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UNIVERSITY OF SAN DIEGO
Hahn School of Nursing and Health Science
DOCTOR OF PHILOSOPHY IN NURSING

DOCUMENTATION: DELIRIUM IN THE HOSPITALIZED OLDER ADULT

by

Jacqueline Fitzgerald Close

A dissertation presented to the
FACULTY OF THE HAHN SCHOOL OF NURSING AND HEALTH SCIENCE
UNIVERSITY OF SAN DIEGO

In partial fulfillment of the
Requirements for the degree
DOCTOR OF PHILOSOPHY IN NURSING

April 23, 2012

Dissertation Committee

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ABSTRACT

Background: Delirium is a common, life threatening and preventable geriatric syndrome. Because this condition is frequently addressed by administering dangerous antipsychotic drugs, it is imperative that accurate systematic assessments are charted to determine the actual need for these medications. The purpose of the study was to describe medical record documentation of a systematic assessment of delirium in older adults who had been administered an antipsychotic medication.

Methods: A descriptive correlational retrospective design was used for this medical record data based study. The setting was a 107 bed acute care community hospital located in southern California. Inclusion criteria were medical records of patients who were 65 years or older, admitted to a medical/surgical/telemetry unit and had received lorazepam or haloperidol. Descriptive and inferential statistics were conducted using SPSS version 18.

Results: For the total participant cases (N=70), age 65 to 97 years, and 60% female, there was no documentation of a systematic delirium assessment. Therefore, associations between a documented systematic assessment and other select variables could not be determined. However, antipsychotic medications were prescribed more often to females than males ($p=.003$).

Conclusions: This study examined the documentation of a systematic assessment for delirium in hospitalized older adult patients who had been medicated with select antipsychotic medications. Documentation of a systematic assessment of delirium is important so causative factors can be remedied and appropriate interventions put into

place to not only keep the patient safe, but hopefully improve the outcomes of hospitalized older adults.

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DEDICATION

I would like to dedicate this dissertation to my mother, Joyce Francis, a woman who never had much in the way of material wealth but never doubted the success of her children, and to my father, Jack Fitzgerald, a good and forthright man who is smiling down from heaven and whispering his ever-present adage, “You can do whatever your little heart desires.”

Also to my husband, Guy, who has been my biggest supporter and fan during this wonderful journey and to Jenny, our daughter and the best kid in the whole world. I hope I have shown her how much she can accomplish if she puts her heart into it. And more so, it is my fervent desire she knows this: “You can do whatever your little heart desires.”

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Chapter One

INTRODUCTION

Delirium is a common, life threatening and preventable geriatric syndrome. According to the evidence currently available, this condition complicates patient care and increases hospital costs for approximately 20% of the 12.5 million patients over 65 years of age amounting to \$6.9 billion in Medicare dollars (Inouye, 2006). The prevalence of delirium in older adult patients admitted to the hospital is as high as 24% and in-hospital incidence rates can reach 65% (Spivack, 2010). Post discharge mortality rate ranges from 35% to 40% and hospital costs can total \$8 billion nationwide. Furthermore, institutionalization, rehabilitation, and home health care can add another \$100 billion. Total costs for delirium range from \$16,000 to \$64,000 per patient (Spivack, 2010).

Delirium is associated with poor outcomes and long-term poor prognosis, including nursing home placement (Inouye, 1998). Inouye, Rushing, Foreman, Palmer, and Pompei (1998) studied outcomes of patients diagnosed with delirium during hospitalization and found these patients had an increased incidence of functional decline, new nursing home placement, and death. Death rates at discharge for hospital patients

with delirium range from 6.1 to 62% (Siddiqi, House, & Holmes, 2006). Delirium was also associated with poor functional status among patients with and without dementia (McCusker, Cole, Dendukuri, Belzile, & Primeau, 2001).

Problematic for the care of patients with delirium, and any associated outcomes as the result of the condition, is the fact that the delirium is poorly documented in medical records. While providers commonly medicate the symptoms of delirium with antipsychotics, in clinical practice there can be a lack of documentation of the signs and symptoms of delirium (especially a systematic assessment), inappropriate use of terminology in charting, and in some cases, no documentation at all. The purpose of this proposed study is to address a knowledge gap that currently exists by describing the documentation of delirium in medical records when hospitalized older adults have been medicated with antipsychotics.

Background

Delirium

Delirium is one of the most diagnostically challenging syndromes experienced by hospitalized older adults and therefore documentation of the signs and symptoms is important to interdisciplinary teams caring for these older adults. As background, delirium is characterized by an acutely changing or fluctuating mental status, inattention, disorganized thinking, and altered level of consciousness (American Psychiatric Association, 1994; Foreman, 1993). Delirium is associated with higher mortality, prolonged hospitalization, and greater health care costs (Pompei, Foreman, Rudberg, Inouye, Braundd & Cassel, 1994). The primary risk factor for delirium is preexisting cognitive impairment. Other risk factors include a higher age, the presence of acute

systemic illnesses or medical comorbid diseases, and the use of certain medications (e.g. Benzodiazepines) (Outmet, Kavanagh, Gottfried, & Skrobik, 2007).

The recognition and documentation of delirium is an imperative first step for the nurse especially because delirium is an acute reversible state of confusion. Identification of the underlying cause or causes is also important so that appropriate treatment can begin as soon as possible to prevent further deterioration. However, beginning such treatment for delirium is especially problematic for two reasons: 1) systematic assessments for delirium are not done and documented routinely by health care providers, including nurses, and 2) when done, many different terms for delirium are used to describe the condition in medical records.

Identifying and Documenting Delirium

Identification of delirium remains a clinical diagnosis, based on bedside observation of the patient and information from families and caregivers. According to Inouye (1990), the diagnosis of delirium should be based on careful bedside monitoring of the 4 key features of delirium and include (1) acute onset and fluctuating course, (2) inattention, (3) disorganized thinking and (4) altered level of consciousness. However, in practice, physicians often fail to detect these symptoms of delirium, documenting symptoms in only 30% - 50% of affected patients. Fluctuating symptoms make delirium hard to detect, especially when physicians only spend brief intervals of time with patients.

Findings are mixed regarding nurse recognition and documentation of delirium. Francis (1992) states that nurses are more likely than physicians to detect delirium symptoms because of the increased time they spend with patients. Unlike Francis (1992),

Steis and Fick (2008) suggest that nurses do not properly assess, recognize, or document the symptoms of delirium. Contributing to the problem, they identified differences among nurses regarding knowledge of assessment, recognition and documentation of delirium. The complexity of causative factors for delirium only adds to the burden of the nurse. The list of causative factors is long and includes: impaired patient cognition (including environmental triggers for impaired mental status), impaired functional status (including immobility), polypharmacy, pain, electrolyte imbalance, dehydration, and possible infection.

Inouye et al. (2001) substantiates that nurses have poor competence in recognizing delirium. Inouye et al. (2001) found that nurses often missed delirium when present (sensitivity), but hardly ever identified delirium when it was absent (specificity). Observations made by nurses are critical for the early detection, documentation of delirium symptoms and continuous monitoring of these symptoms in order to follow the patient's clinical course (Inouye, Foreman, Mion, Katz & Cooney, 2001). However, there is no consensus as to what degree their documentation actually reflects the critical indicators (systematic assessment) identified by Inouye.

Nurses usually recognize that their patients are in distress, confused, exhibiting inappropriate behavior, and need help. In many of these cases nurses contact appropriate medical personnel, obtain an order for and administer a typical antipsychotic medication. However, it is not known if nurses a) systematically assess for the appropriate signs and symptoms of delirium, or b) document these signs and symptoms. These two processes are important because documentation of the assessment in the medical record is

paramount to determining the appropriateness and effectiveness of treatment (McLafferty, 2007).

Problem Statement

As an optimal first step it is vitally important to recognize and document the common contributing factors preceding any case of delirium in order to prevent the condition. However, prevention is not always possible. So, for patients who actually experience symptoms of delirium, several typical select antipsychotic medications are routinely administered to older adults to diminish the symptoms. However, the dangers of extrapyramidal side effects and tardive dyskinesias are common in these medications. Therefore, it is imperative that a systematic assessment be conducted in order to determine that the patient is actually experiencing delirium and the risks of receiving these medications can be warranted. No studies have examined the degree that systematic assessments of delirium have preceded the administration of select antipsychotic medications typically given for symptoms of delirium. Addressing this gap is important because individual systematic assessments are imperative to justifying the administration of dangerous select antipsychotic medications in the older adult population.

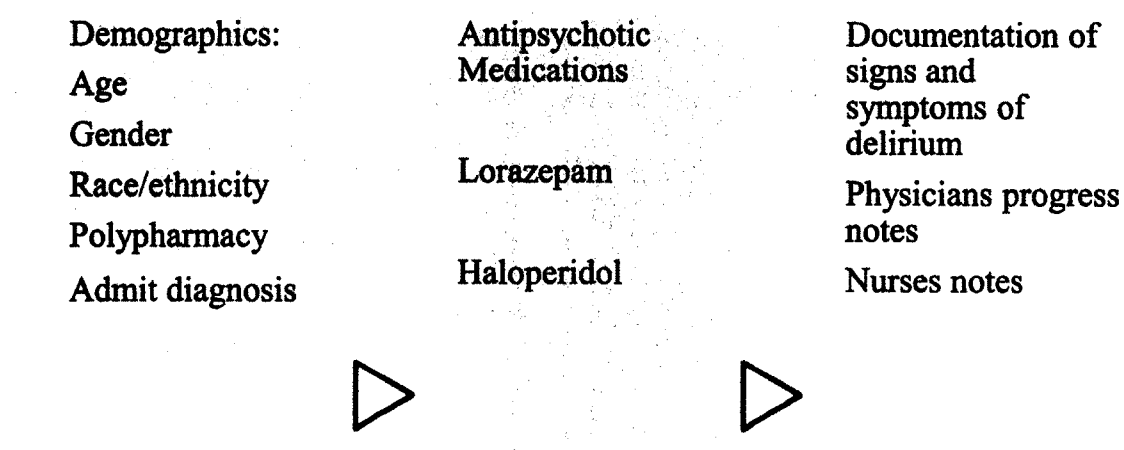
To improve care of the older patient experiencing delirium, “the older population must be acknowledged, and nurses must possess the knowledge and use the appropriate resources needed to meet this population’s unique needs” (Dahlke & Phinney, 2008).

Purpose of the Study

The purpose of the proposed study was to describe the documentation of delirium in the medical records of older adults who have been administered an antipsychotic medication. Additionally, the study will a) describe the documentation of a systematic

assessment for delirium that includes the four key features of delirium [(1) acute onset and fluctuating course, (2) inattention, (3) disorganized thinking and (4) altered level of consciousness] in hospitalized older adults; and b) determine if there are certain patient characteristics that predict if a systematic assessment will or will not be documented in the medical records.

Illustration 1. Conceptual Model



Research Questions

1. Are systematic assessments of delirium [(1) acute onset and fluctuating course, (2) inattention, (3) disorganized thinking and (4) altered level of consciousness] documented when patients are medicated with select antipsychotic medications?

2. What patient characteristics are associated with a documented systematic assessment of the signs and symptoms of delirium?

Specific Aims

Aim 1. Describe the profile of patients (age, gender, race, polypharmacy, and admission diagnosis) who have received select antipsychotic medications (lorazepam/haloperidol).

Aim 2. Describe the frequency that the following terms are charted in the medical records when there has been documentation of administration of select antipsychotic medications (lorazepam/haloperidol): (1) acute onset and fluctuating course, (2) Inattention, (3) disorganized thinking, (4) altered level of consciousness, 5) confusion, (6) agitation, (7) sundowning, and (8) delirium.

Aim 3. Describe the relationship between the documentation of administration of select antipsychotic medications (lorazepam/haloperidol) and the documentation of a systematic assessment of delirium that includes the [(1) acute onset and fluctuating course of (2) inattention, (3) disorganized thinking and (4) altered level of consciousness in the medical record.

Aim 4a. Describe the relationship between select patient demographics (age, gender, race, polypharmacy, and admission diagnosis) and the documentation of (1) confusion, (2) agitation, (3) sundowning, or (4) delirium in patients who have received select antipsychotic medications (lorazepam/haloperidol).

Aim 4b. Describe the relationship between select patient demographics (age, gender, race, polypharmacy, and admission diagnosis) and the documentation of a systematic assessment of delirium that includes the [(1) acute onset and fluctuating course (2) inattention, (3) disorganized thinking and (4) altered level of consciousness] in patients who have received select antipsychotic medications (lorazepam/haloperidol).

Aim 5a. What patient characteristics account for the most variability in the documentation of (1) confusion, (2) agitation, (3) sundowning, or (4) delirium in patients who have received antipsychotic medication?

Aim 5b. What patient characteristics account for the most variability in the documentation of a systematic assessment that includes an (1) acute onset and fluctuating course in (2) inattention, (3) disorganized thinking and (4) altered level of consciousness being completed in patients who have received antipsychotic medication?

Summary

All patient treatments, including the administration of antipsychotics to older adults, should be preceded by systematic assessments and the assessments documented in order to substantiate the appropriateness of the treatment. However, literature demonstrates that delirium may go unrecognized and/or the documentation of the signs and symptoms may be inadequate. As a first step leading to future research, this study will describe the documentation of delirium in the medical records of hospitalized older adults who have been administered an antipsychotic medication.

Chapter Two

REVIEW OF THE LITERATURE

Delirium is a common, life threatening but preventable clinical syndrome among older adult hospitalized patients. For the purpose of this study delirium is defined as an acute decline in attention and cognition. Cognition is described by Miller and Keane (1978) as the operation of the mind processes by which we become aware of objects of thought and perception, including all aspects of perceiving, thinking, and remembering. Attention is described by Maxmen, Ward and Kilsug (2009) as the ability to sustain a focus on one task or activity.

Delirium complicates hospital stays for at least 20 percent of the 12.5 million patients 65 years or older. Prevalence rates of delirium present on admission to the hospital range from 4% to 53.3% in older adult medical inpatients (Inouye, 2006; Sendelbach, 2009). Incidence rates (occurrence of new cases) of delirium during hospitalization range from 6% to 56%. Postoperative delirium has been estimated 10% to 52% and up to 80% in older adults in the intensive care unit (Inouye, 1998). The cost of a hospital stay increases by \$2,500 per person per admission resulting in \$6.9 billion of

Medicare hospital expenditures (Inouye, 2006). More importantly, the hospital mortality rates among older adult patients with delirium range from 22% to 76% and the one-year mortality rate is 35% to 40%. For those who do not die in the hospital, delirium often initiates a series of events that leads to functional decline, loss of independence, nursing home placement and death (Inouye, 2001).

Background

The Latin word *delirare* means to go out of the furrow, but also denotes to be deranged, crazy, or out of one's wits. Delirium was first seen in the medical literature in the first century A.D., but the meaning was still vague until the end of the eighteenth century.

Throughout history, delirium has been used to describe either insanity or an organic mental syndrome. It has been used in the English language in two ways. First, to refer to a mental disorder due to some malfunction of the brain featuring incoherent speech, hallucinations, frenzied excitement, and restlessness; and second, suggesting uncontrollable excitement or emotion, "frenzied rapture" or "wildly absurd thought or speech."

