-017-1765-3

Souza, T. L. de, Azzolin, K. de O., & Fernandes, V. R. (2018). Cuidados multiprofissionais para pacientes em delirium em terapia intensiva : Revisão integrativa. *Revista Gaúcha de Enfermagem*, *39*(0). https://doi.org/10.1590/1983-1447.2018.2017-0157

Strecker, C., & Hitch, D. (2020). Perceptions of current occupational therapy practice with older adults experiencing delirium. *Australasian journal on ageing*. MEDLINE. https://doi.org/10.1111/ajag.12882

Tobar, E., Alvarez, E., & Garrido, M. (2017). Cognitive stimulation and occupational therapy for delirium prevention. *Revista Brasileira de Terapia Intensiva*, *29*(2). https://doi.org/10.5935/0103-507X.20170034

Trogrlić, Z., van der Jagt, M., Bakker, J., Balas, M. C., Ely, E. W., van der Voort, P. H., & Ista, E. (2015). A systematic review of implementation strategies for assessment, prevention, and management of ICU delirium and their effect on clinical outcomes. *Critical Care*, *19*(1), 157. https://doi.org/10.1186/s13054-015-0886-9

Weinreich, M., Herman, J., Dickason, S., & Mayo, H. (2017). Occupational Therapy in the Intensive Care Unit : A Systematic Review. *Occupational Therapy In Health Care*, *31*(3), 205-213. https://doi.org/10.1080/07380577.2017.1340690

Zaal, I. J., Devlin, J. W., Peelen, L. M., & Slooter, A. J. C. (2015a). A Systematic Review of Risk Factors for Delirium in the ICU*: *Critical Care Medicine*, *43*(1), 40-47. https://doi.org/10.1097/CCM.0000000000000625

Zaal, I. J., Devlin, J. W., Peelen, L. M., & Slooter, A. J. C. (2015b). A systematic review of risk factors for delirium in the ICU. *Critical care medicine*, *43*(1), 40-47. MEDLINE. https://doi.org/10.1097/CCM.0000000000000625

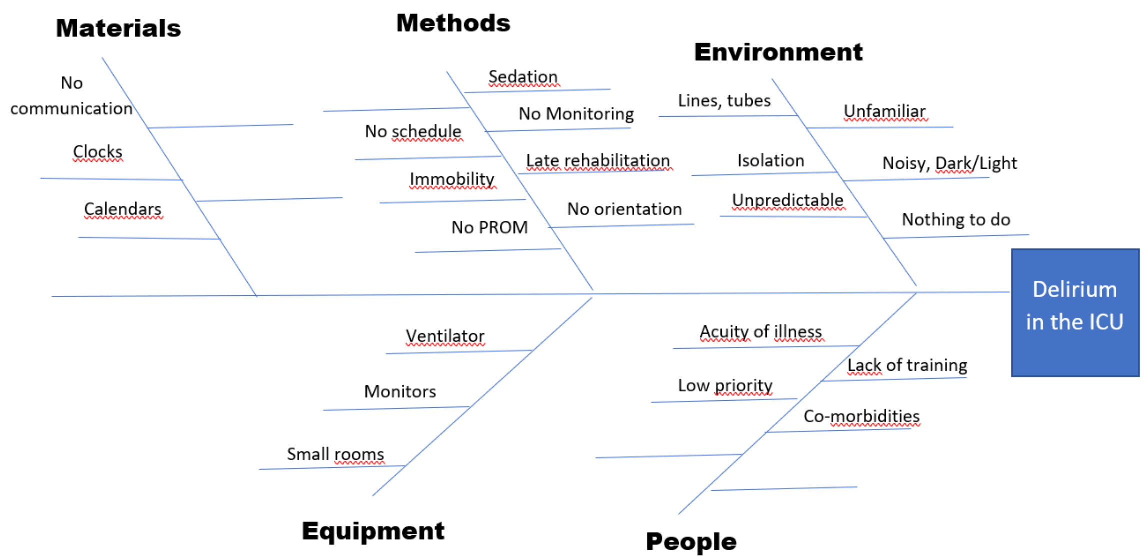
Zhang, L., Hu, W., Cai, Z., Liu, J., Wu, J., Deng, Y., Yu, K., Chen, X., Zhu, L., Ma, J., & Qin, Y. (2019). Early mobilization of critically ill patients in the intensive care unit : A systematic review and meta-analysis. *PLOS ONE*, *14*(10), e0223185. https://doi.org/10.1371/journal.pone.0223185

Zhang, Z., Pan, L., & Ni, H. (2013). Impact of delirium on clinical outcome in critically ill patients : A meta-analysis. *General hospital psychiatry*, *35*(2), 105-111. MEDLINE. https://doi.org/10.1016/j.genhosppsych.2012.11.003

