Symptoms and Delirium in Critical Illness

Angela Lee

Advisor: Judith A. Tate, PhD, RN

The Ohio State University College of Nursing

Abstract

The number of chronically critically ill (CCI) [i.e. patients recovering from an extended intensive care unit (ICU) stay] is expected to reach 600,000 within a decade with associated hospital costs nearing $60 billion annually (Kahn et, al., 2015). Increasingly, these patients are discharged to long-term acute care hospitals (LTACHs) for ventilator liberation and rehabilitation. Few studies describing symptom burden in patients admitted to LTACHs have been undertaken. The purpose of this study is to identify symptoms experienced in patients who require mechanical ventilation in an LTACH. This prospective observational study of 5 mechanically ventilated patients admitted to an LTACH following an ICU stay was completed in Columbus, OH. Symptoms were assessed daily using Puntillo's Patient Symptom Survey (Puntillo et al., 2010). Delirium was assessed using the Confusion Assessment Method for the ICU (CAM-ICU). Sedation state was measured using the Richmond Agitation and Sedation Scale (RASS). Validity and reliability for these instruments have been established. We calculated frequencies and determined if sedated patients were able to participate in the symptom assessment by assessing delirium presence. Five patients of an average age of 60.8 and of both genders were enrolled in the study and assessed between 5-27 days. Patients experienced pain for 46.7% (29/62), anxiety 56.5% (35/62), fatigue 88.7% (55/62), and delirium 46.7% (29/62) of the days measured. From the total days assessed, 61% (38/62) were spent at a goal RASS (i.e., -1 to +1), 37% (23/62) deeply sedated (i.e., -2, -3) 2% (1/62) in coma, and no days agitated. Excluding the one coma day, delirium occurred on 50% (31/62) of all days assessed. This is the first study to describe continued symptom burden in patients admitted to a LTACH. This knowledge is applicable to the clinical setting because data shows that sedation level and delirium presence may have a negative impact on participation in weaning trials or rehabilitation, which are the focus of LTACH admission.

I. Statement of Problem

Introduction

Every year, over 5.7 million patients are admitted into ICUs for critical care management of varying severities, which results in care for about 55,000 critically ill patients daily (Society of Critical Care Medicine [SCCM], 2016). Patients are commonly admitted for intensive monitoring, airway support, medical stabilization, comprehensive management, and restoration of stabilization or comfort (SCCM, 2016). The length of stay for ICU admission can vary depending on the severity of illness and the resources available for support. Critical illness is expensive, technologically dense and unpredictable in its course, which is cause for uncertainty and emotional stress for patients and their family members.

Background

Advances in technology and care contribute to increases in patient survivorship following critical illness (Nelson, Cox, Hope, & Carson, 2010). In addition to increases in ICU admissions, the number of patients who survive critical illness has increased. A subset of these survivors experience continued need for frequent monitoring and support (Miller et al., 2016). This particular patient population is considered Chronically Critically Ill (CCI) because these patients are survivors of acute critical illness, but still require aggressive monitoring and long term treatment beyond the intensive care (Nelson, Cox, Hope, & Carson, 2010). CCI patients experience functional dependence, cognitive and psychological dysfunction and increased risk for mortality (Nelson et al., 2010).

The number of CCI is expected to reach 600,000 within a decade with associated hospital costs nearing $60 billion annually (Kahn et, al., 2015). The complexity of these cases requires skilled nursing and medical care that is found in a care setting specifically devoted to mechanical

ventilation and continued close monitoring. As a result, patients who are unable to be liberated from mechanical ventilation in ICUs are discharged to long-term acute care hospitals (LTACHs), which are facilities that specialize in liberation from mechanical ventilation and post-ICU rehabilitation. Patients admitted to LTACHs have an average length of stay of 25 or more days and are designed to provide the care typically found in ICUs, but in a less intense environment (Kahn, Benson, Appleby, Carson, & Iwashyna, 2010). These facilities help to support the CCI patient because they provide more focused care in an environment ideal for normalization and mechanical ventilation liberation. LTACHs provide long-term recovery and stabilization in a new baseline for the patient and focus on continued critical management, stabilization, and respiratory optimization. The treatment team in LTACHs works closely with acute care hospitals to ensure continuity of care.

Patients are selected for transfer to LTACHs based on the greatest potential for recovery. These CCI patients require skilled interventions and continuous monitoring. Considered as acute care hospitals that provide care to patients with high acuity needs, LTACHs are equipped with appropriate technology and resources that help to promote normal functioning and sustain care in patients (Miller et al., 2016). Interventions are carefully considered in order to ensure best outcomes and prevent additional complications.

Although they have survived critical illness, CCI patients continue to report persistent unrelieved symptoms following discharge, which presents challenges to recovery (Choi et al., 2014). Because CCI patients they are unable to express themselves vocally, accurate symptom identification can be a challenge. The often nonverbal and non-communicative nature of ICU patients presents a challenge in accurately identifying symptom presence. As a result, patient

assessments may be incomplete and interventions ineffective, which may result in negative patient outcomes (Tate, Sereika, Divirgilio, Nilsen, Demerci, Campbell, & Happ, 2013).