Numerous definitions for delirium can be found in the literature. Lipowski (1990) defines delirium as a transient mental syndrome of acute onset featuring disturbances in consciousness, cognition and attention, reduced or increased psychomotor activity and disturbed sleep-wake cycle. Millsap (2007) defines delirium as an abrupt change in attention and cognition and presents as the inability to focus, sustain, or shift attention in a normal fashion. Delirium is defined in the DSM-IV as an acute change in mental status,

inattention, disorganized thinking and altered level of consciousness (Morandi et al., 2008).

As the result of the many (meanings/definitions) above, there are also many different terms used by health care professionals to describe delirium. Intensive Care Unit Psychosis, acute brain dysfunction, brain failure, psychosis, confusion, encephalopathy, severe agitation, and sundowning are but a few. Only 54% of clinicians use the term delirium to indicate the disorder of delirium. The current consensus is to not only use the unifying term delirium but to also subcategorize delirium according to psychomotor symptoms (hyperactive, hypoactive, or mixed) (Pun and Ely, 2007).

Delirium Subtypes. Delirium seen in the hospitalized older adult patient may vacillate between stupor and hyperactivity. Three subtypes of delirium have been identified in the literature and include hyperactive, hypoactive and mixed delirium. Mixed delirium contains manifestations of both hyperactive and hypoactive delirium.

Hyperactive delirium is characterized by agitation, restlessness, attempting to remove medical devices and emotional lability. Patients with hyperactive delirium exhibit behaviors most commonly recognized as delirium and these behaviors include psychomotor hyperactivity, excitability and a tendency toward hallucinations. Patients with hyperactive delirium are easily identified because of the associated behaviors including hypervigilance, restlessness, fast or loud speech, irritability, combativeness, impatience, swearing, singing, laughing, uncooperativeness, euphoria, anger, wandering, distractibility, nightmares, and persistent thoughts (Milisen, Braes, Fick, & Foremann, 2006).

Hypoactive delirium is more common and often more harmful for the patient in the long term because it remains unrecognized in 66%-84% of hospitalized patients. Hypoactive delirium is characterized by withdrawal, flat affect, apathy, lethargy, reduced alertness, and decreased responsiveness. The patient may be lethargic, somnolent, and exhibit reduced psychomotor activity such as unawareness, decreased alertness, sparse or slow speech, slowed movements, staring and apathy. This is the “quiet” patient for whom the diagnosis is often missed (Milisen, Braes, Fick, & Foremann, 2006). Patients with hypoactive delirium are often misdiagnosed as demented or depressed (Inouye, Foreman, Mion, Katz, and Cooney, 2001).

The third type of delirium is mixed delirium and involves behavior that fluctuates between the hyperactive and hypoactive behaviors. This is difficult to identify because of the constantly changing presentation of the patient.

Regardless of the type of delirium the patient is experiencing, it is imperative that it be recognized as a medical emergency, assessed, documented, and treated to lessen the negative outcomes resulting from this syndrome.

Symptomatology

The onset of delirium is acute in most cases and the cardinal clinical symptoms are difficulty sustaining attention, fluctuating course and cognitive symptoms. The patient is unable to maintain attention for any period of time. He may be disoriented to time and space, perception disorders may be present, hallucinations, identification mistakes and distortion in the size of objects may be present. The key characteristics of delirium are a fluctuating course, as well as altered level of consciousness (Alvarel-Fernandez, Formiga, & Gomez, 2007).

Common Features

Inouye (1998) describes four features of delirium as acute onset and fluctuating course, inattention, disorganized thinking and altered level of consciousness and the cardinal features being acute onset and inattention. Establishing the onset of delirium requires knowledge of the patient's baseline cognitive functioning and may often require the help of a family member in the admission process for supplying the correct information. The course of delirium usually fluctuates over a 24 hour period with symptoms changing in severity. This may be very confusing to the bedside nurse and can lead to longer delays in treatment because the patient may seem "normal" when indeed he is not. Inattention is described as difficulty focusing, maintaining, and shifting attention. Patients experiencing delirium may have difficulty with the conversation, become easily distracted or have difficulty following commands. Disorganized thinking will show as incoherent, rambling or irrelevant conversation, illogical flow of ideas or switching from one subject to another without a coherent train of thought

Risk Factors

There are numerous risk factors for developing delirium. These include predisposing risk factors and precipitating risk factors.

Predisposing Risk Factors

Predisposing risk factors for delirium are factors present at the time of hospital admission that may affect a patient's vulnerability for developing delirium during hospitalization. These predisposing risk factors may include advancing age, preexisting cognitive impairment, severity of illness, depression, vision or hearing impairment and functional impairment (Sendlebach, 2009). Other literature (National guidelines for

seniors' mental health: the assessment and treatment of delirium, 2006; Capezuti, Zwicker, Mezey, & Fulmer, 2008) cited some of the same predisposing risk factors as Sendlebach, but added more. These are male sex, depression, alcohol abuse, abnormal serum sodium, and vision and hearing impairment.

In a systematic literature review of the risk factors associated with the development of delirium in hospitalized geriatric patients the authors found that advanced age, dementia and medical illness are three predominant risk factors that place patients in the high risk category for developing delirium (Elle, Cole, Primeau, and Bellavance, 1998). The goal of the systematic review was to identify the risk factors that were most prevalent in the development of delirium in the hospitalized older adult, whether they were surgical, medical or psychiatric patients.

Inouye (1998) listed the top predisposing factors to be baseline cognitive impairment or dementia, severe underlying illness and comorbidity, functional impairment and advanced age.

Age. Advanced age has been demonstrated to be the prime risk factor for developing delirium (Capezuti, Zwicker, Mezey, and Fulmer, 2008). Old age is defined differently in the literature however; the age of 65 is the most widely used for the beginning of old age. Elle, et al., (1996) found that advanced age was significantly associated with the development of delirium. Inouye (2006) found that although the overall prevalence of delirium in the community is only 1 to 2 percent, the prevalence increases with age, rising to 14 percent among those more than 85 year old.

Lipowski (1990) lists age related changes in the brain as likely factor contributing to the development of delirium in the older adult patient. He discusses the homeostatic

disturbances brought on by the stress of hospitalization and how they may result in decompensation of the brain structures and mechanisms related to cognition and attention, thus resulting in delirium.

Dementia. Through a systematic literature review by Elle, et al., (1998) dementia was the most studied risk factor and the most strongly associated with delirium. Twelve of the fifteen studies showed a positive correlation. The cumulative OR was 5.2 (95% CI 4.2 6.3).

Young & Inouye (2007) found that delirium is the most common complication of hospital admission for older people. Dementia is associated with an increased risk of developing delirium and delirium is associated with increased risk of developing dementia, although Fick et al., (2002) propose that it is unclear whether the delirium is unmasking previously unrecognized dementia or initiating a process of cognitive decline.

Dementia is an important risk factor to the development of delirium in the hospitalized older adult with demented patients having a two to five fold increase risk of delirium (Inouye, 1998).

Medical Illness. Chronic medical illnesses can predispose older adult hospitalized patients to delirium. These illnesses may include central nervous system diseases such as cerebrovascular disease, mass lesions, trauma and infections. Diseases outside of the central nervous system may also contribute to the development of delirium and these may include infections, metabolic, cardiac, pulmonary, endocrine disorders and cancers (Inouye, 1998).

Precipitating Risk Factors

Precipitating risk factors precede the development of delirium and are any noxious insults or events that happen during hospitalization. These risk factors may include medications misadventures, immobilization, use of indwelling bladder catheters, use of physical restraints, dehydration, malnutrition, iatrogenic events, medical illnesses, infections, metabolic abnormalities, alcohol or drug withdrawal, environmental or psychosocial factors (Inouye, 1998).

Medication. Medications are common precipitating factors to the development of delirium. These medications include prescription, over the counter, complementary therapy medications or illegal drugs. The most common classes of drugs associated with delirium are sedative hypnotics, benzodiazepines, analgesics (narcotics), and anticholinergic medications (Alagiakrishan & Wiens, 2004).

Medications were found by Inouye (1998) to be the most common changeable cause of delirium. Many different medications can cause delirium in the older adult and the most common are sedative-hypnotics, narcotics, and medications with anticholinergic effects. Inouye also pointed out that use of psychoactive medication was associated with a 3.9-fold increased risk of delirium and use of two or more psychoactive medications was associated with a 4.5-fold increase. Sedative-hypnotic medications are associated with a 3.0 to 11.7-fold increased risk of delirium, narcotics with a 2.5-2.7 fold risk and anticholinergic medications with a 4.5 to 11.7 fold increase. As many of these medications are prescribed during hospitalization, sedative-hypnotic medications for sleep are prescribed for 46%-66% of medical patients and 85-96% of surgical patients (Inouye, 1998).

Delirium may also be related to the number of medications prescribed as well as the drug-drug and drug-disease interactions. These untoward effects of medications increase with age. Inouye & Charpentier (1996) found that adding more than three medications during hospitalization can increase the risk of delirium by at least four-fold in the older patient. Inouye, (1998) concludes that nonpharmacologic interventions for delirium management are recommended and pharmacologic management with psychoactive medications be reserved for patients that are a danger to themselves or others.

Anticholinergic medications. Anticholinergic medications antagonize the actions of acetylcholine and other cholinergic agonists in the parasympathetic nervous system and are given cautiously in the older adult patient may be more sensitive to the effects of these drugs (Physician's Drug Handbook, 2008, p. 19)

There is evidence to support a role for cholinergic deficiency in delirium as the cholinergic system plays a key role in cognition and attention and there is evidence in the literature to support a role for cholinergic deficiency in delirium. Acetylcholine synthesis involves various precursors, enzymes, and receptors, and interruption of any or all of these processes may lead to delirium. (Hshieh, Fong, Marcantonio & Inouye, 2008). Anticholinergic medications can induce delirium and are often the culprits in the hospitalized older adult. Increasing acetylcholine levels using cholinesterase inhibitors such as physostigmine has been shown to reverse delirium associated with anticholinergic drugs. (Fong, Tulebaev, & Inouye (2009). Han, McCusker, Cle, Abrahamowicz, Primeau, & Elie (2001) found that exposure to anticholinergic medications was associated with a higher severity of delirium in hospitalized older

medical patients. This study included 278 inpatients 65 years and older with diagnosed delirium. The patients were followed using the Delirium Index. The Delirium Index was developed by this group of researchers based on the Confusion Assessment Method (CAM) and assesses the severity of delirium versus the presence of delirium (CAM). Although many studies have focused on anticholinergic medications as the causal factor for the development of delirium, this study looked specifically at the relationship between these medications and the severity of delirium. This relationship between anticholinergic medication exposure and the severity of delirium supports an anticholinergic/delirium causation theory.

In a cohort study of any mechanically ventilated patient admitted to the medical or coronary ICUs at Vanderbilt University's 631 bed medical center from February 2000 to May 2001. Exclusion criteria included baseline neurologic diseases that would confound the evaluation of delirium; Pandharipande et al. (2006) found that lorazepam administration was an important and potentially modifiable risk factor for transitioning into delirium after adjusting for relevant covariates. Using regression modeling and in addition to advancing age and APACHE II scores, there is an independent and dose related association between receiving lorazepam and transitioning into delirium. A limitation of the study may have been the relative covariates that were important pre study were not all inclusive. The possibility exists that other covariates such as renal and hepatic failure, hypoxemia, and sleep deprivation could have altered the results. Ethically, the study could not have a proper control group because when patients are in the ICU on a ventilator, the standard of care is for pain and anxiety to be assessed and addressed with medication for the comfort of the patient. The findings of this study are

that the medications used to reduce anxiety are associated with the development of delirium. Lorazepam was associated with a higher risk of transitioning into delirium after adjusting for the relevant covariates.

Immobility. Inouye and Charpentier (1996) suggested that the use of physical restraints and urinary catheterization contributed to the development of delirium. Schuurmans et al., (2001) suggests that lack of postoperative mobility was a contributing risk factor for delirium. Invasive lines, catheters, restraints and any other immobilizing device contribute to the inability of the patient to continue activities of daily living.

Physical activity has been recognized as an important aspect of patient care for nearly 50 years. Yet, deconditioning and functional decline of hospitalized older adult patients continue to be reported. Immobilization can lead to delirium and functional decline within a few days; however physicians routinely order bed rest or no activity in 26% of patient day or minimal activity in an additional 31% of patient days (Lazarus et al., 1991)

Many risk factors, whether predisposing or precipitating can contribute to the patient developing delirium. A systematic assessment and thorough documentation may lead to better outcomes for older adults during hospitalization.

Predictive Factor Models

Kallisvaart et al. (2006) studied the validity of a medical risk stratification model for the evaluation of post-operative hip-surgery patients. 603 hip surgery patients aged 70 years and older were screened for risk factors for postoperative delirium. Predefined risk factors for delirium were assessed on admission and included the Mini-Mental State Examination, standardized Snellen test for visual impairment, chart review for the

APACHE II score, and blood urea nitrogen to creatinine ratio. The outcome was postoperative delirium using the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DMS-IV), and Confusion Assessment Method criteria. All the patients were screened daily for delirium. Cognitive impairment at admission had the highest predictive value for postoperative delirium (coefficient of determination = 0.15). In addition to cognitive impairment risk stratification age and type of admission also predicted delirium in this population.

Pathophysiology of Delirium

Adding to the confusion of naming delirium as discussed above, no one causal factor or catalyst has been identified to explain the pathophysiology for delirium although several hypotheses have emerged. Current literature suggests that medication toxicity, inflammation, neuronal injury and acute stress can all disrupt neurotransmission and contribute to the cause(s) of delirium.

Inflammatory Theory of Delirium

Evidence is available to propose that trauma, infection, surgery or any other physical insult to the body can lead to increased production of proinflammatory cytokines that in susceptible patients induce delirium. Peripherally secreted cytokines can intensify responses in the microglia (phagocytes that clean up waste products from the nervous system) that in turn cause severe inflammation of the brain. Proinflammatory cytokine levels have been shown to be elevated in patients with delirium (Fong, Tulebaev and Inouye, 2009).

Neuronal Injury Theory of Delirium

Neuronal injury or neuronal inflammation is injury or inflammation to the central nervous system or the brain. This type of injury can be caused by many different metabolic or ischemic insults to the brain such as hypoxemia, hypercapnia, hypoglycemia, or any major organ dysfunction, Neuronal injury is known to be a contributing factor for the development of delirium. In addition, dysfunction of the liver, kidneys, or pulmonary system can contribute to neuronal injury leading to delirium.

Many of the underlying mechanisms of neuronal injury are difficult to identify in older adults. Inouye (1998) found that occult respiratory failure that is difficult to detect because of the atypical signs and symptoms of dyspnea and tachypnea, is often missed by providers resulting in delirium. Myocardial infarction and congestive heart failure often present with symptoms of delirium without the usual chest pain or difficult respiratory effort seen in younger patients. Infections, particularly urinary tract and pulmonary infections including pneumonia often present with in older adults with only the symptoms of delirium, and the usual fever or leukocytosis may be absent in the older adult patient.

Distinct neuropathological processes are beginning to be defined, but there is probably no final pathway to delirium, rather delirium may be the final common symptom of multiple neurotransmitter abnormalities (Flacker & Lipsitz, 1999).

