THE PENNSYLVANIA STATE UNIVERSITY
SCHREYER HONORS COLLEGE

SCHOOL OF NURSING

THE EFFECTS OF ENVIRONMENTAL AND ORIENTING DEVICES ON THE PREVALENCE AND SEVERITY OF DELIRIUM SUPERIMPOSED ON DEMENTIA IN HOSPITALIZED OLDER ADULTS

BRITTNEY CHRISTINE DIMEGLIO
Spring 2012

A thesis
submitted in partial fulfillment
of the requirements
for a baccalaureate degree
in Nursing
with honors in Nursing

Reviewed and approved by the following:

Donna M. Fick
Professor of Nursing
Thesis Supervisor
Honors Advisor

Rita Jablonski
Assistant Professor of Nursing
Faculty Reader

Abstract

Delirium superimposed on dementia is common in hospitalized older adults and leads to poor long term outcomes. A few studies have investigated the impact of environmental factors on an episode of delirium, but this research has been sparse and conflicting at times; more research must be done to find the link between these potentially modifiable risk factors and delirium. The purpose of this study was to conduct a secondary data analysis of the association between environmental and orienting devices and the presence and severity of delirium superimposed on dementia in hospitalized older adults. More specifically, to analyze the data related to environmental and orienting devices patients are exposed to while hospitalized and if this has any impact on the prevalence and severity of a delirious episode.

Results were analyzed for 143 hospitalized older adults from the parent study who were screened for dementia using the Modified Blessed Dementia Rating Scale (MBDRS) and were assessed daily using an 11-item environmental tool and the Confusion Assessment Model (CAM). The subjects mean age was 83.47 with a mean length of stay of 6.6 days. Forty percent of subjects experienced delirium during hospitalization. Delirium was found to be related to the total environmental score but not individual orienting and environmental devices. The use of highly sensitive instruments in future studies to measure environmental devices such as the amount of noise and light present in a patient's room may provide more accurate research findings. In addition, nurses and other healthcare professionals can refer to online resources such as the Hospital Elder Life Program (HELP) and ConsultGeriRN.org, which will provide evidence based practice guidelines related to the recognition and prevention of delirium. Nurses using these resources may better address ways to enhance the environment in hospitalized older adults with dementia. Finally, a comprehensive baseline assessment of a patient's mental status will allow for the detection of changes over time.

Table of Contents

List of Figures

List of Tables

Acknowledgements

I would like to thank my Honors Supervisor, Honors Advisor, and Mentor, Donna M. Fick, for taking me under her wing throughout this entire journey; from acceptance into the Schreyer Honors College through graduation. She has shared with me her vast array of knowledge related to delirium superimposed on dementia and the methods of scholarly research.

I would also like to thank Rita Jablonski, the entire School of Nursing, and the Schreyer Honors College, at the Pennsylvania State University, for supporting me throughout my undergraduate educational experiences.

Without the guidance and assistance of these persons, institutions, and my undergraduate collegiate experiences, my accomplishments would not have been the same.

Chapter 1: Significance

Dementia is defined as a mental syndrome involving a sustained loss of cognitive function and memory to an extent sufficient to cause dysfunction in activities of daily living (Voyer, 2006). In contrast, delirium is defined as a mental disorder of acute onset with a fluctuating course, characterized by disturbances in consciousness, orientation, memory, thought, perception, and behavior (Voyer, 2006). Detecting delirium in an elderly patient with dementia is challenging given that many often deal with a variety of health conditions and have poor functional autonomy which makes the detection of delirium much more difficult (Voyer, 2006). Delirium has the potential to cause extensive long-term complications for patients including altering the patient's clinical course, worsening cognitive decline, and potentially causing worse long-term outcomes (Fick, 2002). The most important intervention during a delirium is to find the factor causing the episode and correct it. Incorporating environmental and orienting devices within strategies of delirium prevention has been found to decrease the severity and prevalence of delirious episodes in hospitalized elderly patients with dementia, but these studies have been conflicting.