In addition to unrelieved symptoms following ICU stay, patients may experience delirium, an alteration in changes in cognition that affects attention (Ely, Siegel, & Inouye, 2001; Ely et al., 2004). Delirium has been associated with increased length of stay and mortality in critically ill patients (Ely et al., 2004; Salluh et al., 2015). Despite clinical implications, delirium remains to be an understudied acute organ dysfunction in CCI patients due to primary focus and management of other dysfunctions (Ely et al., 2004).

Purpose of Study

The purpose of this study is to identify the symptoms experienced in a group of patients who require mechanical ventilation in an LTACH. In addition, we will describe both the behavioral state (sedation/agitation) and delirium presence in these patients.

Significance of Study

Few studies describing symptom burden in patients admitted to LTACHs have been undertaken. The increase in survivorship CCI has resulted in increased demand for critical care services due to the significant sequelae, including physical, neurological, and emotional dysfunction, following ICU discharge. The number of patients who require ongoing services has contributed to associated hospital costs approximately $60 billion annually (Zilberberg & Shorr, 2008; Kahn et al., 2015).

Theoretical Framework

Using the Anxiety/Agitation in Critical Illness Model (**Figure 1**), a model that is applicable to the LTACH setting, patients appraise a stimulus and exhibit symptoms in response (Tate, Dabbs, Hoffman, Milbrandt, & Happ, 2011). If patients are unable to interact with the

environment as a result of deep sedation or delirium, they may not be able to describe their symptoms. This model also includes the work of nurses who base clinical decisions for interventions on the interpretation of these symptoms.

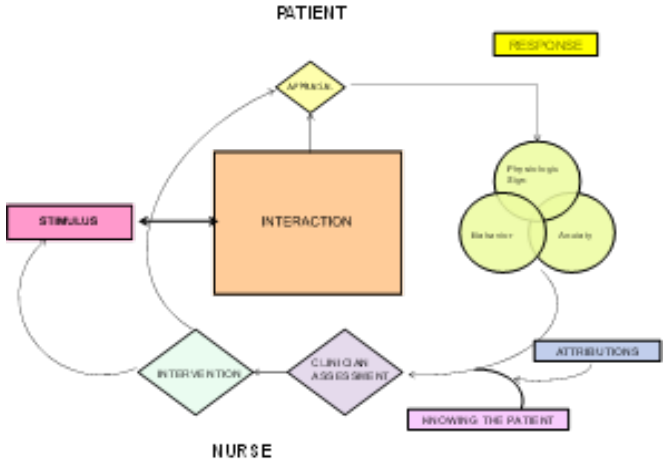

Figure 1. Anxiety and Agitation in Critical Illness

Research Question

What are the most common symptoms experienced by patients admitted to an LTACH following a stay in the ICU? What is the sedation/agitation state of CCI patients admitted to an LTACH following a stay in the ICU? What is the incidence of delirium in CCI patients admitted to an LTACH following a stay in the ICU?

Definitions of Terms

LTACH (long term acute care hospital): facility that specializes in liberation from mechanical ventilation and post-ICU rehabilitation

Chronic Critical Illness, CCI: survivors of acute critical illness requiring continued frequent monitoring and support

Symptom: a physical or mental feature that is regarded as indicating a condition of disease, particularly such a feature that is apparent to the patient

Delirium: a transient, usually reversible, cause of mental dysfunction and manifests clinically as a combination of four features.

Mechanical ventilation: the technique through which gas is moved toward and from the lungs through an external device connected directly to the patient.

Prolonged mechanical ventilation: a period of 21 days or more on mechanical ventilation

Limitations

The small sample size of 5 participants limits the statistical significance of this study. The participants also all received care at one single site, which limits the diversity of the sample and may not be representative of the critically ill adult population. In addition, the similarity in participant demographics may limit the diversity of the sample. The varying lengths of stay of the participants at the site made it difficult to determine statistical significance. Some participants also experienced difficulty in their ability to report symptoms, which created missing data. Changes in level of consciousness and fatigue deterred participants from their full ability to report symptoms.

II. Review of Literature

Introduction

Increasingly, patients admitted to the ICU survive. However, many ICU survivors are dependent on mechanical ventilation, experience profound weakness, cognitive dysfunction and psychological problems (Nelson et al., 2010). Defined as those who have survived acute critical illness and require aggressive monitoring and treatment, CCI patients present challenges to treatment (Nelson et al., 2010). CCI patients experience complex and protracted recovery periods and may have multiple chronic disorders in addition to ventilator dependence. Patients also may

experience significant distress from unrelieved symptoms (Nelson et al., 2010; Puntillo et al., 2010).