Acute Stress Theory of Delirium

The physiologic stress hypothesis suggests that trauma, severe illness, and surgery may modify the blood-brain barrier permeability altering neurotransmitter synthesis and release cytokines in the brain that in turn contribute to the development of delirium (Maldonado, 1990). Rigney, (2010) suggests that the regulatory systems of the human

body may be upset by an overload of stress. Allostasis is a process of physiological adaptation that the body undergoes during periods of high stress. However, when stress exposure is unpredictable, repetitive, chronic or amplified, this can lead to an overload of normal regulatory systems and is described as Allostatic load. Rigney hypothesizes that there is a relationship between high Allostatic load and the development of delirium in the hospitalized older patient. He suggests that having a better understanding of the causes of Allostatic load and how it relates to delirium may lead to earlier interventions for delirium and therefore possibly improve the outcomes for older hospitalized patients.

In summary, there may not be a single neuropathogenic pathway to delirium development. Multiple hypotheses may work in tandem to contribute to the process of delirium (Maldonado, 2008). As an example of one of the more complex hypotheses, Lipowski (1990) noted that in the older patient, delirium is a reaction to extreme stress brought on by abnormally high levels of circulating glucocorticoids or the increased vulnerability of the hypothalamus to these high levels or both. Sleep pathology may also be a contributing cause for delirium in older adults because the sleep/wake cycles tend to be fragmented in the older adult resulting in a high prevalence of sleep apnea and daytime sleepiness. Sleep apnea results in hypoxemia that in turn may impair mental status through yet another neuropathogenic pathway (Lipowski, 1990).

Finally, Inouye (1998) discusses low vulnerability/high vulnerability and the relationship between noxious insults in the hospitalized older adults may contribute to the development of delirium in the Predictive Model and Interrelationship with Baseline Vulnerability. This model takes into account the development of delirium related to baseline patient vulnerability and precipitating factors or noxious insults occurring during

hospitalization. A patient with high vulnerability (severe risk factors) may develop delirium with relatively small insults, whereas a patient with low vulnerability (few risk factors) may not develop delirium while hospitalized if the noxious insults remain low.

Complications of Delirium

Complications of delirium include increased hospital stays, functional and cognitive decline, institutional care, and mortality. Each of complications result in increased suffering for patients and families as well as increased health care costs

Functional Decline

Function is the ability to manage day-to-day activities such as eating, bathing, walking, managing money, and keeping track of medications serving as the foundation for independence. Functional decline, therefore, is the loss of the ability to perform one or more of these activities of daily living. Among other common causes of functional decline such as illness, injuries, medication side effects, depression, and poor diet, delirium ranks high as a cause of functional decline among older adults. In hospitalized older adults experiencing any of the causes, especially delirium, functional decline can occur in a matter of days (Capezuti et al., 2008).

Therefore, functional decline has been shown in the literature to be one of the many negative outcomes of delirium in hospitalized older adult patients. George et al., (1997) found that delirium is not only common but is also associated with a poor long term prognosis. Delirium may be a marker for functional deterioration and decline in older adults post hospitalization. Compared with the controls in this prospective case-controlled study carried out in the United Kingdom, patients discharged from the hospital following an episode of delirium were four times more likely to be institutionalized and

twice as likely to be re-admitted to the hospital or have died within a year after discharge from the hospital.

McCusker et al., (2001) found that delirium was an independent predictor of sustained poor functional status during the year after medical admission to a hospital. Participants were 65 years of age and older, admitted from the emergency department to medical units, and were screened for delirium during the first week of hospitalization. They were then followed at 2, 6, and 12 month intervals after admission. The baseline screening tools used were a) Confusion Assessment Method (CAM), a measure of delirium symptoms, b) Informant Questionnaire on Cognitive Decline in the older adult, a measure of dementia, c) Barthel Index, a measure of physical function, d) measure of instrumental activities of daily living (IADL), e) Mini-Mental State Examination (MMSE), a measure of mental status. In addition, comorbidity, physiologic and clinical severity, and discharge setting (specifically, long term care setting was of interest). Study findings, for older patients with and without dementia that delirium was an independent predictor of poor functional status (as well as poor cognitive status) during the year after admission to the hospital. Three conclusions of this study were a) some symptoms (mainly inattention) may persist long after resolution of the episode of delirium and result in functional impairment, b) irreversible neuronal dysfunction may account for the new functional (and cognitive) deficits, and c) delirium in this population may represent a chronic disorder. The authors summarized that delirium is an important prognostic marker for functional and cognitive decline at least 12 months after admission to the hospital.

Marcantonio et al., (2003) found that in patients admitted to post-acute care facilities from acute care hospitals, delirium symptoms were prevalent, persistent, and associated with poor functional recovery. In this prospective cohort study the sample consisted of 551 patients, 65 years of age and older, and newly admitted to participating facilities, (55 rehabilitation hospitals, and 30 skilled nursing facilities in 29 states). In linear regression models adjusting for age, baseline functional status, comorbidity, and dementia, persistent or worsening delirium symptoms were strongly associated with poor functional recovery. Having persistent delirium was independently associated with nearly four points less improvement in the AD scale over the 1-week period. Furthermore patients with fewer or resolved delirium symptoms had a functional recovery similar to those without delirium. Rudolph et al., (2010) found that older patients who underwent cardiac surgery and developed delirium postoperatively were at risk of functional decline. The sample consisted of adults 60 years of age and older who had undergone post elective or urgent cardiac surgery (n = 190). Delirium was assessed daily using the Confusion Assessment Method (CAM). Prior to surgery, and 1 and 12 months following surgery, the patients were assessed for function using the Instrumental activities of daily living (IADL) scale. Instrumental activities of daily living are activities that allow the person to function independently in the community and include ability to use the telephone, shop, food preparation, housekeeping, laundry, transportation, medication administration and ability to handle finances. Functional decline was defined in this study as the loss of ability to perform one IADL at follow-up. Results demonstrated delirium occurred in 43.1% of patients and functional decline was present in 36.3% at 1 month and 14.6% at 12 months. After adjustment of age, cognition, comorbidity, and baseline

function, the authors concluded that delirium was associated with functional decline at 1 month, but not at 12 months. The important implication from this study was that delirium after cardiac surgery is more than an acute, hospital problem and can have functional consequences that may persist for long periods of time after discharge.

Dolan et al., (2000) found that patients with hip fractures who develop delirium require longer hospital stays, are more often discharged to long term care facilities, and have poor long term prognosis in relation to regaining function in activities of daily living. All participants were 65 years or older and living in the community prior to the hip fracture. Approximately 15% of the initial sample had been identified as cognitively impaired based on a medical chart notation of dementia, organic brain syndrome, or Alzheimer's disease and were excluded from the study. Longitudinal data were available for 443 participants at 2 months, 408 at 6 months, 381 at 12 months, 320 at 18 months and 306 at 24 months post hospitalization. This study examined delirium independent of dementia and found that baseline delirium was an important indicator of poor long-term outcomes such as independence in activities of daily living.

Cognitive Decline

A number of studies have examined cognitive functional decline as a result of an episode of delirium. As background, cognitive functioning includes the processes by that a person perceives, registers, stores, retrieves and uses information. Conditions in that cognitive function is impaired are the dementias, delirium and depression (Capezuti et al., 2008).

Dolan, et al., (2000) examined cognitive functional decline, specifically mental status, in a population of postoperative hip repair older adult patients using the

mini-mental state examination (MMSE). The MMSE is a brief 30-point screening test used to test for mental status, one aspect of cognition (Wikipedia, 2011). Admission delirium accounted for worse MMSE scores at 24 months (76% vs. 53%). Additionally, those admitted with delirium were more likely to score in the mild impairment to severe impairment range on the MMSE at 24 months. Results of this study demonstrate that these patient populations, when admitted with delirium, were nearly two times more likely to have cognitive impairment on the MMSE at 24 months post discharge.

McCusker et al., (2001) also examined cognitive decline, specifically mental status, as an adverse outcome of delirium experienced by hospitalized older patients, with and without dementia. For older patients with and without dementia, delirium is an independent predictor of poor cognitive and functional status during the year after medical admission to a hospital. Additionally, delirium in older hospitalized patients is associated with significantly worse cognitive status even after adjustment for comorbidity, severity of illness and other relevant covariates. McCusker et al (2001) concluded that delirium was an important prognostic indicator for cognitive function for at least one year after hospital admission in patients with dementia.

Bickel, Grading, Kochs and Forstl (2008) studied cognitive decline among hip surgery patients age 60 years and older. Using logistic regression analysis and adjusting for age, sex, medical comorbidity, and preoperative cognitive status, there was a significant association between delirium and cognition, memory decline, and the need for long term care (OR = 5.6; 95% CI = 1.6-19.7). This study concluded that delirium in hospitalized older adult patients with cognitive impairment not only persists post hospitalization, but also predicts future cognitive decline.

Hospital Length of Stay

Several studies have documented that hospitalized patients who experience an episode of delirium have longer lengths of stay. For example, Stevens, de Moore and Simpson (2001) found that delirium as a comorbid diagnosis in general hospital patients was associated with increased length of stay (LOS) as well as increased use of resources during hospitalization. This prospective cohort study found a 2.18-fold longer length of stay in patients experiencing delirium compared to controls after allowing for severity of illness. The strength of this study was all cases of delirium were clearly diagnosed and only patients experiencing delirium after admission were included. An additional strength of this study was that it examined hyperactive delirium specifically. Patients presenting with hyperactive delirium were more behaviorally disturbed and referred for psychiatric consultation.

An observational case control study by Ansaloni et al., (2010) evaluated the incidence of postoperative delirium in older adult patients undergoing general surgery, the risk factors associated with post-operative delirium, and the impact of delirium on hospital stay. The results of this study conducted in Bologna, Italy found that while the community prevalence of delirium is only 1-2 percent, it rises to 14 percent in persons over the age of 85. The sample size was 351 patients older than 65 years of age who had emergency or elective surgeries. Exclusion criteria were the inability to perform cognitive and psychomotor tests for any reason, sensory impairment, inability to communicate because of language, and previous diagnoses of dementia. The incidence of postoperative delirium ranged from 11-42 percent in medical inpatients and 20-40 percent in ICU (Intensive Care Unit) patients, but affected up to half of all older adult hospitalized

patients. Those same older adult patients having had hip surgery or vascular surgery demonstrated to have higher rates of post-operative delirium. Results demonstrated that 13.2 percent of admissions developed post op delirium with the emergency surgery cohort being 17.9 percent compared with 6.7 percent of elective surgery patients. Age was considered one of the risk factors for developing delirium while hospitalized for surgery. The incidence rate of 13.2 percent is low compared to other studies of this kind. One of the weaknesses of this study was the exclusion of patients unable to perform cognitive and psychometric tests, especially patients with the diagnosis of dementia. Dementia is an extremely high risk factor for developing delirium in hospitalized older adults.

McCusker et al., (2003) found that incident delirium rather than prevalent delirium may increase the length of hospital stay after adjusting for comorbidity, illness severity and other confounding variables. Three suggestions for this were raised by the study authors. First, incident delirium may have resulted from complications that may have been the cause of the longer stay. Second, deterioration in physical function may have accompanied incident delirium making discharge inappropriate until the patient's clinical condition improved. Third, a diagnosis of incident delirium may call for further evaluation and tests that may in turn require a longer hospital stay. This study also found that the presence of hypoactive delirium was associated with considerable longer hospital stays. This was related to increased risk for pressure ulcers, nosocomial infections or other iatrogenic complications.

Institutionalization

Nursing home placement is a negative outcome of delirium in the hospitalized older adult. McAvay, VanNess, Bogardus, Zhang, Leslie, Leo-Summers and Inouye (2006) performed a secondary analysis of prospective cohort data collected from patients in the Delirium Prevention Trial. One year post-discharge follow-ups were completed on the sample size of 433 patients, and of those patients 24 had delirium at discharge, 31 had delirium that resolved during hospitalization, and 378 were never delirious. The percentage of patients that were institutionalized was 19/24 (79.2%) patients with delirium at discharge, 14/31 (45.2%) patients whose delirium had resolved and 111/378 (29.4%) patients who were never delirious. Those patients who survived the first year post-discharge data is analyzed and the discharged with delirium group had a mean length of stay in the nursing home of 180.2 days, the resolved delirium group of 143.7 days and 72.9 days for those who had never experienced delirium while hospitalized. This prospective cohort study shows a strong association between delirium at discharge and nursing home placement or death over a 1-year period of time, followed by patients with resolution of delirium by discharge. This study also shows the deleterious effects of delirium one year after discharge from the hospital. The implications of this study are twofold. First, it shows the importance of identifying and treating both resolved and unresolved cases of delirium before discharge and second, the importance of prevention of delirium in the hospitalized older adult.

Mortality

Inouye et al., (2003) examined the independent contribution of baseline delirium to hospital mortality in three large prospective cohorts of older adult hospitalized

patients. The hypothesis tested was that baseline delirium would be an important prognostic indicator after controlling for underlying severity of illness, age, dementia and functional status. In the sample size of 727 patients from three university-affiliated teaching hospitals, the outcomes were assessed from admission to discharge or 3-month follow-up, or from admission to functional decline or death. The mean age of the study participants was 78.9 years, frail (42% with an Activity of Daily Living impairment at baseline), primarily female (60%), with an overall rate of delirium on admission of 12% of the total 727 patients. Only 9% of the patients admitted with delirium died during their hospitalization; however, by 3-month follow up, the number of deaths in the combined sample increased to 98 (14%). It should be noted that only prevalent delirium and not incident delirium was assessed at all three sites and those with incident delirium were not classified as delirious at admission.

Kiely, et al., (2009) followed four hundred twelve post-acute care (PAC) patients in an observational cohort study and found that patients who were delirious at the time of admission, persistent delirium was a significant independent predictor of 1-year mortality. The objective of this study was to follow a cohort of patients that presented with delirium upon admission to the PAC. These patients were followed for a year, regardless of where they were residing, and examination of the relationship between persistent delirium and mortality at four follow-up points. Assessments were performed at baseline and four follow-up times: 2, 4, 12 and 26 weeks. The average age of the study sample was 84 with 65% of those were women. The result of this study indicates that delirium persists after hospitalization and was associated with a high 1-year mortality rate. Patients whose delirium persisted were nearly three times as likely to die during

the 1-year follow-up as patients whose delirium resolved, even after adjusting for the confounding effects of age, sex, comorbidity, functional status, and dementia. The authors concluded that persistent delirium contributed to mortality and was substantial in patients with and without dementia.

Pharmacological Treatment of Delirium

With regards to the pharmacological treatment of delirium, antipsychotics are the drugs of choice. Antipsychotics should be used at the lowest possible dose for the shortest period of time. Haloperidol is the most frequently used and best utilized antipsychotic medication because of its few anticholinergic effects, few metabolites and small likelihood of causing sedation (Markowitz & Narasimhan, 2008). The two antipsychotic medications used in this study for case finding are lorazepam and haloperidol and they are chosen because they are the two most prevalent antipsychotics used to treat delirium in the older adult at this site.