The prevalence delirium superimposed on dementia in hospitalized and community populations aged 65 and older ranges from 22% to 89% (Fick et. al., 2002). Risk factors for delirium in the hospital setting include immobility, medications, iatrogenic events, intercurrent illness, sensory deprivation, social isolation, and visual and hearing impairments (McCusker, 2001). Failing to recognize episodes of delirium superimposed on dementia contributes to the complicated declines patients experience. Delirious patients have greater in-hospital and post-discharge mortality, prolonged length of hospital stay, multiple occurrences of institutionalization, and an increased functional and cognitive decline (de Rooij, 2005). Additionally, poor detection of delirium complicates hospital stays for at least 20% of the 12.5 million patients 65 years of age or older who are hospitalized each year and increases hospital costs by $2,500 per patient, meaning about $6.9 billion of Medicare hospital expenditures are attributed to delirium (Inouye, 2006). Not only is delirium associated with increased costs, but episodes of delirium have been related to excessive and inappropriate use of central-nervous system medications. Staying attentive to the detection of a delirious episode and decreasing the amount of prescribed medications the elderly consume will cause the amount of funds needed to care for these patients to decrease, along with the prevalence of this devastating disease.

Although there are a growing number of pharmacologic agents available for treating patients with delirium, dementia, and other behavioral disturbances, these medications may only serve to exacerbate or further mask these described adverse effects (Fick, 2002). Case reports, cross-sectional, and cohort

studies have documented that the most common classes of medications that put patients at risk for the development of delirium are sedative-hypnotics, narcotics, antihistamines, antipsychotics, anticholinergics, and cardiovascular drugs (Fick, 2002). For example, exposures to meperidine and benzodiazepines were independently associated with the development of postoperative delirium over the course of 24 hours during a prospective cohort study of patients who developed delirium during postoperative days two through five (Marcantonio, 1994). To combat these problems there are interventions shown to be effective at preventing delirious episodes caused by these harmful classes of medications.

First, instead of exposing the elderly hospitalized patient to high doses of narcotics and other postoperative medications, health care providers can prescribe the lowest possible dose to be administered through the most effective route (Marcantonio, 1994). Additionally, the use of alternative medication choices, including acetaminophen or non-steroidal anti-inflammatories, have shown to reduce narcotic requirements by 30% to 50% while maintaining equal analgesia and should be considered in all patients without clear contraindication (Marcantonio, 1994).

Second, although many of the risk factors for delirium have not been studied in depth evidence has emerged to show that environmental and orienting devices positively affect confusion scores (McCusker, 2001). Environmental devices encompass the following: sufficient lighting, noise level, room changes, the presence of a roommate, extent of disruption, window visibility, the use of restraints, invasive devices, and room changes. Orienting devices include a visible calendar, a visible clock, and a message/orientation board. In a study of inpatients with hip fractures, being in a room by oneself, presence of a visible timepiece, and use of a television were associated with lower confusion scores while sensory overload produced a negative effect on scores (McCusker, 2001). Another study shows that isolation of a patient with no visible daylight or without visits from relatives brings a higher risk of delirium (Rompaey, 2009). In addition, the use of physical restraints before the onset of delirium showed a very high risk while the absence of a clock was no risk factor (Rompaey, 2009).

As the population of baby boomer’s age the incidence of delirium superimposed on dementia is likely to increase, which supports the need to better understand this important clinical issue. A few studies have investigated the impact of environmental factors on an episode of delirium, but this research has been sparse and conflicting at times; more research must be done to find a substantial link. The purpose of this study was to conduct a secondary data analysis of the influence environmental and orientation devices have on the presence and severity of delirium superimposed on dementia in hospitalized older adults. The

purpose was accomplished by analyzing the relationship between orienting devices, hospital environment, and delirium. Through a secondary data analysis the following questions were explored: 1) What is the relationship between the presence of orienting devices and the incidence of delirium in older adults with dementia? and 2) What is the association between the presence of environmental factors and the presence of delirium in hospitalized patients with dementia? Specific environmental and orientation variables to analyze included presence of a clock, presence of a calendar, presence of a message/orientation board, presence of a roommate, amount of disruption, presence of a window, amount of noise and light present, use of restraints, presence of invasive devices, and amount of room changes.