Symptoms are defined to be "subjective experience[s] reflecting changes in the biopsychosocial functioning, sensations, or cognition of an individual" (Dodd et al., 2001). For CCI patients, those who are discharged from acute care hospitals often report continued symptoms such as anxiety and fatigue that may persist into LTACH settings (Dodd et al., 2001). Despite the research on the patient population admitted into LTACHs, there is still limited information about the symptom burden and delirium presence these patients experience. Given the current information regarding symptom presence in patients following critical illness in the ICU, it can be speculated that those who are admitted into LTACHs may also experience similar experiences of symptom presence (Dodd et al., 2001). Further demonstration of the relationship between symptom identification and delirium presence in ICU survivors admitted into LTACHs can provide insight into the need for potential therapeutic management interventions that could be undertaken to provide optimal care. In order to reach a definitive conclusion, documentation of symptom presence is necessary. The purpose of this review is to describe the current state of the science related to symptom identification and delirium presence in ICU survivors and to demonstrate the gaps that exist related to symptom identification in patients admitted into LTACHs.

Chronic Critical Illness

Advances in innovation and technology enhance nurses' ability to care for high-risk patients to be cared for in a unit specializing in complex interventions or procedures. ICU admission generally involves presence of organ dysfunction, surgical procedure intensity, and failure of intensive care treatment (Adhikari, Fowler, Bhagwanjee, & Rubenfeld, 2010). Those

who survive the expected period of acute critical illness experience a combination of multi-organ compromise, symptom burden, and poor outcomes, as well as a need for prolonged mechanical ventilation (Kahn, Benson, Appleby, Carson, & Iwashyna, 2010). The term "prolonged mechanical ventilation" is used to describe ventilator dependence, which could last from 2 days to 4 weeks (Nelson et al., 2010). The symptoms that are experienced by patients in a LTACH setting may be different from those reported in more acutely ill patients. As such, it is important to identify the symptom experience through unique assessment to improve on symptom identification and management.

Studies suggest that CCI may actually be characterized as a syndrome because of multitude of conditions that often found in this patient population (Nelson, et al., 2010). **Figure 2** illustrates the characterization of CCI.

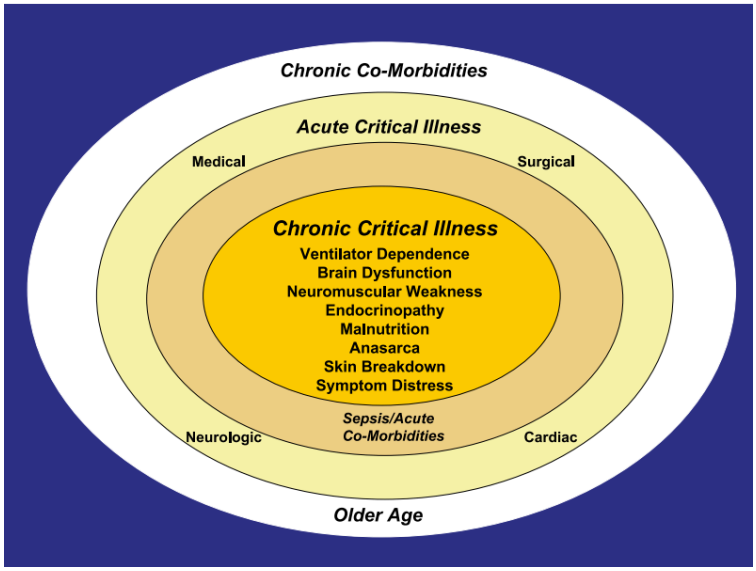

Figure 2: Characterization of Chronic Critical Illness (Nelson et al., 2010).

The unique characteristics of CCI include alterations to body composition and profound weakness, increased susceptibility to infection, neurocognitive dysfunction, and neuroendocrine and skin changes (Nelson et al., 2004). Studies have also shown that CCI patients frequently report pain, fatigue, thirst, sadness, shortness of breath, nervousness, worry, and difficulty with

communication (Nelson et al., 2004). Psychological symptoms, such as sadness, nervousness, and worry are more common in this patient population. Patients reported these symptoms to be more “frequent” and “almost constant” (Nelson et al., 2004). These characteristics in addition to prolonged mechanical ventilation provide the clinical definition of CCI. In patients that require prolonged mechanical ventilation, between 5 and 10% develop CCI and between 30 and 53% of CCI may be liberated from mechanical ventilation. But liberation from mechanical ventilation does not confirm survival in the long-term; varying complexities of other underlying conditions may contribute to overall mortality. For instance, advanced age with organ dysfunction is often associated with higher mortality rates compared to younger counterparts (Nelson et al., 2010). The use of a mortality predictor model may help to address the overall prognosis for recovery from CCI.

CCI is emerging as a problem for the healthcare system due to the increased number of patients who require mechanical ventilation, with rates increasing about 5.5% each year (Nelson et al., 2010). Because the population is aging, this number is expected to increase (Nelson et al., 2010). While the CCI are only less than 10% of those who require mechanical ventilation, they utilize about 20 to 40% of ICU bed days and critical care resources (Nelson et al., 2010). Because CCI is associated with high cost care, overall healthcare costs are estimated to increase substantially (Nelson et al., 2010).