Appendix A

Quality Improvement Fishbone Diagram of Causes

Appendix A. Institute for Healthcare Improvement (Institute for Healthcare Improvement, 2021). Cause and Effect (fishbone) Diagram



Appendix B

Data Collection Form

Days		**1**	**2**	**3**
ICDSC	Altered level of consciousness			
	Inattention			
	Disorientation			
	Hallucination, delusion, psychosis			
	Psychomotor Agitation/Retardation			
	Inappropriate speech or mood			
	Sleep-wake disturbance			
	Symptom fluctuation			
	Total score			
	Level			
	comment			
Delirium	Contributing factors			
	Intervention			
RASS	Target			
	Score			
EPM	Myocardial stability			
	Oxygenation stability			
	Vasopressor use			
	Engages to voice			
	Neuro stability			
	Score			
	Comment			
	Current level			
Intubation				
FI02				
PEEP				
OT				
PT				

Participant	**1**	**2**	**3**
Age 18-30			
31-40			
41-50			
51-60			
61-70			
71-80			
81-90			
91-100			
COVID			
PNA (bact, vir, aspiration)			
Chronic kidney disease			
Withdrawal syndrome (alcohol, opioid)			
CHF exacerb			
DKA			
COPD exacerb			
Pulmonary embolism			
Anaphylactic shock			
Orthopedic condition (fx)			
UTI			
GI bleed			
Length of stay in hospital			

Participant	**1**	**2**	**3**
Day of 1st OT			
Number of OT sessions			
Number of OT attempts			
Average duration of OT			
Content of OT			
Reason for OT attempt			
Content of PT			
Attempt PT			

Appendix C

Richmond Agitation-Sedation Scale (RASS)

Richmond Agitation Sedation Scale (RASS) *

Score	Term	Description	
+4	Combative	Overtly combative, violent, immediate danger to staff	
+3	Very agitated	Pulls or removes tube(s) or catheter(s); aggressive	
+2	Agitated	Frequent non-purposeful movement, fights ventilator	
+1	Restless	Anxious but movements not aggressive vigorous	
0	Alert and calm		
-1	Drowsy	Not fully alert, but has sustained awakening (eye-opening/eye contact) to *voice* **(≥10 seconds)**	Verbal Stimulation
-2	Light sedation	Briefly awakens with eye contact to *voice* **(<10 seconds)**	Verbal Stimulation
-3	Moderate sedation	Movement or eye opening to *voice* **(but no eye contact)**	Verbal Stimulation
-4	Deep sedation	No response to voice, but movement or eye opening to *physical* stimulation	Physical Stimulation
-5	Unarousable	No response to *voice or physical* stimulation	Physical Stimulation

Procedure for RASS Assessment

1. Observe patient
   a. Patient is alert, restless, or agitated. **(score 0 to +4)**
2. If not alert, state patient's name and *say* to open eyes and look at speaker.
   b. Patient awakens with sustained eye opening and eye contact. **(score –1)**
   c. Patient awakens with eye opening and eye contact, but not sustained. **(score –2)**
   d. Patient has any movement in response to voice but no eye contact. **(score –3)**
3. When no response to verbal stimulation, physically stimulate patient by shaking shoulder and/or rubbing sternum.
   e. Patient has any movement to physical stimulation. **(score –4)**
   f. Patient has no response to any stimulation. **(score –5)**

* Sessler CN, Gosnell M, Grap MJ, Brophy GT, O'Neal PV, Keane KA et al. The Richmond Agitation-Sedation Scale: validity and reliability in adult intensive care patients. Am J Respir Crit Care Med 2002; 166:1338-1344.

* Ely EW, Truman B, Shintani A, Thomason JWW, Wheeler AP, Gordon S et al. Monitoring sedation status over time in ICU patients: the reliability and validity of the Richmond Agitation Sedation Scale (RASS). JAMA 2003; 289:2983-2991.

Appendix D

Intensive Care Delirium Screening Checklist. (ICDSC).

Intensive Care Delirium Screening Checklist (ICDSC)

Give a score of "1" to each of the 8 items below if the patient clearly meets the criteria defined in the scoring instructions. Give a score of "0" if there is no manifestation *or* unable to score. If the patient scores ≥4, notify the physician. The diagnosis of delirium is made following clinical assessment; document in the Assessment and Intervention record (RN) and progress note (MD).