Chapter 2: Review of the Literature

Delirium

Delirium is a prevalent, costly, and global problem in older adults. Defined as a mental disorder of acute onset with a fluctuating course, delirium is characterized by disturbances in consciousness, orientation, memory, thought, perception, and behavior (Voyer, 2006). At the time of admission to a hospital, 10%-20% of older adults meet the diagnostic criteria for delirium, and another 25%-60% develop delirium during the course of their hospitalization (Voyer, 2006). Delirium occurs in up to 60% of patients in nursing homes or post-acute care settings and in up to 83% of all patients at the end of life (Inouye, 2006). Although the overall presence of delirium in the community is only 1% to 2%, the prevalence increases with age, rising to 14% among those more than 85 years old (Inouye, 2006). The mortality rates among hospitalized patients with delirium range from 22% to 76%, as high as the rates among patients with acute myocardial infarction or sepsis (Inouye, 2006). Being knowledgeable of the subtype classification a person with delirium presents with may improve the long term outcomes many patients suffer.

Though an abundance of research has explored delirium, there are still many discrepancies regarding the pathophysiology of this debilitating disease. Both delirium and dementia have been shown to share several pathophysiological features, including deficits in cholinergic transmission, decreased cerebral metabolism, and an inflammatory response (Fick, 2002). According to the revised version of the DSM-IV, the criterion for diagnosing delirium includes four essential features: inattention, a sudden change in cognition, an acute and fluctuating disturbance of consciousness, and an underlying medical cause (de Rooij, 2005). Many researchers agree the most probable causes of delirium are physical disease, head trauma, or drug effect (de Rooij, 2005). Paired with the recognition of delirium based on cognitive symptoms is a subtype classification system including hyperactive, hypoactive, and mixed presentations of delirium (de Rooij, 2005).

Hyperactive delirious patients appear restless, agitated, hyper-alert, and often show hallucinations and delusions (de Rooij, 2005). Those with hypoactive delirium appear lethargic, drowsy, sometimes appear to be sedated, respond slowly to questions, and hardly move spontaneously (de Rooij, 2005). A mixed delirious patient presents with both hyperactive and hypoactive characteristics making the detection complicated. The discovery of hypoactive delirium by nurses is much more difficult than the hyperactive subtype. Presentation of delirium subtypes to nurses yielded recognition of 41% for hypoactive delirium and 54% for hyperactive delirium (Steis & Fick, 2008). Improving the long term outcomes that hospitalized elderly patients with delirium experience involves earlier detection by nurses who are able to

make the distinction between the subtypes of delirium. The percentages of hospitalized elderly patients experiencing delirium on admission or during their hospitalization stay will continue to increase if detection and knowledge remain unimproved. Understanding the differences between dementia, delirium, and delirium superimposed on dementia will allow for more accurate detection and treatment.

Dementia

Dementia, in contrast to delirium, is a term used to describe a form of cognitive impairment that is chronic, progressive, and occurring over a period of months to years (Fick, 2002). Primarily, cognitive deficits must be sufficient to impair social or occupational functioning, but occur gradually and continue to decline. Dementia can eventually lead to death as a result of a continuum of events including impaired short-term memory progressing to impaired use of language and an impaired ability to perform activities of daily living (Fick, 2002). More recent research has focused on a condition known as delirium superimposed on dementia; a person with a preexisting diagnosis of dementia who experiences an acute change in mental status.

Delirium Superimposed on Dementia

Delirium is superimposed on dementia when an acute change in mental status occurs in a patient with preexisting dementia (Fick, 2009). The prevalence of delirium superimposed on dementia ranges from 22% to 89% of hospitalized and community populations aged 65 and older with dementia (Fick, 2002). Detecting dementia and delirium alone are challenging for healthcare providers, especially in the elderly population. Recent literature suggests that delirium and dementia may represent points along a continuum, with delirium reflecting an underlying brain vulnerability in early stage dementia (Fick, 2009). When a hospitalized elderly patient begins to experience an episode of delirium in addition to a previously diagnosed, or many times undiagnosed, dementia, circumstances become much more difficult.