Lorazepam is a benzodiazepine with the therapeutic class of anxiolytic and sedative-hypnotic that enhances the action of the inhibitory neurotransmitter gamma-aminobutyric acid in the central nervous system affecting memory, motor, sensory and cognitive function. The therapeutic effect of lorazepam is to produce anxiolytic (anti-anxiety medication), anticonvulsant, sedative, muscle relaxant, and antiemetic effects. The indications for lorazepam are anxiety, insomnia due to anxiety, preoperative sedation and status epilepticus. It should be used cautiously in patients with pulmonary, renal, or hepatic impairment and in the older adult, acutely ill, or debilitated patients (Physician's drug handbook, 2008).

Haloperidol is a butyrophenone in the therapeutic class of antipsychotic drugs and is used for psychotic disorders such as schizophrenia. Haloperidol is also used for treatment of non-. Schizophrenia psychosis; may be used for the emergency sedation of severely agitated or delirious patients. Haloperidol works by exerting antipsychotic effects by strong postsynaptic blockade of central nervous system dopamine receptors. This in turn inhibits dopamine-mediated effects. Haloperidol is contraindicated in patients hypersensitive to the drug and those with Parkinsonism, coma, or CNS depression. Use is cautioned in the older adult or debilitated patients, patients with a history of seizures, EEG abnormalities, cardiovascular disorders, allergies, angle closure glaucoma, or urine retention and in those patients receiving anticoagulants, anticonvulsants, antiparkinsonians, or lithium (Physician's drug handbook, 2008).

Delirium Assessment

Systematic assessment is not done routinely and despite the occurrence of delirium in 14% - 56% of hospitalized older adults, delirium represents the most frequent complication during hospitalization where a systematic assessment is not done on a routine basis. Recognizing the first signs of delirium is paramount to identify, eliminate, or reduce the precipitating factors such as pain, infection, or other illnesses. Nurses need to have a high degree of suspicion for delirium in older adults, specifically for those with predisposing risk factors that increase the susceptibility for delirium (Inouye, Viscoli, Horwitz, Hurst, & Tinetti, 1993). Although delirium is clinically important, it is often misdiagnosed or not detected at all, even though there are potential strategies and instruments that can improve detection and diagnosis. Systematic assessment and

treatment programs appear to be beneficial in identification of delirium in the hospitalized older adult (Cole, 2005).

A systematic review completed by Steis and Fick (2008) found that the concept of nurse knowledge of delirium, recognition of delirium and documentation in the medical record of delirium varied widely. Delirium is very complex and fluctuates within a 24 hour time period. This review also discussed the fact that nurses knew something was amiss with their patients and that their patients needed help. However, without having a framework from that to work, the nurses did not recognize these symptoms as the constellation of delirium. The authors suggested many recommendations to improve recognition of delirium and those recommendations include: delirium assessment education, improved nurse-nurse communication, changes to the health care system, and the use of computerized decision support, implementation of delirium position statements and practice protocols and guidelines. Delirium assessment education would target three nursing groups; nursing students, nursing faculty and practicing bedside direct care nurses. Nurse to nurse communication will include cognitive assessment on every shift and consistent communication of the assessment findings. Using the electronic medical record and a valid and reliable delirium assessment tool will enhance communication and documentation and improve outcomes for the patient experiencing delirium. The authors also recommend the use of a well-known instrument such as the CAM (Confusion Assessment Method) for detecting delirium in older hospitalized adults.

In an Australian study by Hare, McGowan, Wynaden, Speed, and Landsborough (2008) 1209 patient's charts were audited over a four week period of time to identify, quantify and categorize cognitive and behavioral changes that were charted in the

medical records of older adult hospitalized patients. Patient charts were reviewed if the patients were labeled as confused by nursing staff. Confusion was the most common term used to describe changes in cognition or behavior. There was no cognitive screening tool used to describe these changes and the authors felt that this was a barrier to accurate identification of delirium. Cognitive assessment has not routinely been taught in nursing schools; therefore nurses do not recognize delirium at the bedside. Implications for nursing practice that came about as a result of this study were to educate nursing students on cognitive assessment using validated tools on all hospitalized older patients and how to properly document the findings.

In a study by Inouye, Foreman, Mion, Katz, and Cooney (2001) when the Confusion Assessment Method (CAM) was rated by untrained nurses as part of their clinical care and without any formal systematic assessment, delirium was often unrecognized. Nurses, as compared to trained researchers could only identify delirium in 19% of the observations and 31% of patients with delirium. Four risk factors for not recognizing delirium in this study were identified as hypoactive delirium, age 80 years and older, vision impairment and dementia. When all four risk factors were present there was a 20-fold chance of under recognition. The large sample size (797) was strength of this study as well as the comparison of nurse and trained researcher for the findings of delirium in the hospitalized patients. Inouye concluded that nurses often missed delirium when present, but rarely identified delirium when absent. Education of nurses in the key features of the CAM can be enhanced with education of the instrument, cognitive assessment and ramifications of poor identification and therefore treatment of delirium.

Documentation of Delirium

Nurses spend more time at the bedside than physicians and therefore play a critical role in the recognition and documentation of delirium. Nurses also have frequent contact with the patient and can observe fluctuations in attention, level of consciousness and cognitive functioning. Observations made by nurses are crucial for the early detection of delirium symptoms and for the ongoing monitoring of these symptoms to follow the patient's clinical course. When there is ongoing, systematic assessment and documentation of the progress of delirium symptoms in the medical chart, interventions may be tailored to meet the needs of the patient that will result in better outcomes.

A descriptive study by Voyer, Cole, McCusker, St-Jacques, and Laplante (2008) studied accuracy of nurse documentation of delirium symptoms in medical charts and found that documentation by nurses of delirium symptoms is poor. Of the 226 delirious older adults admitted to an acute care hospital; disorientation, agitation and altered level of consciousness were the three documented symptoms of delirium and that was in done so in less than a third of the patients. Higher comorbidity, more severe symptoms of delirium and the use of physical restraints had higher documentation of delirium symptoms. The results of this study were similar to other studies done previously that demonstrated poor nursing documentation of delirium in hospitalized older adults. In this prospective validation study, hyperactive delirium was better documented in the medical chart than hypoactive delirium. Other studies have shown this to be true also and may be because patients with hypoactive delirium are quiet and do not require much attention. Documentation improved on patients experiencing hyperactive delirium who need very frequent monitoring for safety interventions. Furthermore, patients with severe symptoms

of delirium and who were physically restrained were associated with very good documentation.

The strength of this study was the large sample size, the time frame of assessment by the research nurse with comparison to the data from the chart, and third the factors associated with delirium were measured by a trained research assistant blinded to the assessment of delirium by the study nurse. The weaknesses of the study were that two significant symptoms of delirium were not included in the tool (inattention and disorganized thinking). This study was about documentation of delirium in the medical chart and did not take into account if the nurses actually communicated the symptoms without documentation. It does show, however that nurses do not document properly the symptoms of delirium.

In a pilot investigation by Morandi et al. (2009) both nurses and physicians documented the word delirium in only 7% of the patients' charts with the word confusion being the most frequently used descriptor (95%) of any change in the patients' condition. When nurses notified physicians of patients using keywords such as confusion, disorientation, altered mental status, delirium, agitation, inappropriate behavior, mental status change, inattention, hallucination, and lethargy, they were likely to get orders for further assessment or pharmacological interventions. If nurses did not refer to the changes in their patients using these key words above, no actions were documented in the charts for these patients.

According to Millisen et al. (2002) both medical and nursing records demonstrated poor documentation and under diagnosis of delirium in hospitalized older adults. This sample consisted of admissions of older adult patients to two trauma units in

University hospitals in Belgium during a seven month period. The patients were admitted through the emergency department with a diagnosis of hip fracture and were to undergo surgical repair of the fracture. Of the 55 patients enrolled, the mean age was 78.4 years, women comprised 80% of the sample and 29% had some form of neuropsychiatric comorbidity such as dementia, depression or Parkinson's disease. Delirium was assessed by trained raters using the Confusion Assessment Method (CAM) on days 1, 3, 5, 8, and 12 postoperatively. Physician and nursing documentation was reviewed on discharge for documentation about the diagnosis of delirium or reference to the following words: acute confusional state, confusion, acute brain syndrome, acute brain failure, exogenous psychoses, toxic-metabolic encephalopathy, and pseudosenility or by a description of the patient's behavior. These descriptors were as follows: restless, fidgets with materials, annoying, dangerous, shouting, nervous, turbulent, aggressive, sleepless, agitated, or confabulation for the hyperactive form of delirium. Symptom words for hypoactive delirium included quiet, sleepy, drowsy, or passive. And symptom descriptors for mixed would have included disoriented or mentally deranged. Words used to describe adequate cognitive functioning were ability to communicate, alert, lucid, conscious, and oriented. This retrospective study brought to the forefront that documentation of the baseline cognitive status is poor both in the medical and nursing documentation leading to under-diagnosis of delirium. It also demonstrated that failure to diagnose delirium prevents any intervention that in turn leads to poor prognosis and poor outcomes in older adult patients with hip fracture as well as higher morbidity, functional decline, longer length of stay, nursing home placement and death. Recommendations from this study were to

standardize assessment of older adult patients hospitalized with hip fracture that would in turn lead to early recognition and treatment of delirium.

Summary

Although there have been many studies addressing the subtypes of delirium, symptomatology, features, risk factors , pharmacological treatment, pathophysiology, complications, assessment and documentation of delirium, there have been no studies to date that have examined the degree that systematic assessments of delirium and documentation of those assessments have preceded the administration of select antipsychotic medications typically given for symptoms of delirium. Addressing this gap is important because documentation of the assessments of delirium is imperative to justifying the administration of dangerous select antipsychotic medications in the older adult population. Documentation of delirium in the medical record consistently by registered nurses will improve the care of patients with delirium and improve outcomes.

Chapter Three

METHODOLOGY

This chapter includes a description of the study specific aims, design, sample and sampling, data collection, and analytic procedures.

Study Purpose

The primary purpose of the proposed study was to describe the relationship between the administration of select antipsychotic medications and documentation of a systematic assessment for delirium that includes the four key features of delirium [(1) acute onset and fluctuating course, (2) inattention, (3) disorganized thinking and (4) altered level of consciousness] in hospitalized older adults.

Specific Aims

Aim 1. Describe the profile of patients (age, gender, race, polypharmacy, and primary/admission diagnosis) who have received select antipsychotic medications (lorazepam/haloperidol).

Aim 2. Describe the frequency at which the following terms are charted in the medical records when there has been documentation of administration of select

antipsychotic medications (lorazepam/haloperidol): (1) acute onset and fluctuating course (2) inattention, (3) disorganized thinking, (4) altered level of consciousness, (5) confusion, (6) agitation, (7) sundowning, or (8) delirium.

Aim 3. Describe the relationship between the documentation of administration of select antipsychotic medications (lorazepam/haloperidol) and the documentation of a systematic assessment of delirium that includes the [(1) acute onset and fluctuating course, (2) inattention, (3) disorganized thinking and (4) altered level of consciousness] in the medical record.

Aim 4a. Describe the relationship between select patient demographics (age, gender, race, polypharmacy, and primary/admission diagnosis) and the documentation of (1) confusion, (2) agitation, (3) sundowning, or (4) delirium in patients who have received select antipsychotic medications (lorazepam/haloperidol).

Aim 4b. Describe the relationship between select patient demographics (age, gender, race, polypharmacy, , and primary/admission diagnosis) and the documentation of a systematic assessment of delirium that includes the [(1) acute onset and fluctuating course, (2) inattention, (3) disorganized thinking and (4) altered level of consciousness] in patients who have received select antipsychotic medications (lorazepam/haloperidol).

Aim 5a. Describe the patient characteristics that account for the most variability in the charting of (1) confusion, (2) agitation, (3) sundowning, or (4) delirium in patients who have received antipsychotic medication?

Aim 5b. Describe the patient characteristics that account for the most variability in a systematic assessment that includes an [(1) acute onset and fluctuating course,

(2) inattention, (3) disorganized thinking and (4) altered level or consciousness being completed in patients who have received select antipsychotic medication?

Research Design

A descriptive correlational retrospective design was used for this medical record data based study. As background, a descriptive design was used to examine characteristics of a single sample, and organized and described quantitative information. It involved identification of a phenomenon of interest and of the variables within the phenomenon, and conceptual and operational definitions of the variables. The description of the variables led to an interpretation of the theoretical meaning of the findings and provided knowledge of the variables and the study population that can be used for future research in the area (Burns and Grove, 2001).

Vogt (2005) describes a correlational research design as one in which the variables are not manipulated, and the researcher uses association to study relationships. Correlation does not indicate causation.

The purpose of a descriptive correlational design is to examine and describe the relationship of variables that exist in a situation. Variables must be clearly identified and described in detail. This design facilitated the identification of many interrelationships among variables in a situation in a short time. Descriptive correlational studies were also used to develop hypotheses for later studies. No attempt was made to control or manipulate the situation.

Vogt describes a retrospective study as one in which research uses information from the past to draw conclusions. Hess (2004) describes a retrospective study as using

existing data recorded for reasons other than research. In health care, retrospective studies are often termed chart reviews because the medical record commonly is the data source.

Setting

The setting for this study was a 107 bed acute care community hospital located in southern California that serves both rural and urban areas. The hospital is governed by a district of elected officials and is not-for-profit. The hospital is licensed by the California Department of Health and accredited by the Joint Commission. In comparison to other hospitals in the county, this hospital serves a large retirement community.

Medical records were accessed for the study data. One in-patient unit served as the source of those medical records. The unit was a 33 bed combined medical/surgical/telemetry unit.

Data Sources

Medical records were the data source of this study. As background, this documentation was completed by the physicians and nurses, and depending upon the specific data, was located in a paper chart or an electronic medical record. A new electronic health record (EHR) upgrade was put into place in June, 2011. Nurses and physicians attended training on the upgrade and support was available for the first 6 weeks of “go live”. Any paperwork was scanned into the EHR starting in June, 2011.

A purposive sample of patient medical records was selected. Vogt (2005) defines a purposive sample as one that is selected deliberately by the researcher, because certain characteristics are typical or representative of the population. The sample for this study was selected using pharmacy run reports listing patients on the one unit who were 65 years or older and received the select antipsychotic medications, lorazepam/haloperidol.

This report included date, time, unit, patient ID, and medication name. The advantage of this sampling method was that it provided efficient accessibility to specific medications administered to patients on specific in-patient hospital units.

Inclusion Criteria

Inclusion criteria for the selection of medical records included the medical records belonging to patients who were 65 years of age or older at the time of admission, resided on the medical/surgical unit of the hospital, and received select antipsychotic medications, namely lorazepam or haloperidol, by mouth, intravenously, or intramuscularly. These two antipsychotic medications were selected because these were the medications frequently administered at this and other institutions for agitation associated with delirium (Markowitz and Narasimhan, 2008).

Lorazepam: Benzodiazepine, used as anxiolytic, sedative-hypnotic. Indications for lorazepam include anxiety, tension, agitation, irritability, especially in anxiety neuroses or organic disorders, insomnia, preoperative sedation, management of nausea and vomiting caused by chemotherapy, and status epilepticus. Lorazepam is well absorbed in the gastrointestinal tract, metabolized in the liver, excreted by the kidneys and has a half-life of 10-20 hours. Side effects include sleepiness, ataxia, confusion blurred vision, slurred speech, hypotension and headache. Rare side effects can include paradoxical central nervous system restlessness or excitement in the elderly or debilitated. Shorr (2007, p. 716-718) Physician's drug handbook (2008, p. 730-732).

