University of Nevada, Reno

Predisposing Factors of Delirium in Patients on a General Medical Nephrology Unit

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Nursing

by

Stephanie Rae Flowers, RN, BSN

Stephanie S. DeBoor Ph.D. RN, CCRN /Thesis Advisor

May, 2012

University of Nevada, Reno
Statewide • Worldwide

THE GRADUATE SCHOOL

We recommend that the thesis
prepared under our supervision by

Stephanie R. Flowers

entitled

Predisposing Factors of Delirium in Patients on a General Medical Nephrology Unit

be accepted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE

Stephanie S. DeBoor, Ph.D. RN, CCRN, Advisor

Wei Chen Tung, Ph.D., RN Committee Member

Marian Berryhill, Ph.D., Graduate School Representative

Marsha H. Read, Ph. D., Dean, Graduate School

May, 2012

ABSTRACT

Delirium is an acute, serious disturbance in one's mental functioning. When a patient develops delirium during their hospital stay they increase their risk for morbidity and mortality, entry into long term care, risk of dementia, increased length of hospital stay, infection, falls, and or further functional impairment. Not only does delirium cause these further issues for the patient, but it carries a significant economic burden; an additional $100 billion dollars annually on the U.S. health care system. Current literature was reviewed regarding predisposing risk factors for delirium and focused mainly on patients aged 65 or greater. The purpose of this study was to identify whether or not possessing one or more predisposing factors, such as advanced age, transfer from a nursing home, alcohol abuse, smoking, illicit drug use, visual impairment, hearing loss, elevated urea-creatinine, history of stroke, epilepsy, CHF, or depression contributed to higher risk of developing delirium within the patient's first 72 hours of stay. Statistically significant results were found identifying that having more predisposing factors as a total ($p=.023$), does indeed put patients at higher risk for developing delirium. Further research is needed to identify which predisposing factor(s) may hold greater weight in the development of delirium.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

Introduction

In the medical community, the term delirium is often interchanged with the word psychosis. For the purpose of this paper, the term delirium will be used to identify those who display such behaviors as change in level of consciousness, disorganized thinking, and inattention. Delirium, as defined by the Mayo Clinic (2010), is, "A serious disturbance in a person's mental abilities that results in a decreased awareness of one's environment and confused thinking" (p.1). Delirium in the patient care setting has direct implications to patient outcomes including greater length of hospital stay, higher cost of treatment, and higher morbidity and mortality. Delirium continues to affect patients in the realms of quality of life once discharged. The prevalence of delirium at the time of hospital admission has been reported to range from 4% to 53.3% in medical inpatients (Sendelbach & Guthrie, 2009). Prevalence of delirium in an intensive care setting, however, rates higher, at nearly 70% of all cases (Arend & Christensen, 2009).

Nurses are at the forefront of delirium observation, due to their time at the bedside with each patient. Not only is it critical for nurses to have the tools and knowledge to identify delirium in the patient, but it is also necessary for the nurse to understand predisposing factors of delirium that exist prior to the patient's hospitalization in anticipation and prevention of delirium. These predisposing factors may increase a patient's risk for developing delirium during their hospital stay. Such factors include: advanced age, transfer from a nursing home, alcohol abuse, smoking, illicit drug use, visual impairment, hearing loss, elevated urea-creatinine, history of stroke, epilepsy, congestive heart failure (CHF), or depression (Arend & Christensen, 2009).

Statement of the Problem

Patients in the hospital setting, with the aforementioned predisposing factors, are at greater risk for the development of delirium. Patients need to be screened for predisposing factors upon hospital admission in order for a closer observation of the development of delirium, in hopes of its prevention.

Significance of the Problem

In 2010, the National Institute for Health and Clinical Excellence (NICE) issued clinical guidelines on delirium with the main consequences of delirium reported as: increased risk of dementia following an episode of delirium, increase length of hospital stay, increased mortality, increased likelihood of entry into long-term care, and increased risk of falls, pressure ulcers, nosocomial infection, and or functional impairment (Bryant, 2011). A synopsis of the NICE clinical guidelines led authors O'Mahony, Murthy, Akunne, & Young (2011) to publish this statement: "An estimated additional $2500 per patient or a $6.9 billion annual expenditure for Medicare is incurred when treating patients with delirium" (p. 746). These authors further state that NICE prevention methods could be shown to reduce cost as related to delirium if implemented in the hospital setting as well as long term care facilities. A few examples of delirium prevention implementations are: providing appropriate lighting for day and night, ensuring a clear view of a clock and calendar for those at risk, and addressing dehydration and constipation issues often, etc. (O'Mahony, Murthy, Akunne, & Young, 2011). The Mayo Clinic, (as cited in Crosby, Culley, & Marcantonio), (2010), stated that delirium's economic burden on the U.S. health care system, "is more than $100 billion annually" (p. 12).

Statement of the Purpose

The purpose of this study was to determine whether a relationship exists between patients on a general medical unit with predisposing factors to their development of delirium during a 72 hour period.

Theoretical Framework

The Cognitive Reserve Theory, as described by Kolanowski, Fick, Clare, Therrien, and Gill (2010) guided this study. These authors utilize the cognitive reserve theory to explain how the brain changes with delirium. To understand its application, one must first understand the concept of cognitive reserve, as it relates to this theory. Cognitive reserve refers to the active processes in the brain that modify the risk for evidence of brain disease, depending on the brain's metabolic activity. Differing amounts of cognitive reserve provide the level of efficacy divergences in cognitive coping with brain pathology. This theory recognizes that the differences in brain metabolic activity are not related to brain size, but rather its dynamic activity that is determined by the different kinds of mental stimulation the brain has been exposed to over a lifetime. Such exposures that might enhance brain metabolic activity include the level of education of the individual, complexity of their occupation, as well as the mental complexity of their desired leisure activities. For example, individuals with lower levels of educational attainment are at greater risk than those with higher educations. Furthermore these authors state, "Neurons and synapses are the substrate upon which brain networks are built, and enhanced synaptic activity (more efficient brain networks) might exist in persons who engage in mentally stimulating activities" (p. 233). As time

passes throughout the patients' hospitalization, manifestations of changes in the patient's cognitive reserve are assessed.