Patients who are frail, very old, afflicted with several diseases, and have poor functional autonomy make the recognition of delirium very difficult (Voyer, 2006). A relevant study reported a prevalence of 57% delirium among demented subjects (n=202) (Voyer, 2006). Another study found that 22% of patients at the early stage of dementia had delirium, 45% among mid-stage dementia patients, and 58% among late-stage dementia patients (Voyer, 2006). Four independent risk factors for under-recognition of delirium by nurses are the presence of the hypoactive form of delirium, age 80 and older, vision impairment, and dementia (Fick, 2002). In a study of 717 patients, the overall presence of delirium was 44% and the

prevalence of delirium superimposed on dementia was 56.7% (Fick, 2002). Twenty-six percent of the 717 patients were classified as having the hypoactive form of delirium, compared with 22% having hyperactive delirium (Fick, 2002). As the evidence reports, the detection of a delirious episode is challenging for healthcare professionals to detect, especially nurses. Still, it becomes even more difficult to recognize an episode of delirium in a patient with a previous dementia.

Preventing delirium is the most effective strategy for reducing its frequency and complications. Some research has been conducted in this area, but more needs to be done and put into practice. The Yale Delirium Prevention Trial demonstrated the effectiveness of intervention protocols targeted towards six risk factors: orientation and therapeutic activities for cognitive impairment, early mobilization to avert immobilization, non-pharmacologic approaches to minimize the use of psychoactive drugs, interventions to prevent sleep deprivation, communication methods and adaptive equipment (especially eye glasses and hearing aids) for vision and hearing impairment, and early interventions for volume depletion (Inouye, 2006). In support, a randomized clinical trial involving patients who had had hip fractures demonstrated the effectiveness of a multicomponent strategy for the prevention of delirium including pain management, reduction in the use of psychoactive drugs, early mobilization, prevention of postoperative complications, appropriate environmental stimuli, and treatment of delirium symptoms (Inouye, 2006).

The use of non-pharmacologic methods should be instituted in every patient when striving to address predisposing and precipitating factors causing the delirious event (Inouye, 2006). These non-pharmacologic methods include creating a calm, comfortable environment with the use of orienting influences such as calendars, clocks, and familiar objects from home; regularly reorienting the patient to staff members; involving family members in supportive care; limiting room and staff changes; coordinating schedules for administering drugs, obtaining vital signs, performing procedures to allow the patient an uninterrupted period for sleep at night with low levels of noise and lighting; and encouraging normal sleep-wake cycles by opening blinds and encouraging wakefulness and mobility during the daytime (Inouye, 2006). These non-pharmacologic prevention strategies are the focus of this secondary data analysis. More specifically, to study the effects orientation devices such as calendars and clocks, the presence of a roommate, and amounts of noise and light present in the hospitalized patient’s room have on the presence and severity of delirium superimposed on dementia.

Health Care Costs and Delirium

With the development of delirium associated with increased morbidity and persistent functional decline, many other factors of a hospitalization stay suffer including increased nursing time per patient, higher per-day hospital costs, increased length of hospital stay, higher rates of nursing home placement, and increased mortality (Leslie, 2008). Patients aged 65 years of age and older account for more than 48% of all days of hospital care (Leslie, 2008). With the elderly population growing daily this percentage is only expected to worsen.

A recent study provides a comprehensive cost estimate for all direct health care services from index hospitalization through one year after discharge of hospitalized patients aged 70 years and older who previously participated in a controlled clinical trial of a delirium prevention intervention (Leslie, 2008). Those patients with delirium survived an average of 256 days during the one year follow up period, compared with 322 days for patients without delirium (Leslie, 2008). The total unadjusted healthcare costs were significantly higher for patients who developed delirium during the index hospitalization than for those without delirium (mean [SD], $69,498 [$59,120] vs $47,958 [$45,640], respectively; $P < .001$) (Leslie, 2008). Furthermore, the total costs per day survived for delirious patients compared to non-delirious patients were more than two and a half times higher (Leslie, 2008).