Continued Symptoms

Identification of symptoms post-intensive care stay is found to be difficult due to the limitations in patient communication. Current forms of communication may be limiting patients’ ability to accurately identify symptoms because of their fluctuations in mental status and physical conditions (Campbell & Happ, 2010). Mechanical ventilation further impairs symptom

communication due to physical barrier and lack of vocalization. Nurses are the most common communication partner for patients and bear the responsibility for symptom management. Symptoms are often misinterpreted by nurses because of patient communication problems or misinterpretation of nonverbal communication cues (Campbell & Happ, 2010). A study by Baer and colleagues (1970) showed that health professionals actually interpret pain levels to be higher in patients able to verbally communicate as compared to those that nonverbally communicate (Baer, Davitz, & Lieb, 1970). It was suggested that complaints of pain were the responsibility of the patient in order to receive adequate treatment and management (Baer et al., 1970). Another study showed that health professionals based pain levels on vital signs, ventilator compliance, and behavior, but these signs may also be significant for signs of dyspnea, fear, and anxiety (Gélinas, Fortier, Viens, Fillion, & Puntillo, 2004). Puntillo and colleagues (2010) also listed these symptoms commonly experience with mechanical ventilation: anxiety, thirst, and tiredness. As a result of this symptom overlap, symptom management may be imprecise, which leads to over- or under- treatment.

To overcome inaccurate symptom assessment, use of symptom surveys has been recommended to enhance patient self-report. Use of a standardized tool prevents recall bias and provides better recognition of symptoms (Campbell & Happ, 2010).

Recent studies suggest that CCI patients may experience symptoms in a different way compared with patients in the general population (Barsevick, Whitmer, Nail, Beck, & Dudley, 2006). As a result, these patients require a different approach to assessment and management. The most common symptoms experienced by CCI patients are pain, fatigue, thirst, dyspnea, fear, worry, and communication difficulties (Campbell & Happ, 2010). Studies have found that CCI

patients often report psychological symptoms more often as compared to physiological symptoms (Nelson et al., 2004).

In the cases of difficult interpretation, healthcare professionals employ the assistance of family members or other individuals in order to provide symptom management. But studies have shown that the symptom reports by proxies are actually not in agreement with those of the patients (Wiencek, 2008; Puntillo, Smith, Arai & Stotts, 2008). Despite the use of professional experience for symptom interpretation and identification, the unique symptom set of CCI patients continues to be under-assessed and treated. As a result, improvements in communication must be made in order to provide for adequate symptom identification.

Delirium Presence

Identification of symptoms during critical illness is influenced by the communication limitations between patient and healthcare provider. Symptom communication may be limited by delirium, a condition of cognitive dysfunction seen frequently in critically ill patients (Ely et al., 2004; Tate et al., 2013). Delirium is characterized by changes to level of consciousness, acute onset, symptoms of inattention and distorted thinking (Ely et al., 2001). Although the condition is reversible, delirium presents a challenge for accurate and effective symptom identification and management (Tate et al., 2013). Delirium is associated with a number of negative outcomes including length of stay, long-term cognitive impairment, and mortality (Ely et al., 2001a; Ely et al., 2004; Girard et al., 2010). Despite the clinical implications, delirium continues to be under-assessed in critical illness due to precedence of other organ failures (Ely et al., 2004). In the ICU setting, patient management is more commonly focused on the heart, lungs, or kidneys (Ely et al., 2004). Limited attention is placed on delirium presence because of the following inaccurate beliefs: 1) it is not a common primary reason for admission; 2) it is believed to secondary to

medication use or disease process; 3) it believed to be a typical phenomenon in the ICU setting and refractory to treatment; 4) it is believed to not result in adverse outcomes for the patient; and 5) monitoring delirium is believed to be time consuming (Ely et al., 2001a; Geary, 1994; Guenther et al., 2012; McGuire, Basten, Ryan, & Gallagher, 2000). Hypoactive motoric subtype delirium is commonly found in ICU patients (Guenther et al., 2012). Delirium is often overlooked in these patients because they present with a calmer and quieter demeanor (Guenther et al., 2012). Findings from Spronk and colleagues (2009) showed that limited active monitoring of delirium using an objective assessment resulted in underassessed hypoactive delirium in about 75% of patient assessments (Spronk, Riekerk, Hofhuis, & Rommes, 2009). Another study showed that delirium presence and duration predicted mortality after discharge from an ICU (Ely et al., 2004). Findings suggest that effective management and care of CCI patients may be with efficient identification of modifiable risk factors for delirium (Ely et al., 2004). Current tools used to monitor delirium include objective assessment with the CAM-ICU. Understanding of the different delirium subtypes may help to improve delirium recognition in assessment. Routine assessment may help to enhance detection for delirium and prevent long-term cognitive impairment (Ely et al., 2004).