Haloperidol: Butyrophenone derivative that acts as an antipsychotic, antiemetic, and antidyskinetic agent. Haloperidol is used for acute psychosis, delirium, psychotic disorders and Tourette's disorder. Haloperidol is absorbed from the gastrointestinal tract,

metabolized by the liver and excreted in the urine and has a half-life of 10-25 hours depending on the route of administration. Side effects include blurred vision, constipation, orthostatic hypotension, dry mouth, swelling and tenderness of female breasts and peripheral edema. Rare side effects include allergic reaction, difficulty urinating, decreased thirst, dizziness, decreased sexual function, drowsiness, nausea, vomiting, photosensitivity and lethargy. Shorr (2007, p. 584-586), Physician's drug handbook (2008, p. 600-602)

Exclusion Criteria

Any participant exhibiting alcohol withdrawal, admitted for terminal care, treatment of metastatic cancer, patients currently undergoing psychiatric treatment or patients who were blind, deaf, aphasic, or unable to speak English were excluded from the study.

Sample Size

Power

Using G*Power Version 3.1.2 a correlation: Bivariate normal model with an alpha of 0.05 and power of 0.80 needed a sample size of 67.

Multiple logistic regressions were proposed as one statistical test for this study. There was no consensus on the approach to compute the power and sample size with logistic regression. Some authors used the likelihood ratio test; some used the test on proportions; some suggested various approximations to handle the multivariate case.

Sample size calculation for multivariable analysis was complex. Katz, 2006 suggests having 10 outcomes for each independent variable for multiple logistic regressions (Katz, 2006). Katz recommendations were utilized for this study.

Variables and Operational Definitions

Dependent Variables

Documentation of delirium or signs and symptoms of delirium were the dependent variables in this study. The presence of one or more documented signs and symptoms of delirium were the dependent variables used for certain study aims. For other study aims, a systematic assessment had to be present in its entirety and was the dependent variable. Presence of delirium documentation was indicated by a yes or no and therefore the dependent variables were measured at the nominal level.

Aims 4a and 5a. For the purpose of Aims 4a and 5a, the definition of delirium documentation included documentation of the terms confusion, agitation, sundowning, and delirium. Either as a single term or a cluster of these terms qualified as meeting the ‘yes’ option for presence of documentation.

Aims 3, 4b, and 5b. For the purpose of Aims 3, 4b and 5b the CAM (1990) all inclusive definition of delirium, that included [(1) acute onset and fluctuating course of (2) inattention, (3) disorganized thinking and (4) altered level of consciousness], was documented in order to qualify as meeting the ‘yes’ option for presence of delirium documentation.

Independent Variables

Demographics. Age, gender, race, polypharmacy, and admission diagnosis were chosen as the demographics.

Age was defined as the chronological age of the patient, measured by years, the day the chart was assessed. The age will be found in the electronic medical record on the “M” page that is the patient summary screen.

Gender was defined as male or female and this will be found in the electronic medical record on the “M” page that is the patient summary screen.

Race was defined as choice that is selected by registration at the time of admission. This is given to the clerk by the patient and is found in the electronic medical record.

Polypharmacy was defined in the literature as 4 or more medications being taken while hospitalized no matter the route of administration.

Admission diagnosis was defined as the reason the patient came to seek health care. Admission diagnosis is documented by the physician and is located in the discharge summary. Using the physician diagnosis, coders in the medical record assign ICD-9 codes to each diagnosis (see Variable Table, Appendix A).

Data Extraction

Data collection was conducted in the medical records department. Data was extracted by the investigator using a data extraction instrument from a number of sections of the medical record. These sections included Emergency Room record, History and Physical, Consults, Discharge Summaries, Operative Reports, Medication Administration Records, and Nursing and Physician Notes (see Data Extraction Tool, Appendix B).

Documentation of Signs and Symptoms of Delirium

In relation to the administration of haloperidol and lorazepam, the physician and nursing notes for each case was assessed for the words delirium, confusion, agitation and sundowning as well as acute onset and fluctuating course of (1) inattention, (2) disorganized thinking, and (3) altered level of consciousness.

Physician's progress notes. This is a handwritten physician progress note (daily notes of the patient's progress while hospitalized) that is placed in the paper chart. Any discipline that consults on the patient is required to place a note in the progress notes section of the medical record or make a note in the electronic medical record (physical, occupational, speech therapy). A consulting physician will either dictate a note or write a progress note on his or her observations, diagnoses, and plan of care for the patient. Any symptom of delirium (delirium, confusion, agitation, or sundowning) that is charted by a physician was documented on the data collection extraction sheet.

Nurse's charting. Charting by the nursing staff is done electronically using Cerner. Cerner® solutions enable physicians, nurses, and other authorized users to share data and streamline processes across an entire organization. An online "digital chart" displays up-to-date patient information in real time, complete with decision-support tools for physicians and nurses. Simple prompts allow swift and accurate ordering, documentation, and billing.

Protection of Human Subjects

In order to ensure the protection of each subject's freedom from intrinsic risk or injury and to ascertain rights to privacy and dignity, a variety of human subject protective mechanisms were utilized in this study. Level of oversight for the proposed study was obtained from the Palomar Pomerado Health Investigational Review Committee and then the University of San Diego Investigational Review Board. While the medical records were accessed, no personally identifying data was extracted to the data extraction sheet. Each case was assigned a research code number. The code number was recorded on the data extraction instrument. The code number was also recorded in the code book along

with the medical record. The code book was stored in a locked file cabinet in the investigators locked office. Only de-identified data was entered in an electronic data file for analysis, therefore, only de-identified data was analyzed in this study. The perceived benefits outweigh the risks, however the IRBs made the final determination of risk and the associated oversight required of the study.

Data Collection Instruments/Measures

A chart extraction sheet was developed by the investigator to capture data from the medical records (see Appendix B).

Independent variables of age, gender, race/ethnicity, polypharmacy, and admission diagnosis was documented. The dependent variables of documentation of delirium were noted on the data extraction sheet.

Medical record validity. When there is a discrepancy between charting among the physicians, the attending physician's documentation was utilized over any conflicting information from other physicians involved in the hospital stay.

Data Analysis

Descriptive and multivariate statistics were used to answer the following research questions and aims. The data was analyzed using SPSS version 18 software program.

Question 1: Are systematic assessments of delirium [(1) acute onset and fluctuating course, (2) inattention, (3) disorganized thinking and (4) altered level of consciousness] completed prior to patients being medicated with select antipsychotic medications?

Question 2: What patient characteristics are associated with a systematic assessment of the signs and symptoms of delirium?

Aim 1. Describe the profile of patients (age, gender, race, polypharmacy, and admission diagnosis) who have received select antipsychotic medications (lorazepam/haloperidol). Descriptive statistics such as ranges mean score, SD, and percents will be used to address Aim 1.

Aim 2. Describe the frequency at which the following terms are charted in the medical records when there has been documentation of administration of select antipsychotic medications (lorazepam/haloperidol): (1) acute onset and fluctuating course, (2) inattention, (3) disorganized thinking, (4) altered level of consciousness, (5) confusion, (6) agitation, (7) sundowning, and (8) delirium. Bivariate correlation will be used to address Aim 2.

Aim 3. Describe the relationship between the documentation of administration of select antipsychotic medications (lorazepam/haloperidol) and the documentation of a systematic assessment of delirium that includes (1) acute onset and fluctuating course (2) inattention, (3), disorganized thinking, and (4) altered level of consciousness in the medical record. Bivariate correlation will be used to address Aim 3.

Aim 4a. Describe the relationship between select patient demographics (age, gender, race, polypharmacy, and admission diagnosis) and the documentation of (1) confusion, (2) agitation, (3) sundowning, or (4) delirium in patients who have received select antipsychotic medications (lorazepam/haloperidol). Bivariate correlation will be used to address Aim 4a.

Aim 4b. Describe the relationship between select patient demographics (age, gender, race, polypharmacy, , and admission diagnosis) and the documentation of a systematic assessment of delirium that includes the [(1) acute onset and fluctuating

course (2) inattention, (3) disorganized thinking and (4) altered level of consciousness] in patients who have received select antipsychotic medications (lorazepam/haloperidol).

Bivariate correlation will be used to address Aim 4b.

Aim 5a. Determine what patient characteristics account for the most variability in the charting of (1) confusion, (2) agitation, (3) sundowning, or (4) delirium in patients who have received antipsychotic medication (lorazepam/haloperidol) Regression analysis will be used to address Aim 5a.

Aim 5b. What patient characteristics account for the most variability in a systematic assessment that includes an [(1) acute onset and fluctuating course in (2) inattention, (3) disorganized thinking and (4) altered level of consciousness being completed in patients who have received antipsychotic medications? Regression analysis will be used to address Aim 5b.

Summary

The purpose of the proposed study was to describe the relationship between the administration of select antipsychotic medications and the documentation of a systematic assessment for delirium that included the four key features of delirium [(1) acute onset and fluctuating course, (2) inattention, (3) disorganized thinking and (4) altered level of consciousness] in hospitalized older adults.

Chapter Four

STUDY RESULTS

The purpose of this study was to address a knowledge gap that currently exists by describing the documentation of a systematic assessment of delirium in medical records of hospitalized older adults who have received select antipsychotic medications.

Addressing this gap is important because individual systematic assessments are imperative to justifying the administration of dangerous select antipsychotic medications in the older adult population. The two research questions that provided direction for the study:

1. Were systematic assessments of delirium [(1) acute onset and fluctuating course, (2) inattention, (3) disorganized thinking and (4) altered level of consciousness] documented when patients were medicated with select antipsychotic medications, and
2. What patient characteristics were associated with a documented systematic assessment of the signs and symptoms of delirium?

Specific Aims and Results

Aim 1. Describe the profile of patients (age, gender, race, polypharmacy, and admission diagnosis) who have received select antipsychotic medications (lorazepam/haloperidol).

The number of participants in this study was 70 and ranged in age from 65 to 97 years of age with a mean of 81.11 (SD = 8.33). Sixty percent (60%) of the participants were female. Ninety percent (90%) were Caucasian, 1.4% Black, 2.9% Asian or Pacific Islander, 2.9% Hispanic, 1.4% Other-Non-Hispanic and 1.4% unknown. Polypharmacy was defined as the participants taking 4 or more home medications and 95.7% of the participants in this study fit that criterion. There were a total of 33 discrete admission diagnoses so for the purpose of analysis these were collapsed into 6 categories. The resulting study diagnoses were respiratory, cardiovascular, gastrointestinal, musculoskeletal, infection/inflammation and other (e.g. hyponatremia, acute renal failure and toxic encephalopathy and aggressive behavior) (see Table 1). Percent of patients for whom antipsychotic medications administered was 70% lorazepam, 20% haloperidol, and 10% both lorazepam and haloperidol (see Table 2).

Table 1. Demographics

Demographics		
Variables	Categories	Number (%)
Age	65-84	45 (64.3)
	85+	25 (35.7)
	Total	70 (100)
Gender	Male	28 (40)
	Female	42 (60)
	Total	70 (100)
Race	Caucasian	63 (90)
	Black	1 (1.4)
	Asian or Pacific Islander	2 (2.9)
	Hispanic	2 (2.9)
	Other, Non-Hispanic	1 (1.4)
	Unknown	1 (1.4)
	Total	70 (100)
Polypharmacy (>4 medications)	No	3 (4.3)
	Yes	67 (95.7)
	Total	70 (100)
Admission Diagnosis (Collapsed)	Respiratory	18 (25.7)
	Cardiovascular	16 (22.9)
	Gastrointestinal	12 (17.1)
	Musculoskeletal	8 (11.4)
	Infection/Inflammation	8 (11.4)
	Other	8 (11.4)
	Total	70 (100)

Table 2. Antipsychotic Medications (N=70)

Antipsychotic Medications		
Variables	Categories	Number (%)
Antipsychotic Medications	Lorazepam	49 (70)
	Haloperidol	14 (20)
	Both	7 (10)
	Total	70 (100)

Additionally, when examining 3 exclusive groups (patients who received only haloperidol, only lorazepam, or only both), being under versus greater than or equal to 85 years old was not related to being prescribed antipsychotic medications ($p=.717$), nor was diagnostic category ($p=.347$). However, gender was a factor with females being prescribed more a) lorazepam and b) both lorazepam and haloperidol, and less haloperidol, when compared to males ($p=.003$).

Aim 2. Describe the frequency of the following terms charted in the medical records when there has been documentation of administration of select antipsychotic medications (lorazepam/haloperidol): (1) acute onset and fluctuating course, (2) inattention, (3) disorganized thinking, and (4) altered level of consciousness, (5) confusion, (6) agitation, (7) sundowning, and (8) delirium.

Although there was limited documentation of the four key features of delirium: acute onset and fluctuating course, inattention, disorganized thinking and altered level of consciousness by both physicians and nurses, both groups of healthcare professionals used the terms ‘confusion’ and ‘agitation’ more frequently than the four key features (see Table 3).

Table 3. Documentation

Documentation		
Variables	Physician Number (%)	Nursing Number (%)
Acute onset and fluctuating course	2 (2.9)	2 (2.9)
Inattention	0 (0.0)	1 (1.4)
Disorganized thinking	1 (1.4)	2 (2.9)
Altered level of consciousness	2 (2.9)	16 (22.9)
Confusion	17 (24.3)	32 (45.7)
Agitation	15 (21.4)	28 (40.0)
Sundowning	2 (2.9)	2 (2.9)
Delirium	7 (10.0)	0 (0.0)

Aim 3. Describe the relationship between the documentation of administration of select antipsychotic medications (lorazepam/haloperidol) and the documentation of a systematic assessment of delirium that includes the [(1) acute onset and fluctuating course, (2) inattention, (3) disorganized thinking and (4) altered level of consciousness in the medical record.

The definition of documentation of a systematic documentation included all four features of delirium (1-4 above). There were no patient charts with complete documentation of a systematic assessment in the 70 participants; therefore this aim could not be addressed. In other words, a relationship between the documentation of administration of select antipsychotic medications (lorazepam/haloperidol) and the documentation of a systematic assessment of delirium could not be determined because there was no systematic assessment documented on patients before administration of the antipsychotic medications.

Aim 4a. Describe the relationship between select patient demographics (age, gender, race, polypharmacy, and admission diagnosis) and the documentation of the

discrete terms (1) confusion, (2) agitation, (3) sundowning, or (4) delirium in patients who have received select antipsychotic medications (lorazepam/haloperidol).

While there were rare instances of documentation of these discrete terms (1-4), the occurrence was so infrequent that statistical assumptions for calculating associations would have been violated and so it was not possible to address this aim for any of the items (1-4).

Aim 4b. Describe the relationship between select patient demographics (age, gender, race, polypharmacy and admission diagnosis) and the documentation of a systematic assessment of delirium that includes the [(1) acute onset and fluctuating course, (2) inattention, (3) disorganized thinking and (4) altered level of consciousness] in patients who have received select antipsychotic medications (lorazepam/haloperidol).