The economic burden of delirium is significant. As the aging population increases the incidence of delirium will continue to increase, and the expenditures related to the hospitalizations of these patients will ultimately increase. With the amount of health care costs directed toward the care of hospitalized patients who develop delirium, a greater understanding of the precipitating factors, the detection, and the prevention verses the acceleration of delirium is pertinent.

Medication and Delirium

Among the long list of risk factors exposing hospitalized elderly patients to the development of a delirious episode is the use of medications. Although some studies have shown weaker relationships between the use of medications and the develop of delirium, the class of neuroleptic medications appears to be associated with delirium. A study analyzed a variety of risk factors related to the development of delirium and found that certain medications do have a correlation with the development of delirium. A multivariate analysis of medication groups traditionally associated with delirium, including neuroleptics, narcotics, H2 blockers, digoxin, anticholinergics, benzodiazepines, steroids, and non-steroidal anti-

inflammatories, showed that the use of narcotics and/or the use of neuroleptics increased the odds of delirium (Schor, 1992).

Postoperative exposure to psychoactive medications has been shown to play a role in the development of postoperative delirium. With medication usage rates among the elderly population high, the amount of medication administration in the hospital setting with an elderly patient diagnosed with dementia is even higher. A study found that meperidine has a statistically significant association with delirium (Marcantonio, 1994). Meperidine's metabolite, normeperidine, is active, has a long half-life, and is idiosyncratically metabolized by the liver, allowing its accumulation to toxic levels in patients receiving continuous meperidine (Marcantonio, 1994). Furthermore, meperidine and normeperidine have much more anticholinergic activity than other narcotics creating higher serum anticholinergic activity, which has been reported to cause postoperative delirium in surgical patients more than in patients whose serum anticholinergic activity is lower (Marcantonio, 1994). Of the most repetitive results, opioids, corticosteroids, and benzodiazepines, all included within the class of psychoactive drugs, have shown promising results for a relationship with the development of delirium.

Environment, Orienting Devices, and Delirium

Although some cases of delirium may be unavoidable, clinical trials provide compelling evidence that at least 30% to 40% of cases may be preventable (Inouye, 2006). With evidence to estimate the amount of health care costs directed towards the care of patients with delirium, the large amount of time needed spent on the care of delirious patients and the long-term outcomes delirious patients face, it is imperative to implement strategies aimed at preventing delirium. One of the interventions discussed is using fewer pharmacologic strategies and using more non-pharmacologic strategies for prevention. For example, the use of orienting devices such as clocks and calendars, and environmental devices such as reduction of noise level and amount of light, have shown to positively affect the severity of delirium.

A recent study of inpatients aged 65 and older admitted to medical or surgical units found that a high number of medications administered during hospitalization, surgery, a high number of procedures, and intensive care treatment were associated with the development of delirium (McCusker, 2001). In all groups of patients, Delirium Index (DI) scores tended to increase in the following categories: Transition into or out of isolation; a high number of room changes; hospital unit (when in the ICU, patients were estimated to have DI scores 4.6 points higher than when in the medical units); presence of dementia and physical restraints; and presence of a family member (McCusker, 2001). The weakness emerges when

looking at the presence of a radio, TV, calendar, hearing aid, and noise and lighting level because there is not enough research conducted in these areas to support repeated, significant findings.

Other studies have looked at environmental devices and have found similar results, but the results have been conflicting. A study of 523 patients investigated factors related to patient characteristics, chronic pathology, acute illness, and the environment for their contribution to the development of delirium in the intensive care patient (Rompaey, 2009). With respect to the environmental results founded in the study, the isolation of a patient, no visible daylight, no visits from relatives, and the use of physical restraints showed a higher risk of dementia after multivariate analysis (Rompaey, 2009). These results provide more reason to support future research in this area of delirium prevention. These non-pharmacologic methods of delirium prevention have shown scarce, but promising results for both the patient, the health care provider, and the economy.