Chapter Summary

This review of literature was completed to describe the current state of literature related to the symptom identification and delirium presence in ICU survivors and to illustrate the gaps that exist related to symptom burden in patients admitted into LTACHs. The advancement in medicine, an aging population, and the lifespan of patients with chronic comorbidities all contribute to the continuing growth of the CCI population. Given the growing population of CCI

patients and the costs to healthcare, it is imperative that evidence is developed for continued symptom burden so that effective management strategies can be developed and utilized.

III. Methodology

Research Design

This prospective observational study of 5 mechanically ventilated patients admitted to an LTACH following an ICU stay in a major city in the Midwest. Symptoms were assessed daily using Puntillo's Patient Symptom Survey, a valid and reliable instrument (Puntillo et al., 2010). Delirium was assessed using the Confusion Assessment Method for the ICU (CAM-ICU) (Ely et al., 2001b). Sedation state was measured using the Richmond Agitation and Sedation Scale (RASS) (Ely et al., 2003; Sessler et al., 2002). We calculated frequencies and determined if sedated patients were able to participate in the symptom assessment.

We applied Puntillo's Patient Symptom Survey to patients in the LTACH who were mechanically ventilated and had tracheostomy tubes. CCI patients were asked to identify their symptom experience and rate frequency of each of the 10 symptoms. Symptom assessment was performed every day for an average of 16 days. Patients were unable to respond for reasons, which included deep sedation and extreme fatigue.

Population and Sample Design

IRB approval was obtained from The Ohio State University Institutional Review Board for an expedited review from the Biomedical Review Board. The study was conducted at Regency Hospital-Columbus-Inc., a 152 bed, free standing LTACH in Columbus, Ohio. The LTACH provides comprehensive, interprofessional, specialized care for patients with a variety of diagnoses, with a primary focus on weaning medically complex patients from mechanical ventilation. The nurse-to-patient ratio at the LTACH is acuity driven. The typical nurse-to-

patient ratio for LTACHs is more similar to that of PCUs than ICUs (Kahn, 2014). Patients were eligible for study inclusion if they were: 1) >18 years old, 2) admitted to the LTACH following an ICU stay, 3) English speaking. Patients were excluded from study participation for any of the following reasons: 1) severe neurologic deficits defined as coma (i.e., Richmond Agitation Sedation Score [RASS] score < -4 due to stroke, intracranial hemorrhage, cranial trauma, malignancy, anoxic brain injury, or cerebral edema, 2) inability to obtain informed consent from the patient's legally authorized representative (LAR) within 96 hours of meeting all inclusion criteria, and 3) chronic ventilator dependence that is deemed "not weanable" by admitting LTACH physician.

Data Collection Procedures

Informed consent was obtained by a trained clinical research nurse (CRN), who was not involved in the direct care of the patient, to eliminate any potential for coercion to participate. Based on clinical trials and the very high rates of cognitive impairment experienced by CCI we sought informed consent from both Legally Authorized Representative (LAR) and subject assent to participate in the study. Throughout the course of the study, the CRN recorded demographic data and daily measures during the patients' LTACH stay (i.e., up to 28 LTACH days). Each day, the CRN assessed each patient's pain level with either the Pain Numeric Rating Scale or the Behavioral Pain Scale and level or arousal with the RASS (Payen et al., 2001; Ely et al., 2003). Participants with a RASS score of -3 or higher underwent an in-person delirium screening with the CAM-ICU (Ely et al, 2001b). Other symptoms were assessed via a brief, valid and reliable Patient Symptom Survey (Puntillo et al., 2010).

Data Collection Instruments

Daily patient assessment was completed using the 10-item Patient Symptom Survey, the RASS, and the CAM-ICU. The Patient Symptom Survey had 10 symptoms (i.e. pain, tired, short of breath, restless, anxious, sad, hungry, scared, thirsty, confused) to reduce respondent burden while providing a brief, reliable, and easily administered assessment at the bedside. Patients were asked to rate whether the symptom was present and, if present, its intensity (1 = mild; 2 = moderate; 3 = severe) and distress (1 = not very distressing; 2 = moderately distressing; 3 = very distressing). This instrument was previously pilot tested on 24 ICU patients by Puntillo and colleagues (2010). Face validity was established in that patients were able to differentiate among the ten symptoms and chose among the entire range of intensity and distress scores for each symptom. In the current study, face validity of the symptom assessment instrument was established by the fact that both delirious and non-delirious patients were able to differentiate between the presence and absence of various symptoms; were able to differentiate between symptom intensity and distress; and were able to differentiate between the severity of various symptoms. Interrater reliability of symptom assessment was assured in the following manner: two research team members were at the patient's bedside, one member asked the symptom questions, and both members recorded responses independently and then compared responses.