Assessment	Scoring Instructions	Score
1. Altered Level of Consciousness*	• If MAAS portion of VAMAAS is 0 (no response) or 1 (response to noxious stimulus only), record "U/A" (unable to score) and do not complete remainder of screening tool. • Score "0" if MAAS score is 3 (calm, cooperative, interacts with environment without prompting) • Score "1" if MAAS score is 2, 4, 5 or 6 (MAAS score of 2 is a patient who only interacts or responds when stimulated by light touch or voice – no spontaneous interaction or movement; 4, 5 and 6 are exaggerated responses).	
If MAAS ≠ 0 or 1, screen items 2-8 and complete a total score of all 8 items.		
2. Inattention	"1" for any of the following: • Difficulty following conversation or instructions • Easily distracted by external stimuli • Difficulty in shifting focuses	
3. Disorientation	"1" for any obvious mistake in person, place or time	
4. Hallucination/ delusions/ psychosis	"1" for any one of the following: • Unequivocal manifestation of hallucinations or of behaviour probably due to hallucinations (e.g.catching non-existent object) • Delusions • Gross impairment in reality testing	
5. Psychomotor agitation or retardation	"1" for any of the following: • Hyperactivity requiring additional sedatives or restraints in order to control potential dangerousness (e.g. pulling out IV lines, hitting staff) • Hypoactivity or clinically noticeable psychomotor slowing. Differs from depression by fluctuation in consciousness and inattention.	
6. Inappropriate speech or mood	"1" for any of the following (score 0 if unable to assess): • Inappropriate, disorganized or incoherent speech. • Inappropriate display of emotion related to events or situation.	
7. Sleep wake/cycle disturbance	"1" for any of the following: • Sleeping less than 4 hours or waking frequently at night (do not consider wakefulness initiated by medical staff or loud environment). • Sleeping during most of day.	
8. Symptom fluctuation	"1" for fluctuation of the manifestation of any item or symptom over 24 hours (e.g., from one shift to another).	
TOTAL SCORE (0-8/8):	A score ≥ 4 suggests delirium. A score > 4 is not indicative of the severity of the delirium.	

Last reviewed January 29, 2020

Adapted with permission (Skrobik, Y)
Bergeon, et al, 2001, Intensive Care Medicine

Appendix E

Early Progressive Mobility Screen (EPM)

AMERICAN ASSOCIATION of CRITICAL-CARE NURSES

Early Progressive Mobility Protocol

STEP 1: Screen for safety

Evaluate daily

M Myocardial Stability

- □ No active cardiac ischemia within past 12-24 hours
- □ No dysrhythmia requiring new antidysrhythmic agent within past 12-24 hours

O Oxygenation Stability

- □ FiO_2 <0.85 on mechanical ventilation
- □ PEEP <15 cm H_2O
- □ No unsecured airway

V Vasopressor Use

- □ No new or increase of any vasopressor x2 hrs

E Engages to Voice

- □ Responds to verbal stimulation
- □ RASS <+3, or SAS <6

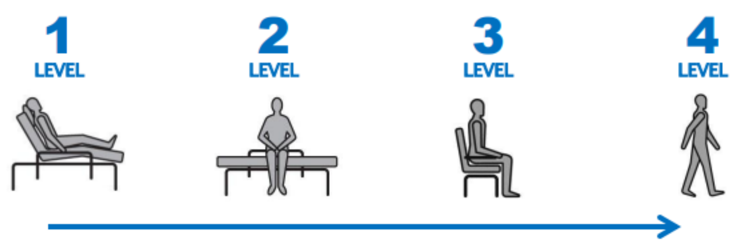
N Neuro Stability

- □ ICP <15
- □ No acute or uncontrolled intracranial event

Does not meet criteria = Start at Level 1 and evaluate in 12 hours

Meets all criteria = Start at Level 2 and Progress

STEP 2: Implement Progressive Mobility



Level 1 — Goal: Clinical stability and able to move arm against gravity

- Passive ROM TID
- Turn Q2 hours
- Active-resistance PT
- Sitting position 20 min TID

Level 2 — Goal: Sitting upright and able to move leg against gravity

- Passive ROM TID
- Turn Q2 Hours
- Active-resistance PT
- Sitting position 20 min TID
- Sitting on edge of bed

Level 3 — Goal: Increased strength and stands with minimal to moderate assist

- Turn Q2 Hours
- Active-resistance PT
- Sitting position 20 min TID
- Sitting on edge of bed
- Active transfer to chair ≥20 min 2 x/day

Level 4 — Goal: Strength and distance walk

- Self or assisted turn Q2 Hours
- Active-resistance PT
- Active transfer to chair ≥20 min 3 x/day
- Ambulation (marching in place, walking in halls)

Executing Evidence-Based Progressive Mobility in the ICU

AACN WebinarSeries