In a more recent study of orientation to time as a guide to the presence and severity of cognitive impairment in older hospital patients, researchers found that of 262 patients, the fifteen subjects with delirium misidentified (or failed to respond to) the year and the day of the month, 93.3% (14) did not know the time and 80.0% (12) did not know the month or day of the week (O'Keeffe, 2010). To further show this inability to be oriented to time, the results showed a strong relationship between the duration of hospital stay and both the presence and the magnitude of errors in identifying the date and day of the week (O'Keeffe, 2010). These results are not surprising given the relative absence of usual social and environmental cues (especially a clock and calendar) during prolonged hospital stays (O'Keeffe, 2010). Keeping aware of a patient's orientation to time is one of the most effective strategies for determining whether a patient has dementia or not, and in predicting cognitive decline over time (O'Keeffe, 2010). More important, the elderly who endure long hospital stays suffer an even greater disorientation to the environment due to prolonged periods of time without the social and environmental cues experienced daily when not hospitalized.

Summary

It is important to not only look at what pathophysiological factors cause delirium and dementia, but also to pay attention to aspects of the environment predisposing one and affecting the severity of delirium superimposed on dementia in the elderly population. Although the current literature has a baseline understanding of delirium, dementia, delirium superimposed on dementia, and what causes them, the piece missing is how the environment affects these areas. Unlike a person's genetic characteristics and chronic co-comorbidities, the patient's overall environment and presence of an acute illness are factors we

as healthcare providers can strive to modify (Figure 1). Health care providers can control the presence of a clock, a TV, or a calendar in a patient's room to keep them oriented throughout their hospital stay. Health care professionals need to make the hospital environment match that outside the hospital as much as possible.

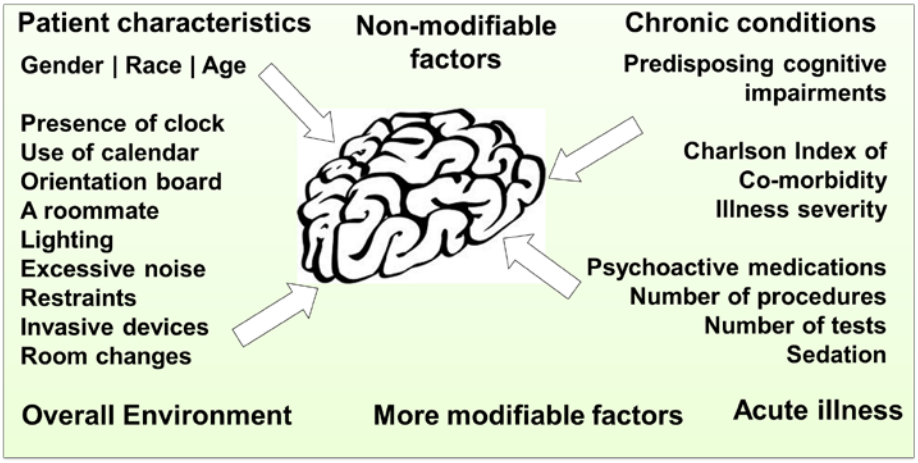

Figure 1. The environment, DSD, and the brain

Adapted from Rompaey, et. al. (2009)

These simple changes and attention to environment may have an important impact on the number of patients who experience delirium and may have the potential to decrease the amount of people who suffer from dementia. More research must be conducted in the area of environmental and orienting devices affecting the severity of delirium in hospitalized elderly patients for answers to be discovered and changes to be made.

Chapter 3: Methods

Design

This study was an exploratory design utilizing a secondary data analysis from the original parent study by Fick (ClinicalTrials.gov Identifier NCT01394328). The study questions were: 1) What is the relationship between the presence of orienting devices and the incidence of delirium in older adults with dementia? and 2) What is the association between the presence of environmental factors and the presence of delirium in hospitalized patients with dementia?

Secondary Data Analysis

Defined by Pilot and Hungler as "the use of data gathered in a previous study to test new hypotheses or explore new relationships," a secondary data analysis "builds off the design, sampling, and data collection decisions of the original research team, but focuses on variables and relationships that were not considered before" (Stommel, 2004). Although the secondary analysis is subject to use the previously collected data it is possible to select on a subset of the original data to analyze. The main idea of a secondary data analysis is that a new research idea creates a new research problem, but the ideas are relatable to the existing research data (Stommel, 2004). Though there are many advantages to conducting a secondary data analysis including the availability of existing data, low costs, and comprehensive data collection, there are disadvantages, or data quality issues to be aware of.