Kolanowski et al. (2010) discuss a variety of pathophysiological pathways of delirium, but the main focus is on a, "derangement of the functional metabolism of the brain" (p. 234). In patients with delirium, there is evidence of slowing electroencephalograms (EEG) as well as decreased cerebral blood flow in varied and diffuse regions of the brain, both of which normalize once delirium resolves. Researchers believe this is in relation to a disruption of neurotransmitters, particularly cholinergic and dopamine. For the purpose of this study, patient's blood pressures over their course of stay will be used to determine perfusion and therefore, cerebral blood flow. Empirical evidence of this study reports that administration of anticholinergic medications not only induces clinical manifestations of delirium, but also EEG changes. As with dopamine, evidence shows that in excess, dopamine may often times precipitate delirium. Treatments for delirium include both cholinergic medications and dopamine antagonists for this reason (Kolanowski et. al., 2010). Patients' medication administration records were available to determine if any anticholinergic medications were administered throughout the patient's 72 hour stay.

Another pathway in the development of delirium discussed in this article is inflammation; however, the exact mechanism of how it can cause delirium is unknown. Kolanowski et al. (2010) states three realms of evidence in this distinction:

1. Infusion of cytokines can induce delirium.
2. Elevated markers of inflammation, chemokines and cytokines, after cardiac surgery are associated with the development of delirium.

3. Cytokines IL-6 and IL-8 are elevated in medical patients who develop delirium versus those who do not develop delirium (p. 234).

From a psychological standpoint, Kolanowski et al. (2010) blame delirium primarily on attention and state that, "Damage to the attentional system can result in slowed processing and reduced concentration, affecting many aspects of cognitive functioning and impacting significantly on activities of daily living" (p. 234). Posner (1990) identifies the attentional system of the human brain as both a sensory and motor system that carries out three major functions: "a) orienting to sensory events b) detecting signals for focal (conscious) processing and c) maintaining a vigilant or alert state" (p.26). Attentional system capacities vary from individual to individual, as does the risk of developing delirium. In patients with pre-operational or pre-trauma attentional deficits, their risk for developing delirium is quite high. This may be met with other outside factors noted to increase delirium such as opioid use, benzodiazepine use, and derangements of the hypothalamic-pituitary-adrenal axis, which may not be known upon hospital admission, if ever (Kolanowski et.al., 2010).

In the aging individual, decreased neurogenesis and plasticity, which is "the lifelong ability of the brain to reorganize neural pathways based on new experiences" in the hippocampus have been correlated with cognitive declines (Chudler, 2011, p.1). However, activities such as physical exercise and learning can change the ability the brain has to respond to experiences. This is known as activity-dependent neuroplasticity. Evidence has shown that, "Plasticity related to learning and behavior change likely involves new neural circuits, new or modified synaptic patterns and/or the formation of

new synapses or neurons in hippocampus and other plastic brain regions" (Kolanowski et.al., 2010, p. 235).

Recent clinical trials have shown improvements in the prevention of delirium in the acute care setting by nonpharmacological treatment and interventions related to commonly targeted risk factors for reduced cognitive reserves such as, dehydration, sleep deprivation, immobility, anticholinergic, CNS-active medications, visual and hearing impairments, and sensory deprivation (Kolanowski et. al., 2010). These factors were monitored during the chart-review portion of this study. Furthermore, the trials showed a lowered incidence of delirium during hospitalization. By screening patients for predisposing factors such as visual impairment, hearing loss, and use of current medications, hopefully a number of fewer cases will result in delirium during hospital admission.

Chapter Summary

Patients who develop delirium during their hospital stay suffer many consequences including higher hospitalization costs related to longer lengths of stay, increased risk for infection, falls, pressure ulcers, and morbidity/mortality, as well as a higher chance of needing long term care. The Cognitive Reserve Theory provided guidance for this research based on the explanation of why and how delirium may develop. In addition, this theory also offers suggestions of patient interaction and activity that may prevent or lessen delirium episodes. There is little research available on predisposing factors of delirium as it relates to patients admitted to a general medical unit. There is also a lack of screening either in the form of a nursing tool or perhaps in relation to a nursing knowledge deficit. This study was designed to determine a

likelihood of delirium development in patients on a general medical unit who present with predisposing factors by utilizing The Cognitive Reserve Theory's understanding of cognitive reserve and the attentional system. Factors such as visual or hearing impairment, use of medications, as well as patient's blood pressures were assessed during chart review.

CHAPTER II

Introduction

A search for information pertaining to delirium in the acute care setting began with a computerized review of the literature in CINHAL, Pub Med, and Google™. A total of 19 articles dating from 2007 to current were found concerning this population of interest. Primary focus was placed on those articles published since 2007. The literature reviewed was limited in the population of this research study, ages 18 and above, therefore, the majority of the literature reviewed deals with a population of 65 years of age or greater, and some data collected in an intensive care setting. This information was used to inform and provide basic comparative knowledge for analysis.