No participant documentation had a complete systematic assessment in the medical records; therefore, no relationship could be ascertained.

Aim 5a. Determine what patient characteristics account for the most variability in the documentation of (1) confusion, (2) agitation, (3) sundowning, or (4) delirium in patients who have received antipsychotic medication.

Again, while there were rare instances of documentation of these discrete terms (1-4), the occurrence was so infrequent that statistical assumptions for calculating associations would have been violated. And, it was not possible to demonstrate variability for any of the individual items (1-4), a requirement for regression analysis (Vogt, 2005).

Aim 5b. Determine what patient characteristics account for the most variability in the documentation of a systematic assessment that includes an [(1) acute onset and

fluctuating course, (2) inattention, (3) disorganized thinking and (4) altered level of consciousness being completed in patients who have received antipsychotic medication.

Since complete documentation of a systematic assessment of delirium was to include [(1) acute onset and fluctuating course, (2) inattention, (3) disorganized thinking and (4) altered level of consciousness and there were no data meeting this requirement, this aim could not be addressed.

Summary

The two research questions that provided direction for the study were 1) Were systematic assessments of delirium [(1) acute onset and fluctuating course, (2) inattention, (3) disorganized thinking and (4) altered level of consciousness] documented when patients were medicated with select antipsychotic medications?, and 2) What patient characteristics were associated with a documented systematic assessment of the signs and symptoms of delirium? To answer question number one, there was no documentation of a completed systematic assessment in any of the 70 participant charts. Regarding question number two, because of the absence of systematic assessments prior to the administration of antipsychotic medications, there were no associations to be determined. There were significant differences between males and females in terms of being prescribed antipsychotic medications with more females being prescribed lorazepam and both lorazepam and haloperidol than males in this study.

Chapter Five

DISCUSSION OF FINDINGS

This study was the first study in a program of research designed to examine delirium in the older adult and develop interventions to prevent delirium in this population. Prior research has demonstrated that older adults are at increased risk for delirium in acute care settings and that antipsychotics, dangerous drugs for older adults, are frequently prescribed for delirium. As a necessary first step for this investigator's program of research, the purpose of this study was to address a gap in the knowledge on this topic by describing the documentation of a necessary systematic assessment of delirium in medical records when hospitalized older adults have been medicated with antipsychotics. Additionally, the study attempted to a) describe the documentation of a systematic assessment that was to include [(1) acute onset and fluctuating course, (2) inattention, (3) disorganized thinking and (4) altered level of consciousness] in hospitalized older adults; and b) determine if there were certain patient characteristics that would predict if a systematic assessment would or would not be documented in the medical records. Further studies on this topic that would rely on medical records for data

could not be conducted without knowing the validity and reliability of delirium documentation.

Summary of Current Study

For the purpose of this study inclusion criteria required that all patients have been administered at least one antipsychotic medication. Accounting for 100% of the patients, 70% received lorazepam, 20% haloperidol, and 10% received both lorazepam and haloperidol. Additionally, when examining these three exclusive groups (patients who received only

Haloperidol, only lorazepam, or only both), being under versus greater than or equal to 85 years old was not related to being prescribed antipsychotic medications ($p=.717$), nor was membership in a diagnostic category ($p=.347$). However, gender was a factor with females being prescribed more lorazepam, both lorazepam and haloperidol, and less haloperidol, when compared to males ($p=.003$). No literature to date has demonstrated this phenomenon of females being prescribed more antipsychotic medications when compared to males.

Limitations and Strengths of Study

This study had a number of limitations. First, variability in a primary study variable, documentation of a systematic assessment was non-existent. There were no systematic assessments recorded in any of the medical records. While this is an important study finding in and of itself, three other study aims could not be addressed. Second, using medical records as a source of data introduces potential error due to possible charting quality issues. In a clinical setting, measuring reliability relative to patient charting is not a standard practice. Therefore, study findings should be interpreted with

caution. Finally, due to the actual use of medical records, no assumption should be made regarding if systematic assessments were or were not performed. It is possible that such assessments were completed, but were not charted.

Remembering that this study was about charting and not the actual conduct of an assessment, a strength of this study was that the charting reflected the actual charting patterns of both physician and nurses because the data was collected in a clinical setting. In addition, the fact that the study was retrospective limited bias that might have been introduced if the health care professionals had been aware of the study as they were charting. Finally, the geographic location of the setting afforded the researcher access to a high proportion of older adult patients compared to other settings in the county.

Study Implications

Noting that the United States has a growing older adult population due to living longer lives, many older adults are living longer with accompanying chronic illnesses. Exacerbations of chronic illnesses are necessitating care in hospitals, a setting known to be a risk factor for delirium. To address the future needs for safe care practices for all hospitalized older adults, this study has educational, practice and research implications.

Education Implications

The Institute of Medicine report *Retooling for an Aging America: Building the Health Care Workforce* made a number of recommendations for increasing the health care workforce to meet the needs of the aging population. Most relevant to this study is the following: more health care providers need to be trained in the basics of geriatric care (IOM, 2008). While this study examined the documentation of one clinical syndrome, it is an important clinical syndrome illustrating the lack of knowledge about the basic

biopsychosocial needs of older adults. Therefore, the educational implications of the findings need to be considered in the context of gerontological nursing and not isolated to recommendations simply about charting an assessment.

Gerontological nursing. The structured inclusion of gerontological nursing content into the *undergraduate* nursing curriculum began in the 1960's with the first standards for gerontological nursing practice being developed by the American Nursing Association (ANA) Gerontology Division. At the *graduate* level of nursing education, the first master's degree as a clinical nurse specialist was offered at Duke University and the first Nurse Practitioner program was offered at the University of Massachusetts, both in gerontological nursing. In 1970 gerontological mental health was added to psychiatric nursing (ANA, 2010).

Certification for geriatric generalists and clinical nurse specialists (CNSs) and nurse practitioners (NPs), with master's and doctoral preparation in gerontology, soon followed. The establishment of Medicare and Medicaid in the Social Security Act, Titles 18 and 19 was a significant influence on gerontological nursing education. For most older adults, a large portion of health care expenses are paid for by Medicare or Medicaid making geriatric nursing education important to the US government, other public agencies, as well as private foundations (Medicare, 2012).

Nurses at all levels of professional preparation need to be educated about the care of older adults, especially the hospitalized older adult. Generally, all nurses need to be knowledgeable about normal aging, common disorders, and typical as well as atypical presentations of the older adult experiencing illness. Beginning in 1990, the John A. Hartford Foundation supported a long-range effort for curriculum improvement and

developed academic centers of excellence (ANA, 2010). Standards for faculty use in nursing education programs have been developed to teach the care of the older adult in acute care, long-term care, and community settings. The American Academy of Nursing (AAN), American Association of Colleges of Nursing (AACN), and National League for Nursing (NLN) have provided programming to expand and increase faculty knowledge in the area of geriatric evidence-based practice. There have been a host of geriatric resources and these are available to faculty to support the inclusion of geriatric content into the existing curriculum (Bednash, Mezey & Tagliareni, 2011). However, there remains concern about the use of resources and the integration of geriatric content into undergraduate and graduate programs (Kovner, Mezey, & Harrington, 2002; Bardach & Rowles, 2012).

In order to broaden their understanding of care of older adults, nurses at all levels in their educational preparation need to experience the many diverse settings in which they may find older adults. Such diverse settings include the confusion acute care hospital, nursing home, assisted living, and adult day care. In 1981, the Robert Wood Johnson Teaching Nursing Home Programs and the Kellogg Foundation supported a national initiative to improve nursing home care and linked schools of nursing with nursing homes.

Pharmacology. In 2012 The American Geriatrics Society and an interdisciplinary panel of 11 experts in geriatric care and pharmacotherapy updated the Beers Criteria for Potentially Inappropriate Medication Use in Older Adults. Fifty-three (53) medications or medication classes are included in the final criteria, divided into three categories:

1) potentially inappropriate medications and classes of medications to avoid in older

adults, 2) potentially inappropriate medications and classes of medications to avoid in older adults with certain diseases, and 3) medications to be used with caution (American Geriatrics Society, 2012).

High on the list, lorazepam is included as a short acting benzodiazepine and a potentially inappropriate medication use in older adults because older adults have increased sensitivity to benzodiazepines and slower metabolism to long acting benzodiazepines. All benzodiazepines increase risk of cognitive impairment, delirium, falls, fractures and motor vehicle accidents. Appropriate to this study, lorazepam is to be avoided in older adults with or at high risk of delirium because of inducing or worsening delirium in older adults (American Geriatrics Society, 2012). Haloperidol is a first generation (conventional) antipsychotic and is also included on the potentially inappropriate medication use in older adults because of the risk for cerebrovascular accident (stroke) and mortality in persons with dementia (American Geriatrics Society, 2012). While these warnings exist, these medications are still frequently prescribed for older adults in acute care settings to manage the behaviors of delirium (i.e. e, climbing out of bed).

Nursing educational programs need to integrate information on the implications of medicating the patients with antipsychotic medications. This would include teaching the necessary systematic assessment in order to determine if an older adult patient first has delirium; and if so, the appropriate charting of a systematic assessment. Standard assessment tools such as the Confusion Assessment Method tool are available to assist nurses in the assessment process as well as documenting the assessment.

Practice Implications

Older adults are admitted to many different settings, including the acute care setting. For the purpose of this chapter, this next section will discuss nursing practice implications for the acute care setting only.

Simply mandating a format for documentation of delirium would not be recommended. Ideally, documentation would be included in a comprehensive evidence-based practice program to prevent delirium and treat delirium in acute care hospitals. Such a program should be multidisciplinary (nursing, medicine, medical records, and pharmacy) and be led by a geriatric advanced practice nurse. Beginning with a needs assessment, the team's goal would be to design a comprehensive program to address staff education, delirium assessment, documentation and technology, program evaluation and on-going monitoring, and sustainability.

Organizational needs assessment. In any acute care setting, a thorough organizational needs assessment of the process of nursing care is required before any redesign of care, including the process of documentation, could be determined. The two questions that need to be answered are: 1) What kind of delirium assessment is being done, if any, on the older adult patient before antipsychotic medications are given?, and 2) If nurses are not documenting the assessment findings and reasons for administration of antipsychotic medications, why? Once this needs assessment was complete, a comprehensive evidence-based practice change plan would be recommended that would include staff education regarding practice, a valid and reliable assessment tool, documentation, evaluation of outcomes (immediate and long-term), and plans to sustain gains.

Staff education. In addition to being tailored to the gaps identified in the needs assessment, any program of staff education on delirium should include the 13 NICE recommendations for the prevention of delirium (O'Mahony, Murthy, Adunne & Young, 2011). 1) Ensure that persons at risk for delirium are cared for by a health care team familiar with the person at risk and avoid moving patients from place to place in the hospital, 2) Provide a multicomponent intervention targeted at the risk factors presented by the individual patient, 3) Use of a multidisciplinary team, 4) Address cognitive impairment and disorientation by providing clocks, calendars, reorientation when needed and involving family when possible, 5) Assess and address hydration status, to include constipation, 6) Assess and address hypoxia and optimizing oxygen saturation, 7) Assess for and treating infection, avoid catheterization, 8) Assess and address immobility and function, 9) Assess and address pain, 10) Perform a thorough medication review, 11) Assess and address any nutritional deficits, 12) Assess and address any sensory impairments, 13) Assess and address any sleep problems. (O'Mahony, Murthy, Adunne & Young, 2011). Although there are many standardized protocols for the treatment of delirium, this foundational checklist of possible causes and interventions for delirium provides those accountable for implementing a staff educational program a framework.

Practicing nurses and other health care professionals also need ongoing education on the topic of geriatric pharmacotherapy. At a minimum staff should be oriented to the Updated Beers Criteria for Potentially Inappropriate Medication Use in Older Adults. A review and update of the earlier (1997) version is a must for all health care professionals advocating for safe practice for older hospitalized adults when medications

are ordered that could possibly put the patient at risk for an adverse medication reaction, fall, or worsening delirium.

Delirium assessment tool. The assessment tool recommended for the assessment of delirium in the older hospitalized patient is the Confusion Assessment Method (CAM) (Tullman, Fletcher & Foreman, 2012). The CAM assessment tool for delirium was originally developed over two years (1988-1990) to improve the identification and recognition of delirium and was intended to provide a standardized method to help non psychiatrically trained clinicians to identify delirium quickly and accurately (Inouye, 2003). The CAM assesses the four key features of delirium: 1) acute onset and fluctuating course, 2) inattention, 3) disorganized thinking, and 4) altered level of consciousness. Acute onset and fluctuating course means that there is a change in mental status from the patient's baseline. Implications for nurses using the CAM are that any given nurse would have to know the patient's baseline, and the family, if available would be an excellent resource.

Documentation and Informational Technology. Building the Confusion Assessment Method (CAM) tool into the electronic medical record will assist the nurse in efficiency of documentation. The CAM can be completed in five minutes and is easily incorporated into the ongoing nursing assessments (Waszynski, 2007). This way, patient care plans can be individualized in a timely manner according to changes in the CAM. Permission can be obtained from Dr. Sharon K. Inouye to use the CAM in an EHR as long as credit is shown on the screens when assessments are being entered (Permission to use the CAM in EHR, 2011). A nurse-driven order set for delirium can also be developed

and implemented using an EHR system, thereby connecting the assessment with the care being provided.

Program evaluation and on-going monitoring. Metrics would be determined to evaluate the practice change program. The outcomes that would be measured would be correct application of the CAM at the bedside by nurses, overall rates of delirium, nurse satisfaction with the process.

For delirium prevention a study by Marcantonio (2001) showed promise for a preoperative geriatric consultation in preventing delirium. Metrics for prevention could be how many patients had a geriatric consultation before surgery. For care of the older adult with delirium, the metrics would include cognitive status returned to baseline, functional status returned to baseline and discharged to same destination as prehospitalization (Tullman, Fletcher & Foreman, 2012). Metric audit reports would be designed by the advanced practice nurse (APN) such as a gerontological CNS assisted by an informational technology (IT) professional. The outcomes that would be measured would be correct application of the CAM at the bedside by nurses, overall rates of delirium, nurse satisfaction with the process. Based upon monthly metric reports, follow-up by the APN with the nursing staff to provide additional monitoring and training to successfully embed the CAM into the nursing assessment may be necessary

Program sustainability. For sustainability, the gerontological CNS is in the unique position to monitor the assessment, documentation, evaluation, and sustainability of the program using the three spheres of CNS influence (NACNS, 2004) of patient, nurse, and organization/system. The gerontological CNS would also mentor the nursing

staff in adopting evidence-based nursing practices on interventions for caring for older adults with delirium should that occur.

This study addressed a gap in nursing knowledge regarding documentation of systematic assessments of delirium in the hospitalized older adult. Previous research has demonstrated that delirium is under-recognized by both physicians and nurses (Francis, 1992). Additionally, delirium can be prevented in a large percentage of older adults with identification of high risk patients using the key factors in an assessment process as well as the implementation of a standardized protocol for the care for these patients (Inouye, Bogardus, Charpentier, et al., 1999). This study has demonstrated that documentation of a systematic assessment is lacking and therefore documentation must be highlighted in any comprehensive program addressing nursing practice.