The RASS (Sessler et al., 2002) was used measure agitation – sedation level in conjunction with daily delirium testing for up to 28 days. The RASS is a ten-point (-5 to +4) observational scale validated for use in mechanically ventilated patients. Psychometric properties are well established (Ely et al., 2003). It is widely used for both research and clinical measurement of the behavioral states of sedation and/or agitation over time. In addition to daily symptom assessment, patients were observed for a) episodes of agitation [defined as a RASS

score >2 and deep sedation as a RASS <-2] and b) delirium presence during a 28-day period (from LTACH admission to LTACH discharge)].

Delirium presence was measured with the CAM-ICU (Ely et al., 2001b). After evaluating consciousness, the CRN followed the algorithm to assess 4 features (acute onset or fluctuating mental status, inattention, disorganized thinking, altered level of consciousness). Inter-rater reliability and validity are well established (Ely et al., 2003). Duration of delirium is the number of LTACH days in which patients are CAM-ICU positive and not comatose. Duration of coma is the number of LTACH days that patients have a RASS of <-4.

Data Analysis

Descriptive statistics (percentages, means) were used to characterize the most commonly experienced symptom among the mechanically ventilated participants, the number of days spent at a goal RASS, and number of days delirium positive.

IV. Results

Table 1 shows the demographic characteristics of the sample. A total of 5 mechanically ventilated adult patients participated in the study; 4 men and 1 woman.

Age, mean years	60.8
Gender	
Male, n (%)	4 (75%)
Female, n (%)	1 (25%)
Race	
Caucasian, n (%)	5 (100%)

Table 1: Patient Demographics

Five patients of an average age of 60.8 and of both genders were enrolled in the study and assessed between 5-27 days. Patients experienced pain for 46.7% (29/62), anxiety 56.5% (35/62), fatigue 88.7% (55/62), and delirium 46.7% (29/62) of the days measured. From the total

days assessed, 61% (38/62) were spent at a goal RASS (defined as RASS -1 to +1), 37% (23/62) deeply sedated (i.e., -2, -3) 2% (1/62) in coma, and no days agitated. Excluding the one coma day, delirium occurred on 50% (31/62) of all days assessed.

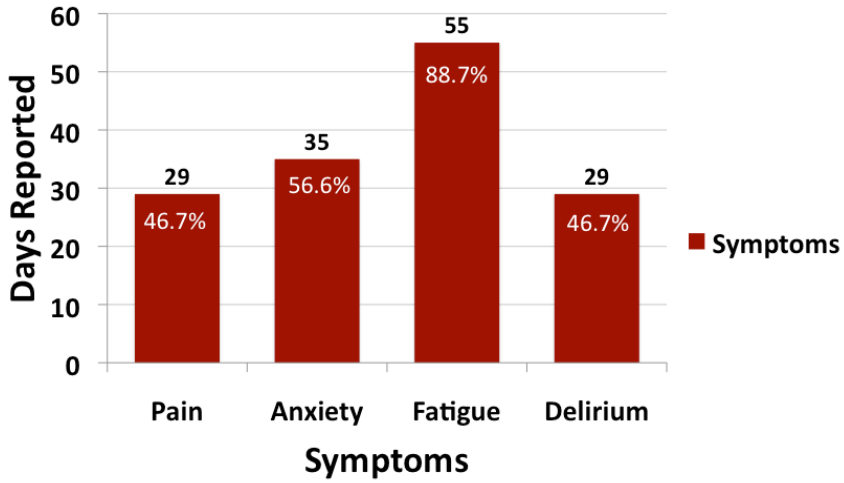

Figure 3: Days of Symptoms Experienced

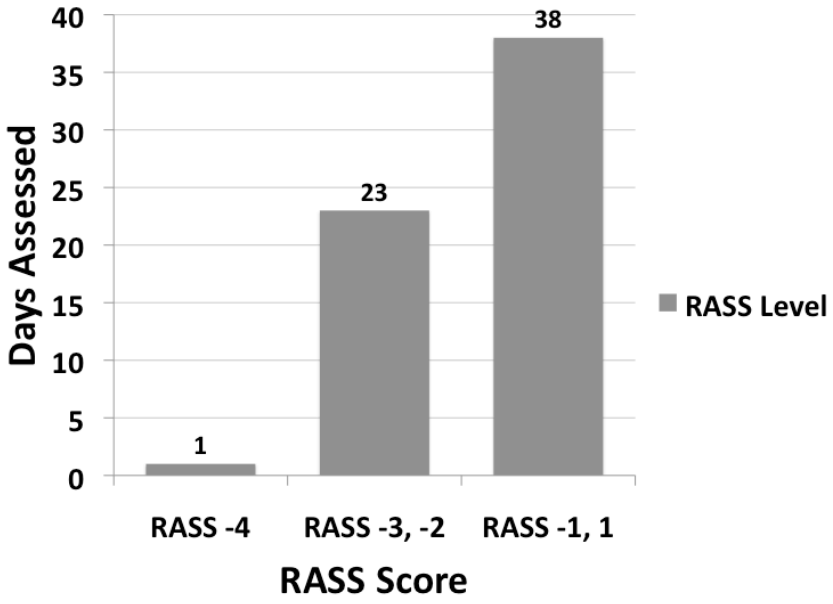

Figure 4: RASS Levels

V. Conclusions and Recommendations

Summary of Findings

In summary, we found that mechanically ventilated patients continue to report symptom presence after ICU discharge. The data showed that the symptoms most commonly reported were pain, anxiety, and fatigue. Patients continue to be sedated and not fully awake and alert for a significant portion of LTACH stay.