Literature Review

Farley & McLafferty (2007) describe clinical features and risk factors for delirium in the older adult. These authors describe two main forms of delirium seen in older patients: hyperactive delirium and hypoactive delirium; hyperactive being more recognized, but hypoactive being more common. In hyperactive delirium the patient has a heightened response to stimuli, has an increase in psychomotor activity, and is over alert. Hypoactive delirium presents as the patient being underactive, apathetic, and lethargic. Outlined within this research are risk factors associated with the development of delirium in the older adult. Additionally, these factors may be physiological and associated with the ageing process inclusive of an increase in body fat, a decrease in lean body mass and water, a decrease in albumin and a decrease in glomerular filtration rate. Furthermore, they describe the neurogenic process of ageing as playing a role in delirium's development due to the decline in cerebral blood flow by 28%, resulting in

neuronal loss and lower concentrations of neurotransmitters including gammaaminobutyric acid (GABA) and acetylcholine (Ach). The authors suggest that these changes result in a lesser cognitive reserve to combat the additional stress occurring with delirium. Other risk factors include deficient nutrition, dementia, illness, alcohol abuse, and depression. Other factors cited as contributory factors in the development of delirium contain dehydration, male gender, older age, reduction in daily activities, abnormal sodium/potassium and or glucose levels, and sensory impairments.

Lin, Heacock, Bhargave, & Fogel (2010) conducted a statewide, retrospective analysis and prevalence of delirium during acute care hospitalization in relation to four primary diagnoses. The four diagnoses included were pneumonia, congestive heart failure (CHF), urinary tract infection (UTI), and lower extremity orthopedic surgery (LEOS). The researchers examined prevalence of delirium on admission and the development of delirium after admission. Results showed delirium on admission was highest in the UTI category, while after admission delirium was highest among the LEOS diagnosis. However, over time, delirium increased most in those diagnosed with UTI's. All four diagnoses showed an increased delirium rate in conjunction with adverse drug effects. The adverse drug effects were related to administration of opiates, analgesics, benzodiazepines, sedatives, or hypnotics. These authors suggest increasing age as the strongest associated factor with the prevalence of delirium both on admission and after admission. Other strong clinical associations in the development of delirium both on and after admission included respiratory treatment, hyponatremia, and hypovolemia. Modest association with after admission delirium was seen in those patients with cerebrovascular disease, atrial fibrillation, and diabetes. Race and gender were not important factors.

Limitations of this study include its limited generalizability as it was conducted across New York State, only. Also, the major limitation mentioned by the authors included that since the study was of retrospective nature, ICD-9 codes were used to identify adverse drug reactions, therefore limiting confirmation of adverse drug reactions due to the limited sensitivity and self-selection of ICD-9 coding information.

Foster, et al. (2010) conducted a twelve month quality improvement project on two acute medical wards for the prevention, detection, and reduction of delirium in the acute care setting. Findings of this study identified 10 out of 30 patients total to have delirium. Of the thirty patients, twenty-nine were identified as having three or more risk factors and were placed at high risk. These authors' identified risk factors for delirium to include: older age, prior cognitive impairments, dementia, iatrogenic factors, visual impairment, poor mobility, and severe medical illness. Each of the study's thirty patients were screened for delirium using the Confusion Assessment Method (CAM), and a diagnosis of delirium was given by a medical team consisting of medical, nursing and allied health representatives. One third of this study's subjects (10) were given a diagnosis of delirium using the CAM. Only half of those cases (5) were identified solely by the medical team, although the nursing staff identified confusion in twelve total cases, including all of the ten CAM diagnoses. Limitations of this study include small sample size and short duration of study.

Cole, Ciampi, Belzile, & Zhong (2009) conducted a systemic review of delirium in subjects aged 50 and above. Findings demonstrated that delirium in this population is associated with a poorer prognosis, as many do not recover completely from the delirium. These authors state that in this population, there is a persistence of delirium rather than an

episode that resolves, and that this accounts for many adverse outcomes such as cognitive impairment, functional disability, greater length of hospital stay, and greater rates of death. Additionally, results in this population were found to be independent of socio-demographic variables such as gender, age, marital status, and living arrangements. This persistent delirium they defined as criteria for delirium present on admission (or shortly after) that is still present upon discharge. After systemic review, the authors found that delirium was present in patients post discharge at 1, 3, and 6 months, respectively to be 44.7%, 32.8%, and 25.6%. Furthermore, results indicate that the strongest risk factor for delirium in the 50 years and older population was dementia.

Holden, Jayathissa, & Young (2008) studied delirium in 216 patients aged 65 years and older, admitted to a general medical ward over a two month period. They used the CAM as well as the Mini Mental Status Examination to screen for the presence of delirium. Of the 216 patients, 56 screened positive for delirium. Of the 56 patients, 31% had a previous history of dementia. Analysis of data revealed that older adults with a diagnosis of delirium tend to have longer lengths of hospital stay, increased cognitive impairment, and increased morbidity and mortality.

Han, et al. (2009) looked at patients 65 years and older who were in the emergency department (ED) for less than 12 hours, and screened for a presence of delirium using the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU). This is a modified, shorter version of the CAM that utilizes objective assessments from objective neuropsychiatric tests to determine inattention and disorganized thinking, rather than requiring clinical judgment to assess such features, as with the CAM. The CAM-ICU is also more appropriate for a fast-paced ED as it takes approximately 2

minutes to complete. The researchers identified risk factors for having the greatest impact on the development of delirium in this population to include: older age, previous residence in a nursing home, dementia, having visual or hearing impairments, on several home medications, and or having an infectious etiology diagnosed by the emergency department physician. Out of 303 patients included in the study, 25% were found to have delirium in the ED, per the CAM-ICU. Limitations of this study include use of the CAM-ICU in the ED as it is primarily reserved for intensive care purposes and not validated for the ED setting. Further limitations include possible selection bias as convenience sampling was used to obtain participant as well as limited size of study sample and short ED time constraints.