Nursing Research

This study retrospectively examined the documentation of a systematic assessment of delirium in medical records when hospitalized older adults had been medicated with antipsychotics. Additionally, the study attempted to a) describe the documentation of a systematic assessment that was to include [(1) acute onset and fluctuating course, (2) inattention, (3) disorganized thinking and (4) altered level of consciousness] in hospitalized older adults; and b) determine if there were certain patient characteristics that would predict if a systematic assessment would or would not be documented in the medical records.

Based upon the findings of this study, that systematic assessments for delirium are not being documented, a number of ideas are presented for future research.

Built into the standard of nursing care, physical systematic assessments are to be completed for all patients on a regular basis in the hospital environment. Therefore, what is preventing an assessment from being done for the signs and symptoms of delirium that would include [(1) acute onset and fluctuating course, (2) inattention, (3) disorganized thinking and (4) altered level of consciousness] in hospitalized older adults? Approaches to addressing this knowledge gap might be to explore motivators and barriers regarding this specific type of documentation. Further investigations might explore what thought processes nurses are using to decide a) if the patient is confused or agitated and b) if medicating the patient should or should not occur without the support of a systematic assessment.

Over 13 delirium instruments exist at present to diagnose, screen or assess symptom severity according to Leentjens and van der Mast (2005). However, after their development and validation, most instruments have not been further studied or implemented in practice. For example, the NEECHAM Confusion Scale and the Delirium Observation Screening Scale (DOSS) are the most frequently used for screening high risk older adult hospitalized patients. The CAM demonstrated to be the best diagnostic instrument and the Delirium Rating Scale (DRS) the best instrument for monitoring the severity of symptoms (Leentjens & van der Mast, 2005). However, these last two instruments are not the most frequently utilized. Further study should determine which is the most sensitive and specific standardized delirium assessment tool for older hospitalized adults. A first step to answering this research question might be to compare delirium ratings across the instruments in an older adult population while also examining

the sensitivity and specificity of the instruments to different causes of delirium. Long term, these instruments need to be validated for use in interventional studies.

Finally, and most importantly, because the goal of nurses and other health care professionals is the prevention of delirium in older hospitalized adults, would delirium risk profiling using a valid and reliable instrument upon admission help identify patients at risk allowing the systematic placement of interventions into the care plan actually prevent delirium?

This current study has been the first step in the investigator's program of research to answer these important questions. Future research steps will need to address practice, documentation, and instrumentation issues. Much of this work will benefit from research conducted in clinical settings using multidisciplinary teams examining nursing practice and how that practice impacts patient outcomes.

Conclusion

This study examined the documentation of a systematic assessment for delirium on hospitalized older adult (over 65 years of age) patients who had been medicated with select antipsychotic medications lorazepam, haloperidol, or both lorazepam and haloperidol. Documentation of a systematic assessment of delirium is important so causative factors can be remedied and interventions put into place to not only keep the patient safe, but hopefully improve the outcomes of hospitalized older adults.

References

- Alagiakrishnan, K. & Wiens, C.A. (2004). An approach to drug induced delirium in the elderly. *Post Graduate Medical Journal*. (80), 388-393.
- Alvarel-Fernandez, B., Formiga, F., & Gomez, R. (2007). Delirium in hospitalized older persons: Review. *The Journal of Nutrition, Health & Aging*, 12(4), 246-251.
- American Health Information Management Association. (2010). *AHIMA*. Retrieved November 15, 2010, from <http://www.ahima.org/certification/rhit.aspx>
- Administration on Aging. (2010, June 30). *Aging Statistics*. Retrieved from http://www.aoa.gov/AoARoot/Aging_Statistics/index.aspx
- American Psychiatric Association (1994). *Diagnostic and statistical manual of mental disorders*. (4th ed.). Washington, DC: American Psychiatric Association.
- American Psychiatric Association (2000). Quick reference to the diagnostic criteria from DSM-IV-TR. Washington, DC: American Psychiatric Association.
- Ansaloni, L., Catena, F., Chattat, R., Fortuna, D., Franceschi, C., Mascitti, P., Melotti, R. M. (2010). Risk factors and incidence of postoperative delirium in elderly patients after elective and emergency surgery. *British Journal of Surgery*, 97, 273-280.
- Bardach, S.H. & Rowles, G.D. (2012). Geriatric education in the health professions: Are we making progress? *The Gerontologist*, 0(0), 1-12 doi: 10.1093/geront/gns006.
- Beers, M. H., & Berkow, M. (2000). *The Merck Manual of Geriatrics* (3rd ed.). Whitehouse Station, NJ: Merck Research Laboratories.

- Benedict, L., Hazelett, S., Fleming, E., Ludwick, R., Anthony, M., Fosnight, S., Zafirau, W. (2008). Prevention, detection and intervention with delirium in an acute care hospital: a feasibility study. *International Journal of Older People Nursing*, 4, 194-202.
- Bickel, H., Gradinger, R., Kochs, E. & Forstl, H. (2008). High risk of cognitive and functional decline after post-operative delirium. A three year prospective study. *Dementia and Geriatric Cognitive Disorders*. 26(1). 26-31.
- Bourne, R. S. (2008). Delirium and use of sedation agents in intensive care. *British Association of Critical Care Nurses, Nursing in Critical Care*, 13(4), 195-201.
- Burns, N., & Grove, S. K. (2001). *The practice of nursing research; conduct, critique, & utilization* (4th ed.). Philadelphia, PA: W.B. Saunders Company.
- Capezuti, E., Zwicker, D., Mezey, M., & Fulmer, T. (Eds.). (2008). *Evidence-based geriatric nursing protocols for best practice* (3rd ed.). New York, NY: Springer Publishing Company.
- Cerner. (n.d.). Retrieved November 10, 2010, from <http://www.cerner.com>
- Cole, M. G. (2005). Delirium in elderly patients. *The Journal of Lifelong Learning in Psychiatry*, 3(2), 320-332.
- Dahlke, S., & Phinney, A. (2008). Caring for hospitalized older adults at risk for delirium; the silent, unspoken piece of nursing practice. *Journal of Gerontological Nursing*, 34(6), 41-47.
- Demidenko, E. (2007). Sample size determination for logistic regression revisited [Abstract]. *Statistics in Medicine*, 26(18), 3385-3397. doi:10.1002/sim.2771.

- Dolan, M.M., Hawkes, W.G., Zimmerman, S.I., Morrison, R.S, Gruber-Baldini, A.L., Hebel, J.R. & Magaziner, J. (2000). Delirium on hospital admission in aged hip fracture patients: Prediction of mortality and 2-year functional outcomes.
- Eliopoulos, C. (2010). The aging population. In *Gerontological Nursing* (7th ed., pp. 3-12). Wolters Kluwer, Philadelphia: Lippincott Williams & Wilkins.
- Elle, M., Cole, M. G., Primeau, F. J., & Bellavance, F. (1998). Delirium risk factors in elderly hospitalized patients. *Journal of General Internal Medicine*, 13, 204-212.
- Fong, T. G., Tulebaev, S. R., & Inouye, S. K. (2009). Delirium in elderly adults: Diagnosis, prevention and treatment. *Nature Review Neurology*, 5, 210-220.
- Fick, D. M., Cooper, J. W., Wade, W. E., Waller, J. L., Maclean, J. R., & Beers, M. H. (2003). Updating the Beers criteria for potentially inappropriate medication use in older adults: Results of a U.S. consensus panel of experts. *Archives of Internal Medicine*, 163, 2716-2724.
- Flacker, J. M., & Lipsitz, L. A. (1999). Neural mechanisms of delirium: Current hypotheses and evolving concepts. *Journal of Gerontology A: Biological Science Medical Science*, 54(7), 239-246.
- Fong, T.G., Tulebaev, S.R. & Inouye, S.K. (2009). Delirium in elderly adults: Diagnosis, prevention and treatment. *Nature Review of Neurology*. 5. 210-220.
- Foreman, M. D. (1993). Acute confusion in the elderly. *Annual Review of Nursing Research*, 11, 3-30.
- Foster, P. C., & Bennett, A. M. (2002). Self-care deficit nursing theory. In Maura Connor (Ed.), *Nursing theories: the base for professional nursing practice* (5th ed., pp. 125-154). Upper Saddle River, NJ: Prentice Hall.

- Francis, J. (1992). Delirium in older patients. *Journal of the American Geriatrics Society*, 40(8), 829-838.
- Generic drugs in alphabetical order. (2008). In Holmer, N & Kelly, W. (Eds.), *Physician's drug handbook* (12th ed., pp. 730-732). Philadelphia, PA: Lippincott, Williams & Wilkins.
- George, J., Bleasdale, S & Singleton, S.J. (1997). Causes and prognosis of delirium in elderly patients admitted to a district general hospital. *Age and Aging*. (26). 423-427.
- Givens, J.L., Sanft, T.B., & Mercantonio, E.R. (2008). Functional recovery after hip fracture: The combined effects of depressive symptoms, cognitive impairment, and delirium. *Journal of the American Geriatrics Society*. (56). 1075-1079.
- Gustafson, Y., Brannstrom, B., Norberg, A., Bucht, G., & Winbald, B. (1991). Underdiagnosis and poor documentation of acute confusional states in elderly hip fracture patients. *Journal of the American Geriatric Society*, 39, 760-765.
- Han, L., McCusker, J., Cole, M., Abrahamowicz, M., Primeau, F., & Elie, M. (2001). Use of medications with anticholinergic effect predicts clinical severity of delirium symptoms in older medical inpatients. *Archives of Internal Medicine*. 161, 1099-1105.
- Hare, M., McGowan, S., Wynaden, D., Speed, G., & Landsborough, I. (2008). Nurses' descriptions of changes in cognitive function in the acute care setting. *Australian Journal of Advanced Nursing*, 26(1), 21-25.

- Hshieh, T.T., Fong, T.G., Marcantonio, E.R. & Inouye, S.K. (2008) Cholinergic deficiency hypothesis in delirium: A synthesis of current evidence. *Journal of Gerontology*. 63(7). 764-772.
- Hess, D.R. (2004). Retrospective studies and chart reviews. *Respiratory Care*. 49(10). 1171-1174.
- Huck, S. W. (2008). Bivariate, multiple, and logistic regression. In A. Burvikovs (Ed.), *Reading statistics and research*. Boston, MA: Pearson Education, Inc.
- Inouye, S. K. (1998). Delirium in hospitalized older patients. *Clinics in Geriatric Medicine*, 14(4), 745-764.
- Inouye, S. (2006). Delirium in older persons. *The New England Journal of Medicine*, 354, 1157-1165.
- Inouye, S.K., Bogardus, S.T., Baker, D.I., Leo-Summers, L & Cooney, L.M. (2000). The hospital elder life program: A model of care to prevent cognitive and functional decline in older hospitalized patients. Hospital Elder Life Program. *Journal of the American Geriatrics Society*, 48(12), 1697-1706.
- Inouye, S.K., Bogardus, S.T., Jr., Charpentier, P.A., Leo-Summers, L., Acampora, D., Holford, T.R., Cooney, L.M., Jr. (1999). A multicomponent intervention to prevent delirium in hospitalized older patients. *The New England Journal of Medicine*, 340(9), 669-676.
- Inouye, S.K., & Charpentier, P.A. (1996). Precipitating factors for delirium in hospitalized elderly persons: Predictive model and interrelationship with baseline vulnerability. *Journal of the American Medical Association*, 275, 852-857.

- Inouye, S., & Ferrucci, L. (2006). Elucidating the pathophysiology of delirium and the interrelationship of delirium and dementia. *Journal of Gerontology*, 61(12), 1277-1280.
- Inouye, S. K., Foreman, M. D., Mion, L. C., Katz, K. H., & Cooney, L. M. (2001). Nurses' recognition of delirium and its symptoms: Comparison of nurse and researcher ratings. *Archives of Internal Medicine*, 161, 2467-2463.
- Inouye, S. K., Rushing, J. T., Foreman, M. D., Palmer, R. M., & Pompei, P. (1998). Does delirium contribute to poor hospital outcomes? *Journal of General Internal Medicine*, 13, 234-242.
- Inouye, S. K., Viscoli, C. M., Horwitz, R. I., Hurst, L. D., & Tinetti, M. E. (1993). A predictive model for delirium in hospitalized older adult medical patients based on admission characteristics. *Annals of Internal Medicine*, 119, 474-481.
- Jyrkka, J., Enlund, H., Korhonen, M. J., Sulkava, R., & Hartikainen, S. (2009). Polypharmacy status as an indicator of mortality in an *elderly population*. *Drugs Aging*, 26(12), 1039-1048.
- Jyrkka, J., Enlund, H., Korhonen, M. J., Sulkava, R., & Hartikainen, S. (2009). Patterns of drug use and factors associated with polypharmacy and excessive polypharmacy in elderly persons: Results of the Kuopio 75+ study: a cross-sectional analysis. *Drugs Aging*, 26(6), 493-503.
- Kalisvaart, K. J., Vreeswijk, R., De Jonghe, J. F., Van Der Ploeg, T., Van Gool, W. A., & Eikelenboom, P. (2006). Risk factors and prediction of postoperative delirium in elderly hip-surgery patients: Implementation and validation of a medical risk factor model. *Journal of the American Geriatrics Society*, 54, 817-822.

- Kane, R. L., Ouslander, J. G., & Abrass, I. B. (2004). *Essentials of Clinical Geriatrics* (5th ed.). New York, NY: McGraw-Hill.
- Katz, M. K. (2006). *Study design and statistical analysis: A practical guide for clinicians*. Cambridge, UK: University Press.
- Kim, P., Coeurlida, L., Muralee, S., & Tampi, R. (2008). Sundowning syndrome in the older patient. *Clinical Geriatrics*, 73(4), 32-36.
- Kim, P., Louis, C., Muralee, S., & Tampi, R. (2005). Sundowning syndrome in the older patient. *Clinical Geriatrics*, 73(4), 32-36.
- Kovner, C.T. Mezey, M. & Harrington, C. (2002). Who cares for older adults? Workforce implications of an aging society. *Health Affairs*, 21(5), 78-89.
- Lazarus, B.A., Murphy, J.B., Colette, E.M. McQuade, W.H., & Culpepper, L. (1991). *Archives of Internal Medicine*. 151(2). 2452-2456.
- Le, C. T., & Boen, J. R. (1995). Prevalence and incidence. *Journal of Clinical Nursing*, 9, 178-188.
- Leentjens, A.F.G. & van der Mast, R.C. (2005) Delirium in elderly people. *Current Opinions in Psychiatry*, 18(3), 325-330.
- Lipowski, Z. J. (1990). Delirium in geriatric patients. In *Delirium: acute confusional states* (pp. 413-441). New York, New York: Oxford.
- Marcantonio, E.R., Flacker, J.M., Wright, R.J., & Resnick, N.M. (2001). Reducing delirium after hip fracture: A randomized trial. *Journal of the American Geriatrics Society*, 49(5), 516-522.