This is the first study to describe continued symptom burden in patients admitted to a LTACH and may lead to better symptom recognition and management in these patients. This study presents new information to clinical practice because it suggests that symptoms experienced by CCI patients may not be resolvable in the 28 days of LTACH stay. These unresolved symptoms may be important for the next level of caregivers (i.e. long-term care facility, family members). Given the complexity of these symptoms, teaching families about symptom management may be limited due to limited evidence on symptoms. Focus may instead be on physical recovery in place of symptom management.

Implications of Study

This knowledge is applicable to the clinical setting because data shows that sedation level and delirium presence may have a negative impact on participation in weaning trials or rehabilitation, which are the focus of LTACH admission. Further exploration of improved management strategies may be warranted to improve symptom identification and management. Likewise, strategies to mitigate delirium have yet to be tested in the LTACH setting.

Recommendations

Further studies with a larger sample sizes are needed to determine relationships between delirium presence, sedation state, and symptom report. This may lead to effective strategies to

improve patient outcomes. With a larger sample size and use of multiple sites, further evidence may be gained for determine of strategies for improved symptom identification and management.

Reference Page

Adhikari, N. K., Fowler, R. A., Bhagwanjee, S., & Rubenfeld, G. D. (2010). Critical care and the global burden of critical illness in adults. *The Lancet*, *376*(9749), 1339-1346.

Baer, E., Davitz, L. J., & Lieb, R. (1970). Inferences of physical pain and psychological distress: I. In relation to verbal and nonverbal patient communication. *Nursing Research*.

Barsevick, A. M., Whitmer, K., Nail, L. M., Beck, S. L., & Dudley, W. N. (2006). Symptom cluster research: conceptual, design, measurement, and analysis issues. *Journal of Pain and Symptom Management*, *31*(1), 85-95.

Campbell, G. B., & Happ, M. B. (2010). Symptom identification in the chronically critically ill. *AACN advanced critical care*, *21*(1), 64.

Choi, J., Hoffman, L. A., Schulz, R., Tate, J. A., Donahoe, M. P., Ren, D., ... & Sherwood, P. R. (2014). Self-reported physical symptoms in intensive care unit (ICU) survivors: pilot exploration over four months post-ICU discharge. *Journal of Pain and Symptom Management*, *47*(2), 257-270.

Dodd, M., Janson, S., Facione, N., Faucett, J., Froelicher, E. S., Humphreys, J., ... & Taylor, D. (2001). Advancing the science of symptom management. *Journal of Advanced Nursing*, *33*(5), 668-676.

Ely, E., Gautam, S., Margolin, R., Francis, J., May, L., Speroff, T., ... & Inouye, S. (2001). The impact of delirium in the intensive care unit on hospital length of stay. Intensive Care Medicine, 27(12), 1892-1900.

Ely, E. W., Margolin, R., Francis, J., May, L., Truman, B., Dittus, R., ... & Inouye, S. K. (2001). Evaluation of delirium in critically ill patients: validation of the Confusion Assessment

Method for the Intensive Care Unit (CAM-ICU). Critical Care Medicine, 29(7), 1370-1379.

Ely, E. W., Shintani, A., Truman, B., Speroff, T., Gordon, S. M., Harrell Jr, F. E., ... & Dittus, R. S. (2004). Delirium as a predictor of mortality in mechanically ventilated patients in the intensive care unit. *JAMA*, 291(14), 1753-1762.

Ely, E. W., Siegel, M. D., & Inouye, S. K. (2001). Delirium in the intensive care unit: an under-recognized syndrome of organ dysfunction. In *Seminars In Respiratory And Critical Care Medicine* (Vol. 22, No. 02, pp. 115-126). Copyright© 2001 by Thieme Medical Publishers, Inc., 333 Seventh Avenue, New York, NY 10001, USA. Tel.:+ 1 (212) 584-4662.

Ely, E. W., Truman, B., Shintani, A., Thomason, J. W., Wheeler, A. P., Gordon, S., ... & Sessler, C. N. (2003). Monitoring sedation status over time in ICU patients: reliability and validity of the Richmond Agitation-Sedation Scale (RASS). *JAMA*, *289*(22), 2983-2991.

Geary, S. M. (1994). Intensive care unit psychosis revisited: understanding and managing delirium in the critical care setting. *Critical Care Nursing Quarterly*, *17*(1), 51-63.

Girard, T. D., Jackson, J. C., Pandharipande, P. P., Pun, B. T., Thompson, J. L., Shintani, A. K., ... & Ely, E. W. (2010). Delirium as a predictor of long-term cognitive impairment in survivors of critical illness. *Critical Care Medicine*, 38(7), 1513.