Bryant (2011) wrote a recent expository article on recognizing delirium, identifying risk factors for, and explaining the assessment and diagnosis of delirium. As recommended by the National Institute for Health and Clinical Excellence (NICE) (2010) guidelines, these risk factors include: increased age 65 years or greater, severe illness, hip fracture, pre-existing cognitive impairment, and dementia. Additionally, Bryant states that patients who develop delirium also have underlying risk factors of physical frailty, sensory impairment, and multiple medications.

Chapter Summary

Literature surrounding the topic of delirium and its development focuses primarily on the older adult population. Many risk factors for developing delirium have been identified by several different research approaches and often include advanced age, dementia, sensory impairment, underlying infection, and previous cognitive impairment.

CHAPTER III

Methodology

Research Design

This study was a retrospective chart review from the year 2011 of patients admitted to a medical unit with a length of stay of 72 hours minimum. The research was designed to review patients' social behavior in relation to delirium, based on meeting criteria such as, "disorganized thinking," "change in level of consciousness," and "inattention." Delirium, as the dependent variable, was assessed while examining charts retrospectively to see if it can be correlated with one or more independent variables, which are predisposing factors listed as follows: advanced age, transfer from a nursing home, alcohol abuse, smoking, illicit drug use, visual impairment, hearing loss, elevated urea-creatinine, history of stroke, epilepsy, CHF, or depression (Arend & Christensen, 2009). Data was used descriptively to identify patients with inclusion criteria that demonstrated various aforementioned symptoms of delirium, set forth by the CAM, and developed within 72 hours of admission. Blood pressures were monitored throughout each patient's stay to evaluate brain perfusion, as was the incidence of pre-hospital administration of anticholinergic medications.

Sample Selection

A representative sample was used to select patients' charts whose key characteristics approximate the population of interest. A priori power analysis was conducted to determine how many charts were needed to provide a significant finding. It was determined that 143 charts were needed for this research to maintain a power of .80 to detect a large effect size.

Inclusion and Exclusion Criteria

The inclusion criterion for this study included: Any patient admitted to the medical unit during the time frame of January 1, 2011 through December 31, 2011, who are greater than 18 years of age, and had a length of stay greater than 72 hours. Patients who were admitted to the hospital on a different unit and then transferred to the medical unit were excluded.

Protection of Human Subjects

Approval of this study was sought and granted from the Institutional Review Boards (IRB) for the University of Nevada, Reno and Renown Regional Medical Center. Upon approval, the director for Health Information was contacted to access medical records for chart review.

Privacy and Confidentiality

Any information obtained in this study remains confidential. IRB protocols have been followed regarding the storage of data. All data is and will continue to be stored in a locked cabinet at the University of Nevada, Reno for the required period of time as identified by IRB protocol. After the storage time the information gathered will be destroyed.

Data Generation and Analysis Procedures

Data Generation

This study was a closed chart review of patients admitted to a medical unit within the time frame of January 1, 2011 through December 31, 2011and had a hospital length of stay for greater than 72 hours. The researcher reviewed nursing notes as well as physician history and physical (H&P) to identify patients' social behavior in relation to

delirium, based on meeting criteria such as, “disorganized thinking,” “change in level of consciousness,” and “inattention.” Upon findings of delirium, patients were screened for predisposing factors such as, advanced age, transfer from a nursing home, alcohol abuse, smoking, illicit drug use, visual impairment, hearing loss, elevated urea-creatinine, history of stroke, epilepsy, CHF, or depression (Arend & Christensen, 2009).

Instrumentation

For the purpose of this study the Confusion Assessment Method (CAM) instrument was utilized. Each patient chart was reviewed and a CAM was conducted by the researcher to identify signs/symptoms of delirium. The nurse’s neurological examination and anecdotal notes were reviewed for key phrases and terminology associated with the development of delirium to include but not exclusive of: inattention, confusion, disorganized thinking, not making sense, random thoughts or words, delirious, and hallucinating.

Data Analysis

Data was analyzed using the independent samples t-test. Charts were reviewed using staff nurses’ basic neurological assessments. Jarvis (2008) defines a basic hospital neurological exam as including the following: eyes open spontaneously, motor response, verbal response, right and left pupil size and reaction, bilateral muscle strength of upper and lower extremities, any ptosis or facial droop, sensation, communication, and ability to swallow.

The CAM was used by the researcher in scoring the nurse’s neurological findings to give an overall neurological patient presentation in relation to delirium signs and symptoms. The CAM is divided into two parts. The first part of the assessment screens

for overall cognitive impairment. Part two then is the diagnosis algorithm that weighs the findings of part one against the four main features of delirium findings:1) acute onset and fluctuating course, 2) inattention, 3) disorganized thinking, and 4) altered level of consciousness (Inouye, et.al, 1990). For a diagnosis of delirium to be made CAM requires the presence of features 1 and 2 and either 3 or 4. To clarify, a diagnosis of delirium is made per the CAM if both acute onset and fluctuating course and inattention are present in addition to either having disorganized thinking, OR altered level of consciousness. There must be three out of the four diagnostic criteria present.

Chapter Summary

This chapter provides an overview of the research design that was utilized for this study, which includes information on sampling, instrumentation, protection of human subjects, along with instrumentation, collection & analysis of data. Data from staff nurse's neurological examination were reviewed by the researcher and a CAM was conducted using that information to make a diagnosis of delirium. Results of prevalence have been statistically analyzed.