- Marcantonio, E.R., Simon, S.E., Bergmann, M.A., Jones, R.N., Murphy, K.M. & Morris, J.N. (2003). Delirium symptoms in post-acute care: Prevalent, persistent, and associated with poor functional recovery. *Journal of the American Geriatrics Society*. 51(1). 3-9.
- Maldonado, J. R. (2008). Pathoetiological model of delirium: A comprehensive understanding of the neurobiology of delirium and an evidence-based approach to prevention and treatment. *Critical Care Clinics*, 24, 789-856.
- Markowitz, J. D., & Narasimhan, M. (2008). Delirium and antipsychotics: A systematic review of epidemiology and somatic treatment options. *Psychiatry*, 5(10), 29-36.
- Maxmen, J.S., Ward, N.G. & Kilgus, M. (2009). *Essential Psychopathology & Its Treatment*. W.W. Norton & Company, Inc. NY.
- McAvay, G.J., VanNess, P.H., Bogardus, S.T., Zhang, Y., Leslie, D.L. Leo-Summers, L.S. & Inouye, S.K. (2006). Older adults discharged from the hospital with delirium: 1-year outcomes. *Journal of the American Geriatric Society*, 54(8), 1245-1250.
- McCusker, J., Cole, M., Dendukuri, N., Belzile, E., & Primeau, F. (2001). Delirium in older medical inpatients and subsequent cognitive and functional status: a prospective study. *Canadian Medical Association Journal*, 165(5), 575-583.
- McCusker, J., Cole, M. G., Dendukuri, N., & Belzile, E. (2003). Does delirium increase hospital stay? *American Geriatrics Society*, 51(11), 1539-1546.
- McEnany, G. P. (2011). Psychopharmacology. In K.D. Melillo & S.C. Houde (Eds.), *Geropsychiatric and Mental Health Nursing* (2nd ed., pp. 121-143). Sudbury, MA: Jones & Bartlett Learning.

- McLafferty, F. A. (2007). Delirium part one: Clinical features, risk factors and assessment. *Nursing Standard*, 21(29), 35-40.
- Medicare.gov (2012). <http://www.cms.gov/Medicare/Medicare-General-Information/MedicareGenInfo/index.html>. Melillo, K. D., & Houde, S. C. (2011). *Geropsychiatric and mental health nursing* (2nd ed.). Sudbury, MA: Jones and Bartlett Learning.
- The Merck Manual of Geriatrics* (2000, 3rd ed.). Whitehouse Station, NJ: Merck Research Laboratories.
- Miller, B. F., & Keane, C. B. (1978). Confusion. In *Encyclopedia and Dictionary of Medicine, Nursing, and Allied Health* (2nd ed.). Philadelphia, PA: W.B. Saunders Company.
- Milisen, K., Braes, T., Fick, D. M., & Foremann, M. D. (2006). Cognitive assessment and differentiating the 3 Ds (dementia, depression, delirium). *Nursing Clinics of North America*, 1-22. doi:10.1016/j.cnur.2005.09.001
- Milisen, K., Foreman, M. D., Wouters, B., Driesen, R., Godderis, J., Abraham, I. L., Broos, P. L. (2002). Documentation of delirium in elderly patients with hip fracture. *Journal of Gerontological Nursing*, 28(11), 23-29.
- Miller, B.F. & Keane, C.B. (1978). *Encyclopedia and Dictionary of Medicine, Nursing, and Allied Health*. (2nd ed., pp.220). W.B. Saunders Company, Philadelphia, PA.
- Millsap, P. (2007). Neurological system. In Linton, A.D. & Lach, H.W. (Eds.), *Matteson & McConnel's Gerontological Nursing: Concepts and Practice* (3rd ed., pp. 412-415). Saunders Elsevier, St. Louis, MO.

- Milstein, A., Pollack, A., Kleinman, G. & Barak, Y. (2002). Confusion/delirium following cataract surgery; An incidence study of 1-year duration. *International Psychogeriatrics*. 14(3). 301-306.
- Morandi, A., Pandharipande, P., Trabucchi, M., Rozzini, R., Mistraletti, G., Trompeo, A. C. & Ely, E. W. (2008). Understanding international differences in terminology for delirium and other types of acute brain dysfunction in critically ill patients. *Intensive Care Medicine*, 34(10), 1907-1915. doi:10.1007/s00134-008-1177-6
- Morandi, A., Solberg, L.M., Habermann, R., Cleeton, P., Peterson, E., Ely, E.W. & Schnelle, J. (2009). Documentation and management of words associated with delirium among elderly patients in post-acute care: a pilot investigation. *Journal of the American Medical Directors Association*. 10(5), 330-334.
- National Guidelines for Seniors' Mental Health: the Assessment and Treatment of Delirium*. (2006). Toronto, ON: Canadian Coalition for Seniors' Mental Health.
- Ouimet, S., Kavanagh, B. P., Gottfried, S. B., & Skrobik, Y. (2007). Incidence, risk factors, and consequences of ICU delirium. *Intensive Care Medicine*, 33(1), 66-73.
- Pandharipande, P., Shintani, A., Peterson, J., Pun, B. T., Wilkinson, G. R., Dittus, R. S., Ely, E. W. (2006). Lorazepam is an independent risk factor for transitioning to delirium in intensive care unit patients. *Anesthesiology*, 104(1), 21-26.
- Physician's drug handbook* (2008, 12th ed.). Philadelphia, PA: Lippincott, Williams and Wilkins.
- Pompei, P., Foreman, M. D., Rudberg, M. A., Inouye, S. K., Braundd, V., & Cassel, C. K. (1994). Delirium in hospitalized older persons: Outcomes and predictors. *Journal of the American Geriatric Society*, 42(8), 809-815.

- Pun, B. T., & Ely, E. W. (2007). The importance of diagnosing and managing icu delirium. *Recent Advances in Chest Medicine*, 132(2), 624-636.
- Rigney, T. (2010). Allostatic load and delirium in the hospitalized older adult. *Nursing Research*, 59(3), 322-330.
- Rudolph, J.L., Inouye, S.K. Jones, R.M. Yang, F.M., Fong, T.G., Levkoff, S.E. & Marcantonio, E.R. (2010). Delirium: An independent predictor of functional decline after cardiac surgery. *Journal of the American geriatrics Society*. 58(4). 643-649.
- Sendelbach, S., & Guthrie, P. F. (2009). Evidence-based guideline: Acute confusion/delirium, identification, assessment, treatment, and prevention. *Journal of Gerontological Nursing*, 35(11), 11-18.
- Shorr, R. I. (2007). *Drugs for the Geriatric Patient*. Philadelphia, PA: Saunders Elsevier.
- Siddiqi, N., House, A. O., & Holmes, J. D. (2006). Occurrence and outcome of delirium in medical in-patients: a systematic literature review. *Age and Ageing*, 35, 350-364.
- Slabaugh, S. L., Maio, V., Templin, M., & Abouzaid, S. (2010). Prevalence and risk of polypharmacy among the elderly in an outpatient setting: A retrospective cohort study in the Emilia-Romagna Region, Italy. *Drugs Aging*, 27(12), 1019-1028.
- Spivack, B. S. (2010). Dr. Sharon Inouye presents lecture on delirium in the elderly. *Clinical Geriatrics*, 18(7), 7-8.
- Stedman (Ed.). (2000). *Stedman's Medical Dictionary*. New York, USA: Lippincott Williams & Wilkins.

- Stevens, L.E., DeMoore, G.M. & Simpson, J.M. (1998). Delirium in hospital: Does it increase length of stay? *Australian and New Zealand Journal of Psychiatry*. (32). 805-808.
- St. Pierre, J. (2004). Delirium, a process improvement approach to changing prescribing practices in a community teaching hospital. *Journal of Nursing Care Quality*, 20(3), 244-250.
- Steis, M. R., & Fick, D. M. (2008). Are nurses recognizing delirium? *Journal of Gerontological Nursing*, 34(9), 40-48.
- Stevens, L. E., DeMoore, G. M., & Simpson, J. M. (2001). Delirium in hospital: does it increase length of stay. *Australian and New Zealand Journal of Psychiatry*, 32, 805-808.
- Tullman, D. F., Mion, L. C., Fletcher, K., & Foreman, M. D. (2008). Delirium: Prevention, early recognition, and treatment. In Capezuti, Zwicker, Mezey & Fulmer (Eds.), *Evidence-based geriatric nursing protocols for best practice* (3rd ed., pp. 111-125). New York, Springer.
- Tullman, D.F., Fletcher, K. & Foreman, M.D. (2012) Delirium. In Capezuti, Zwicker, Mezey & Fulmer (Eds.), *Evidence-based geriatric nursing protocols for best practice* (4th ed., pp. 188). New York, Springer.
- Vanderbilt Nurse. (2010, October). *Vanderbilt nurse*. Retrieved December 22, 2010, from <http://www.vanderbilt.edu/vanderbiltnurse>
- Vogt, W. P. (2005). In *Dictionary of Statistics and Methodology; A Nontechnical Guide for the Social Sciences* (3rd ed.). Thousand Oaks, CA: Sage Publications.

- Vincent, G. K., & Velkoff, V. A. (2010). *The next four decades: the older population in the United States: 2010 to 2050* (P25-1138). Washington, DC: U.S. Census Bureau.
- Vollmer, C. M., Bond, J., Eden, B. M., Resch, D. S., Fulk, L., Robinson, S., Hughes, L. F. (2010). Incidence, prevalence, and under-recognition of delirium in urology patients. *Urologic Nursing*, 30(4), 234-254.
- Voyer, P., Cole, M. G., McCusker, J., St-Jacques, S., & Laplante, J. (2008). Accuracy of nurse documentation of delirium symptoms in medical charts. *International Journal of Nursing Practice*, 14, 165-177.
- Voyer, P., Cole, M.G., McCusker, J. & Belzile, E. (2009). Prevalence and symptoms of delirium superimposed on dementia. *Clinical Nursing Research*. 15(1). 46-66.
- Wakefield, B. J. (2002). Risk for acute confusion on hospital admission. *Clinical Nursing Research*, 11(2), 153-172.
- Wanich, C. K., Sullivan-Marx, E. M., Gottlieb, G. L., & Johnson, J. C. (1992). Functional status outcomes of a nursing intervention in hospitalized elderly. *IMAGE: Journal of Nursing Scholarship*, 24(3), 201-207.
- Waszynski, C.M. (2007). Try This: The Confusion Assessment Method (CAM). *General Assessment Series: Best Practices in Nursing Care to Older Adults*.
- Wikipedia.org/wiki/Mini-mental_state_examination
- Zwicker, D., & Fulmer, T. (2008). Reducing adverse drug events. In Capezuti, Zwicker, Mezey, & Fulmer (Eds.), *Evidence-based geriatric nursing protocols for best practice* (3rd ed., pp. 257-308). New York, New York: Springer Publishing Company.

Appendix A
Variable Table

Dimension	Variables	Measure	Data Source	Level of Data
Participant Characteristics	Demographic Variables (IV)	1) Age 2) Gender 3) Race/ethnicity 4) Polypharmacy 5) Primary language 6) Admission Diagnosis	Electronic Health Record (EHR)	Ratio Nominal Ratio Ratio
Signs and symptoms of Delirium	Documentation of Signs and Symptoms of Delirium (DV)	7) Acute confusion, 8) Agitation 9) Encephalopathy 10) Sundowning	Electronic Health Record (EHR), Physicians progress notes, nurses notes	Nominal
Confusion Assessment Method (CAM)	Documentation of 4 key features of the Confusion Assessment Method (CAM)	11) Acute onset and fluctuating course 12) Inattention 13) Disorganized thinking 14) Altered level of consciousness	Electronic Health Record (EHR) Nurses notes	Nominal

Data Collection Instruments/Measures (chart extraction sheet)

Study participant #	Age	Gender M or F	Race White in	Poly-pharmacy Yes or No	Number of Medications	Admit Dx Write in	Administration of Alivant/Haldol	Delirium doc. MD's Notes Yes or No	Delirium doc. RN's Notes Yes or No	Confusion doc. MD's Notes Yes or No	Confusion doc. RN's Notes Yes or No	Agitation doc. MD's notes Yes or No	Agitation doc. RN's notes Yes or No	Sundowning doc. MD's notes Yes or No	Sundowning doc. RN's notes Yes or No	Fluctuating Mental Status? MD doc. Y/N	Fluctuating Mental Status? RN doc. Y/N	Inattention? MD doc. Y/N	Inattention? RN doc. Y/N	Disorganized thinking? MD doc. Y/N	Disorganized thinking? RN doc. Y/N	Altered LOC? MD doc. Y/N	Altered LOC? RN doc. Y/N
1	68	1	1	1	8	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1
2	91	0	2	1	20	1	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0
3	92	0	0	1	7	2	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0
4	83	0	0	1	4	4	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
5	87	1	3	1	11	5	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1
6	69	1	0	1	15	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	87	1	0	0	3	7	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0
8	77	1	2	1	15	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	80	0	0	1	13	9	2	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0
10	91	0	0	1	4	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	82	0	0	1	16	1	1	0	0	1	0	1	1	0	1	1	0	0	0	0	0	0	0
12	80	0	0	1	10	11	1	0	0	0	1	0	1	0	1	1	1	0	0	0	0	1	0
13	92	0	0	1	7	1	1	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
14	80	0	0	1	17	12	2	1	0	1	1	0	0	1	0	0	0	0	0	0	0	1	0
15	71	1	0	1	21	13	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
16	86	1	0	1	7	14	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1
17	83	1	0	1	10	11	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1
18	67	0	0	1	21	15	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
19	81	1	0	1	14	16	2	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
20	92	0	0	1	11	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1
21	74	1	0	1	7	17	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
22	88	0	0	1	12	14	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0
23	72	1	0	1	15	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	73	1	3	1	18	19	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
25	86	0	0	1	12	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	86	0	0	1	4	20	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

Data Extraction Tool

Appendix B

Appendix D

Palomar Health Investigational Review Committee Approval Letter

MEDICAL STAFF SERVICES

PALOMAR
POMERADO
HEALTH

November 11, 2011

Jacqueline Close, R.N.
Palomar Pomerado Health
15255 Innovation Drive
San Diego, CA 92128

RE: Delirium in the Hospitalized Older Adult

Dear Ms. Close:


The Palomar Pomerado Investigational Review Committee (PPH IRC), in its meeting of November 10, 2011, reviewed and approved the protocol and informed consent for the above-mentioned study. The Committee also approved the request for a waiver of HIPAA authorization in order to conduct this study as it was determined that all of the required conditions have been satisfied. The study was also granted a waiver of informed consent requirements as it was determined that the criteria in 45CFR46.116(d) have been satisfied. The study was approved to be conducted at Pomerado Hospital.


Prior to initiation of the study, approval must also be obtained from the Executive Committee and Administration of the Hospital(s) involved. Studies approved by the Investigational Review Committee may not proceed until after Executive Committee and administrative approval is obtained. Please contact Melissa Wallace at (760) 480-7988 for information on the administrative review process. Study specific laboratory and imaging studies that will be performed as part of the study are required to be ordered on the appropriate form.

The Palomar Pomerado Investigational Review Committee is in compliance with Federal Rules and Regulations and operates in accordance with Good Clinical Practices. Approval of this protocol and informed consent is effective for one (1) year from the initial approval and may not proceed past November 11, 2012 without reapproval by the Palomar Pomerado Investigational Review Committee.

Sincerely,

Richard G. Just, M.D.
Chairman, PPH Investigational Review Committee

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A California Health Care District