Gélinas, C., Fortier, M., Viens, C., Fillion, L., & Puntillo, K. (2004). Pain assessment and management in critically ill intubated patients: a retrospective study. *American Journal of Critical Care*, *13*(2), 126-136.

Guenther, U., Weykam, J., Andorfer, U., Theuerkauf, N., Popp, J., Ely, E. W., & Putensen, C. (2012). Implications of objective vs subjective delirium assessment in surgical intensive care patients. *American Journal of Critical Care*, 21(1), e12-e20.

Kahn, J. M. (2014). The Role of Long-Term Ventilator Hospitals. In *Textbook of Post-ICU Medicine: The Legacy of Critical Care*, 39.

Kahn, J. M., Benson, N. M., Appleby, D., Carson, S. S., & Iwashyna, T. J. (2010). Long-term acute care hospital utilization after critical illness. *JAMA*, *303*(22), 2253-2259.

Kahn, J. M., Le, T., Angus, D. C., Cox, C. E., Hough, C. L., White, D. B., ... & ProVent Study Group Investigators. (2015). The epidemiology of chronic critical illness in the United States*. *Critical Care Medicine*, *43*(2), 282-287.

McGuire, B. E., Basten, C. J., Ryan, C. J., & Gallagher, J. (2000). Intensive care unit syndrome: a dangerous misnomer. *Archives of Internal Medicine*, *160*(7), 906-909.

Miller, T., Canfield, C., Buckingham, T., Johnston, G., Hammerman, S., Skinner, G., & Tote, J. (2016). Long-Term Acute Care: Where Does It Fit in the Health Care Continuum?. *American Journal of Critical Care*, *25*(4), 364-367.

Nelson, J. E., Cox, C. E., Hope, A. A., & Carson, S. S. (2010). Chronic critical illness. *American Journal of Respiratory And Critical Care Medicine*, *182*(4), 446-454.

Nelson, J. E., Meier, D. E., Litke, A., Natale, D. A., Siegel, R. E., & Morrison, R. S. (2004). The symptom burden of chronic critical illness. *Critical Care Medicine*, *32*(7), 1527-1534.

Payen, J. F., Bru, O., Bosson, J. L., Lagrasta, A., Novel, E., Deschaux, I., ... & Jacquot, C. (2001). Assessing pain in critically ill sedated patients by using a behavioral pain scale. *Critical Care Medicine*, *29*(12), 2258-2263.

Puntillo, K. A., Arai, S., Cohen, N. H., Gropper, M. A., Neuhaus, J., Paul, S. M., & Miaskowski, C. (2010). Symptoms experienced by intensive care unit patients at high risk of dying. *Critical Care Medicine*, *38*(11), 2155.

Puntillo, K. A., Smith, D., Arai, S., & Stotts, N. (2008). Critical care nurses provide their perspectives of patients' symptoms in intensive care units. *Heart & Lung: The Journal of Acute and Critical Care*, *37*(6), 466-475.

Salluh, J. I., Wang, H., Schneider, E. B., Nagaraja, N., Yenokyan, G., Damluji, A., ... & Stevens, R. D. (2015). Outcome of delirium in critically ill patients: systematic review and meta-analysis. *BMJ*, *350*, h2538.

Sessler, C. N., Gosnell, M. S., Grap, M. J., Brophy, G. M., O'Neal, P. V., Keane, K. A., ... & Elswick, R. K. (2002). The Richmond Agitation–Sedation Scale: validity and reliability in adult intensive care unit patients. American Journal of Respiratory And Critical Care Medicine, 166(10), 1338-1344.

Society of Critical Care Medicine. Critical care statistics. Retrieved June 2016. http://www.sccm.org/Communications/Pages/CriticalCareStats.aspx

Spronk, P. E., Riekerk, B., Hofhuis, J., & Rommes, J. H. (2009). Occurrence of delirium is severely underestimated in the ICU during daily care. *Intensive Care Medicine*, *35*(7), 1276-1280.

Tate, J. A., Dabbs, A. D., Hoffman, L. A., Milbrandt, E., & Happ, M. B. (2012). Anxiety and agitation in mechanically ventilated patients. *Qualitative Health Research*, *22*(2), 157-173.

Tate, J. A., Sereika, S., Divirgilio, D., Nilsen, M., Demerci, J., Campbell, G., & Happ, M. B. (2013). Symptom communication during critical illness: the impact of age, delirium, and delirium presentation. *Journal of Gerontological Nursing*, *39*(8), 28-38.

Wiencek, C. (2008). *Symptom burden and its relationship to functional status in the chronically critically ill* (Doctoral dissertation, Case Western Reserve University).

Zilberberg, M. D., & Shorr, A. F. (2008). Prolonged acute mechanical ventilation and hospital bed utilization in 2020 in the United States: implications for budgets, plant and personnel planning. *BMC Health Services Research*, *8*(1), 242.