CHAPTER IV

Results

The purpose of this study was to determine if patient's who presented with one or more of the 13 identified predisposing factors (Arend & Christensen, 2009), upon hospital admission had a greater chance of developing delirium within a 72 hour length of stay on a medical-nephrology unit. A total number of 143 charts were used per power analysis and examined for the entire year of 2011. Each of the 143 charts were individually reviewed to identify if any of the 13 predisposing factors were present or not present, and a Confusion Assessment Method (CAM) was performed per each chart to determine a diagnosis of delirium. The process and results are presented below.

Data Generation

Approximately 11 to13 patients' charts were randomly selected from the entire population admitted to the medical nephrology unit for each month during January 1, 2011 to December 31, 2011, for a total of 143 charts. Of these 143 patient charts, 135 were identified to have at least one predisposing factor; however, a CAM was performed on each of the 143 charts regardless of the presence of the 13 predisposing factors. Out of the 143 charts reviewed, a total of 14 patients were identified to have developed delirium within a 72 hour timeframe based on the CAM assessment.

Data Analysis

It was initially thought that data would be analyzed utilizing Logistic Regression to predict an outcome of delirium from the dichotomous data of 13 predisposing factors. Calculations identified a need for approximately 5 to 9 cases of delirium found per each of the 13 predisposing factors (Vittinghoff & McCulloch, 2007). In the current data at

hand, there are 13 predictors or predisposing factors, with only 14 positive cases, just over one event per variable, and thus logistic regression was not advised (C. Maddux, personal communication, March, 20, 2012). An independent-samples t-test was then conducted.

In determining effect size, Cohen's d was calculated at .72, therefore revealing a large effect size in the difference in means. Delirium was noted in 10% of the total sample, thus it was statistically necessary to randomly select 43 charts from the remaining 129 charts not diagnosed with delirium. Every third chart was randomly selected providing a total of 57 charts used for statistical analysis; 43 cases in the non-delirium group and 14 cases in the delirium group.

Sample Demographics

Of the total selection of 57 patient charts, 33 (57.89%) were male and 24 (42.11%) were female. In the two categories of delirium versus non delirium cases, the 14 positive delirium cases consisted of 5 (35.71%) male and 9 (64.29%) female and in the non-delirium cases, 24 (55.81%) male with 19 (44.19%) female. Ages ranged from 19 to 93 years of age throughout the total selection. Of the positive delirium group, 11 of 14 (78.57%) patients were equal to or greater than age 60 years old, while 25 of 43 (58.14%) were 60 years or greater in the non-delirium group. The demographics of the sample size can be generalized to both the Nevada population, as well as the United States in terms of age and gender (U.S. Census Bureau, 2010). Ethnicity was not taken into consideration as there is no evidence in the literature that this is an indicating factor of delirium.

Findings

An independent-samples t-test was conducted to test for differences in the mean number of predictors in both the delirium and non-delirium groups. For the delirium group, those who met diagnostic criteria per the CAM, *(M = 4.00, SD = 1.842)* presented with more overall predisposing factors as a sum when compared to the non-delirium group *(M=2.84, SD = 1.54), t(55) = -2.34, p = .02, d = .80.* Results showed a significance of means, therefore identifying a statistically significant difference between the group with delirium and the group without delirium, in relation to the sum of total predisposing factors. The group with delirium presented with more predisposing factors as a sum, (4.0) than the group without delirium, (2.84) as shown in table 1 below.

Table 1

Descriptive Data

	Delirium Group	**Non-delirium Group**
Average Sum of predisposing factors	4	2.84
Highest amount of predisposing factors per individual	7	6
Lowest amount of predisposing factors per individual	2	0

In comparison of each of the 13 predisposing factors identified in the delirium group versus the non-delirium group, all but three categories ranked more predominant in the delirium group than the non-delirium group. The three that were less common in the delirium group included illicit drug use, current tobacco smoking, and history of stroke. There was no use of illicit drugs found in all 14 delirium cases, but 4 of 43 (9.30%) were found in the random non-delirium cases. Current tobacco smoking was found in 2 of 14

(14.29%) delirium positives, and in 13 of 43 (30.23%) of non-delirium cases. There were no patients in the positive delirium group with a history of stroke, however 6 of 43 (13.95%) were found in the non-delirium group. The totals of findings per group are displayed in table 2.

Table 2

Percentage of Predisposing Factors in Delirium versus Non-Delirium Cases

	Delirium (+) Group	Non-delirium Group
Age >60	78.57%	58.14%
Transfer from a nursing home	28.57%	11.63%
Alcohol abuse	21.43%	18.60%
Illicit drug use	0%	9.30%
Current tobacco smoker	14.29%	30.23%
Vision impairment	92.86%	58.14%
Hearing impairment	28.57%	20.93%
Dehydration	35.71%	18.60%
Increased level of creatinine	28.57%	18.60%
History of stroke	0%	13.95%
History of epilepsy	7.14%	4.65%
History of congestive heart failure	14.29%	11.63%
History of depression	42.86%	9.30%

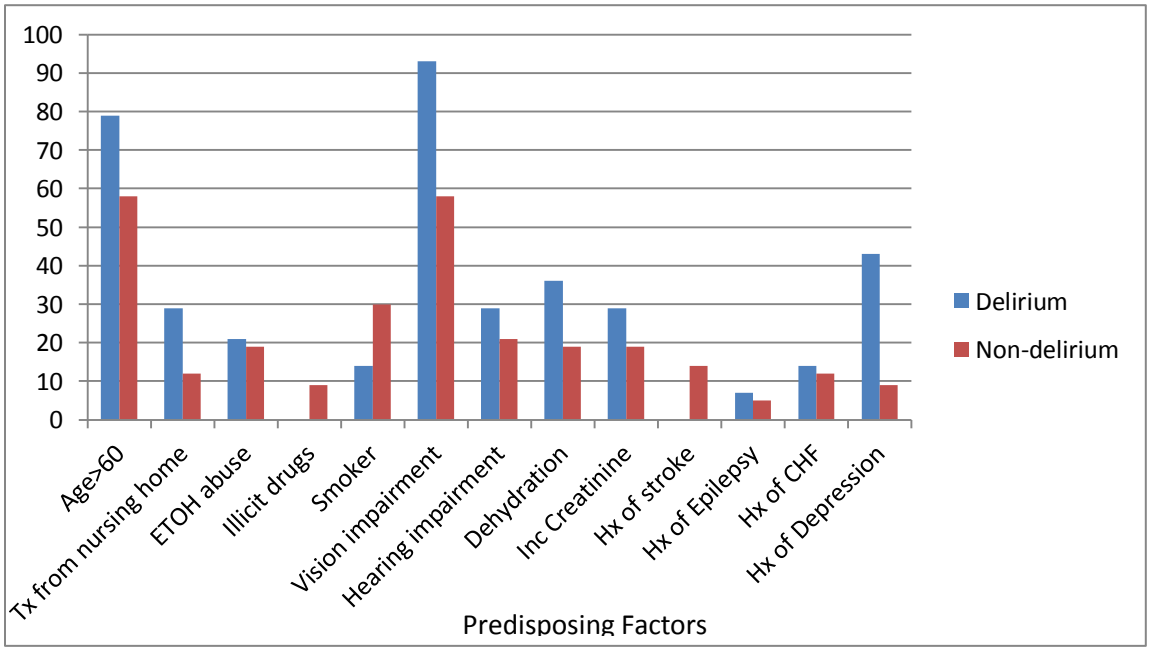
**Highlighted are the top two predisposing factors seen in both the delirium group and the non-delirium group.*

A possible explanation offered as to why no illicit drug use was found in the delirium group could be the fact that this particular group consisted of an older population with over 75% of the group being greater than 60 years of age. This, however, does not hold true to explain why there were no cases positive for history of stroke in this older population. Since, however, the non-delirium group does demonstrate a higher rate of current tobacco smoking habits as well as illicit drug use; this may offer a possible elucidation as to the presence of stroke history per this population.

In both groups, the highest two, most commonly found predisposing factors were age greater than or equal to 60 years, as well as vision impairment, although each is markedly higher in the delirium group. Age has been noted as a predominant predisposing risk factor for delirium throughout the literature (Lee et.al, 2011). A visual representation of this finding can be seen in Figure 1.

Figure 1

Presence of Predisposing Factors in Delirium vs. Non-delirium Cases by Percentage



In addition to this collection of data, blood pressures were monitored throughout each patient's length of stay as well as identification of pre-hospital administrations of any anticholinergic medications. These findings did not alter diagnosis of delirium and all patients were classified as normotensive or hypertensive; no hypotension occurred in all 143 patients.

Chapter Summary

A total of 143 charts were randomly selected from the total patient population admitted to the general medical-nephrology unit from January 1, 2011 to December 31, 2011. Each of the 143 charts selected were screened for 13 predisposing factors, of which 135 out of 143 presented with at least one predisposing factor. Each of the 143 charts was analyzed utilizing the Confusion Assessment Method (CAM), regardless of presence of predisposing factors. Secondary to the CAM, 14 out of 143 patients' charts were diagnosed with delirium. Statistically significant results were reported using the independent samples t-test, resulting that the group with delirium possessed a higher sum of predisposing factors than the sum of predisposing factors in the group without delirium.

CHAPTER V

Discussion

Description of the Study

Developing delirium during a hospital stay has been shown to increase hospital length of stay, cost of treatment, and morbidity and mortality. This study sought to identify whether or not possessing one or more of 13 predisposing factors (advanced age, transfer from a nursing home, alcohol abuse, smoking, illicit drug use, visual impairment, hearing loss, elevated urea-creatinine, history of stroke, epilepsy, CHF, and or depression) upon hospital admission lead to a greater risk of developing delirium within a 72 hour period.

Findings as they relate to Current Literature

The results of the independent samples t-test identified statistical significance in those who presented with a higher sum of predisposing factors for delirium did indeed develop delirium, as compared to the group with a lower sum of predisposing factors. This finding while significant has not previously been found in literature, and therefore stands to add to the overall body of knowledge in relation to predisposing factors of delirium

Results of this study showed age greater than or equal to 60 as one of the predominant predisposing factors seen in those who were diagnosed with delirium. Age was the second highest reported predisposing factor while vision impairment ranked highest. Similarly, Lee et.al (2011) identified predisposing factors for incidental delirium following hip fracture repair. These authors found that age was the number one

contributing predisposing factor among their positive cases of delirium, of which were diagnosed using the CAM.

Rudolph et al. (2011), performed a chart review assessment of patients with a known diagnosis of delirium using an assessment tool similar to the CAM. They concluded the tool was effective at identifying overall risk, but not necessarily diagnosing delirium. The authors identified as a limitation that possible delirium cases were unrecognized due to diagnostic criteria missing from physician or nurse charting, even though delirium was already an identified diagnosis. This too may be why this research's chart review revealed only 14 positive diagnoses of delirium.

Implications for Nursing Practice

The findings of this study offer various implications for nursing. Education of nurses regarding monitoring of neurological status and fluctuations as well as predisposing factors screening, will help identify those at risk for delirium. Offering nurses a better understanding of predisposing factors related to the development of delirium and the ability to monitor baseline neurological status and changes from that baseline per patient is crucial, especially in the first 72 hours of patient hospitalization. This study found that 10% of patients on a general medical nephrology unit developed delirium. Nurses should screen all patients for predisposing factors upon admission. Early recognition and intervention may possibly lessen delirium's occurrence therefore reducing patients' length of stay, overall hospital costs, and morbidity and mortality.

Routine use of the CAM could prove useful in performing neurological assessments, therefore drawing attention to specific neurological status fluctuations that may lead to delirium. In relation to implementing the CAM into nurses' charting

requirements, recent literature revealed that overall, "The majority of nurses found the Confusion Assessment Method to be an effective, user-friendly instrument for the assessment of patients' cognitive status over time," and "the nurses agreed that the Confusion Assessment Method was beneficial in helping identify the subtle signs and symptoms of delirium in patients" (Waszynsi & Petorvic, 2008, pp.49,53).

Limitations

The CAM was utilized due to its overall performance ratings and reliability in the diagnosis of delirium. As stated by Wei et.al, "The CAM has become the most widely used standardized delirium instrument for clinical and research purposes over the past 16 years" (Wei et.al, 2008, p.823).

A limitation of this may be related to the utilization of the Confusion Assessment Method (CAM) as a method of diagnosing delirium, solely by chart review. While use for chart review is not completely disputed in the literature, the CAM was developed to evaluate patients in the clinical setting (Inouye, 2003), not necessarily to evaluate patients via chart review, as this study is based.

Other limitations of the CAM instrument may be how information for diagnosis was collected as part of this study. For instance, the CAM identifies delirium by assessing features such as acute onset, inattention, disorganized thinking, and altered level of consciousness by direct observation of patient behavior. However, in performing a chart review, these features are identified by reviewing nurses' neurological assessments for any changes in neurological status, as well as nurse and physician progress notes for the same kinds of changes. Lack of a nurse's or physician's ability or effort in charting such neurological changes that are needed to be used in the CAM could

make for lack of result in diagnosis of delirium by chart review method (Rudolph et al, 2011).

Recommendations for Future Research

It is the hope of this researcher that the findings of this study will spark dialogue among nurse researchers, staff development educators and staff nurses fostering a desire to replicate or utilize portions of this research for further inquiries. Replication of this study using the CAM at bedside on hospitalized patients daily for the first 72 hours of hospital stay would utilize the CAM in its traditional placement and would allow for direct observation of diagnostic criteria.

Additional research could be conducted regarding the significance of encompassing one predisposing factor upon hospital admission versus another predisposing factor, to see which may or may not play an increased role in the patient's development of delirium during their hospital stay. An increased sample size would allow Logistic Regression to be utilized to show if one predisposing factor was more significantly related to the development of delirium than another. This study observed that encompassing more predisposing factors as a sum was significant to a diagnosis of delirium, but not necessarily if one held greater weight than the other. There was evidence of vision impairment being the most commonly reported predisposing factor among those diagnosed with delirium using the CAM, however, a study that evaluated if vision impairment held greater acuity versus any other predisposing factor may be beneficial.

Finally, research could be conducted examining inter-rater reliability in the use of the CAM. For this purpose, different nurses of different experience levels could perform a CAM on the same patients to determine if the same results were found across levels of nursing experience. This would demonstrate perhaps educational errors related to the nurses' knowledge of the CAM, or operator errors related to the nurses' usage of the CAM.

Chapter Summary

The purpose of this study was to identify whether or not possessing one or more of a list of 13 predisposing factors upon hospital admission led to a greater risk of developing delirium within a 72 hour period. Significant differences were found in those with delirium versus those without delirium, as those with delirium presented with a higher total of predisposing factors than those without delirium. Reasons for these findings were explored. Additional research is needed to further examine which predisposing factor or factors holds greater risk for the development of delirium as well as implications of diagnosing delirium using the Confusion Assessment Method.

Conclusions

This study identified that possessing more of the predisposing factors upon hospital admission led to a greater risk of developing delirium within a 72 hour period. There were significant differences found in those who were diagnosed with delirium per the CAM, as they comprised more predisposing factors as a sum total than those without delirium, nearly double the total amount. The most highly reported predisposing factor throughout the entire sample was vision impairment for both the delirium and non-delirium group, however, significantly higher episodes were found in the delirium group than the non-delirium group. Additional research is needed to identify which specific predisposing factors are more highly linked to the development of delirium, as diagnosed by the CAM.

APPENDIX A

The Confusion Assessment Method (CAM) Diagnostic Algorithm

Feature 1: ***Acute Onset or Fluctuating Course***

This feature is usually obtained from a family member or nurse and is shown by positive responses to the following questions: Is there evidence of an acute change in mental status from the patient's baseline? Did the (abnormal) behavior fluctuate during the day, that is, tend to come and go, or increase and decrease in severity?

Feature 2: ***Inattention***

This feature is shown by a positive response to the following question: Did the patient have difficulty focusing attention, for example, being easily distractible, or having difficulty keeping track of what was being said?

Feature 3: ***Disorganized thinking***

This feature is shown by a positive response to the following question: Was the patient's thinking disorganized or incoherent, such as rambling or irrelevant conversation, unclear or illogical flow of ideas, or unpredictable switching from subject to subject?

Feature 4: ***Altered Level of consciousness***

This feature is shown by any answer other than "alert" to the following question: Overall, how would you rate this patient's level of consciousness? (alert [normal]), vigilant [hyperalert], lethargic [drowsy, easily aroused], stupor [difficult to arouse], or coma [unarousable])

The diagnosis of delirium by CAM requires the presence of features 1 and 2 and either 3 or 4.

(Inouye, van Dyck, Alessi, Balkin, Siegal, & Horwitz, 1990)

References

Arend, E., & Christensen, M. (2009). Delirium in the intensive care unit: A review. *British Association of Critical Care Nurses, 14*(3), 145-152.

Chudler, E. (2011) *Brian plasticity. What is it?* Retrieved September 11, 2011 from http://faculty.washington.edu/chudler/plast.html#over

Cole, M., Ciampi, A., Belzile, E., & Zhong, L. (2009). Persistent delirium in older hospital patients: A systematic review of frequency and prognosis. *Age & Ageing*. *38*, 19–26. doi: 10.1093/ageing/afn253.

Crosby,G., Culley, D., & Marcantionio, E. (2010). *Mayo Clin Proceedings*, *85*(l), 12-14. doi: 10.4065/mcp.2009.0724

Flaherty, J., Steele, K., Chibnall, J., Vasudevan, V., Bassil, N., & Vegis, S. (2010). An ACE unit with a delirium room may improve function and equalize length of stay among older delirious medical inpatients. *Journal of Gerontology:Medical Sciences. 65(12),* 1387–1392 doi:10.1093/gerona/glq136.

Foster, N., Waldron, N., Donaldson, M., Margaria, H., McFaull, A., Hill, A., & D'Beer, C. (2010). A quality improvement project to prevent, detect, and reduce delirium in an acute setting. *Australian Journal of Advanced Nursing, 28*(2), 24-32.

Han, J., Zimmerman, E., Cutler, N., Schnelle, J., Morandi, A., Dittus, R.,… Ely, W. (2009). Delirium in older emergency department patients: recognition, risk factors, and psychomotor subtypes. *Academic Emergency Medicine, 16,* 193–200. doi: 10.1111/j.1553-2712.2008.00339.x.

Holden, J., Jayathissa, S., & Young, G. (2008). Delirium among elderly general medical patients in a New Zealand hospital. *Internal Medicine Journal, 38,* 629-634.

Inouye, S. (2003). *The Confusion Assessment Method (CAM) training manual and coding guide.* Retrieved April 5, 2012 from http://www.hospitalelderlifeprogram.org/pdf/TheConfusionAssessmentMethod.pdf

Inouye, S., van Dyck, C., Alessi, C., Balkin, S., Siegal, A. & Horwitz, R. (1990). Clarifying confusion: The confusion assessment method. *Annals of Internal Medicine*, 1*13*(12), 941-948.

Jarvis, C. (2008). *Physical examination and health assessment*. St. Louis, MI: Saunders.

Kolanowski, A., Fick, D., Clare, L., Therrien, B., & Gill, D. (2010). An intervention for delirium superimposed on dementia based on cognitive reserve theory. *Aging & Mental Health, 14*(2), 232-242.

Lee, H., Mears,S., Rosenberg, P., Leoutsakos, J., Gottschalk, A., & Sieber, F. (2011). Predisposing factors for postoperative delirium after hip fracture repair in individuals with and without dementia. *Journal of the American Geriatrics Society, 59,* 2306-2313. DOI: 10.1111/j.1532-5415.2011.03725.x

Lin, R., Heacock, L., Bhargavel, G., & Fogel, J. (2010). Clinical associations of delirium in hospitalized adult patients and the role of on admission presentation. *International Journal of Geriatric Psychiatry, 25,* 1022–1029. DOI: 10.1002/gps.2500.

Mayo Clinic. (2010). *Delirium*. Retrieved September 30, 2010, from http://www.mayoclinic.com/health/delirium/DS01064

McNicoll, L, Pisani, M., Ely, W., Gifford, D., & Inouye, S.

(2005). Detection of delirium in the intensive care unit: Comparison of confusion assessment method for the intensive care unit with confusion assessment method ratings. *American Geriatrics Society, 53*, 495-500.

Ouldred, E, & Bryant, C. (2011). Delirium: prevention, clinical features and management. *Nursing Standard, 25*(28), 47-56.

Posner, M. (1990). The attention system of the human brain. *Annual Reviews Neurosciences, 13*,25-42.

Rudolph, J., Harrington, M., Lucatorto, M., Chester, J., Francis, J., & Shay, K. (2011). Validation of a medical record-based delirium risk assessment. *Journal of the American Geriatrics Society, 59,* S289-S294. DOI: 10.1111/j.1532-5415.2011.03677.x

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.

U.S. Census Bureau (2010). State & County Quickfacts: Nevada. Retrieved April 8, 2012 from http://quickfacts.census.gov/qfd/states/32000.html

Vittinghoff, E., & McCulloch, C.E. (2007). Relaxing the rule of ten events per variable in logistic and Cox regression. *American Journal of Epidemiology, 165*(6), 710-718.

Voyer, P., Richard, S., Doucet, L.,& Hugues Carmichael, P. (2009). Predisposing factors associated with delirium among demented long-term care residents. *Clinical Nursing Research, 18*(2), 151-171.

Waszynski, C. (2001). Confusion assessment method (CAM). *Try This: Best Practices in Nursing Care to Older Adults, 13*, 1-2.

Waszynski, C., & Petrovic, K. (2008). Nurse's evaluation of the confusion assessment method. *Journal of Gerontological Nursing, 34,* 49-56.

Wei, L., Fearing, M., Sternberg, E., & Inuoye, S. (2008). The confusion assessment method: A systemic review of current usage. *Journal of the American Geriatrics Society, 56,* 823-830. DOI: 10.1111/j.1532-5415.2008.01674.x