The main concern to pay close attention to when conducting a secondary data analysis is the variety of data quality, or validity, issues that occur due to the fact the research data being used is not researcher-controlled (Stommel, 2004). Issues of validity that may arise are completeness, coding, accuracy and use of multiple data coders, choice and application of coding categories, reliability, and accuracy of computer-based data files. Completeness means parts of the existing data may be incomplete or missing entirely and poses the question of how to deal with the missing data (Stommel, 2004). Coding errors occur when the existing data is not coded in a way that is fitting for the secondary data analysis and often occurs when standardized measures are not used during the original data collection (Stommel, 2004). In addition, the accuracy, choice, and application of coding strategies is important to be consistent throughout the data collection to yield interpretable data categories once data collection is complete (Stommel, 2004). It is important to use multiple data sources to help detect and reduce the amount of reliability issues such as data omissions and errors (Stommel, 2004). The advantages, disadvantages, and

data quality issues mentioned are important to pay close attention to when analyzing and synthesizing the data collected from the parent study described below.

Parent Study

The parent study (ClinicalTrials.gov Identifier NCT01394328) was funded by the National Institute of Health/National Institute on Aging. The aims of the parent study were to identify risk factors associated with delirium in hospitalized persons with dementia and to describe the immediate and post-hospital (1 & 3 months) trajectory of cognitive decline and associated outcomes in persons with dementia who develop delirium.

Parent Study Sample

Fick conducted a sample size analysis using risk factors and primary outcomes. The planned sample size included enrolling 165 subjects with dementia and following them during their hospitalization and a 3-month follow-up period. To achieve a power of 0.80 at an alpha of 0.05 a sample size of 125 was necessary, but the sample size increased to 165 to account for attrition and other losses. While 152 patients were enrolled in the study, the final analysis included data from 143 patients after drop outs and excluded enrollments were eliminated. The study also included proxies who were enrolled within 24 hours of the patient's admission to the hospital. The proxy was required to fully consent to the study and participate in interviews throughout the duration of the study.

All study participants were followed daily during their hospitalization and throughout their inclusion in the study. At the time of enrollment proxies/family members were interviewed to confirm the patient's mental status. Research Assistants (RAs) were trained to perform the Confusion Assessment Model (CAM) and Mini Mental Status Exam (MMSE) daily on enrolled patients. RAs also reviewed nursing documentation, medication administration records, and laboratory results for patient status.

Research Assistant Training

All the assessments and daily delirium ratings were completed by a registered nurse or RA. The RAs were trained in proper administration of the CAM and other testing methods used in the study using tested methods developed by Dr. Inouye. After training was completed final interrater reliability assessments were conducted in persons with dementia to assess the consistency of measurements among RAs.

Enrollment of Study Participants

Enrollment and screening of potential study participants was controlled by the RAs. RAs reviewed a daily computerized admission log of all patients 65 years of age and older admitted to the hospital for potential enrollment. Then they reviewed the potential patient's medical records for any evidence of dementia or delirium before approaching them for consent. Family members and/or caregivers were expected to consent to enrollment in the study, in addition to the patient, to take part in interviews throughout the duration of the study.

Inclusion and Exclusion Criteria

Inclusion criteria for the sample were persons with dementia on one of the selected medical-surgical units aged 65 and older, English speaking, had been hospitalized less than 24 hours, and met the criteria for dementia according the Modified Blessed Dementia Rating Scale (MBDRS). Persons were excluded from study enrollment if they had any significant neurological or neurosurgical disease associated with cognitive impairment other than dementia; were nonverbal and unable to communicate due to severe dementia (MMSE= 0), aphasia, intubation, or terminal illness; had no family or caregiver to interview; or had a pre-existing delirium.

Setting

The study participants were inpatients of a 200-bed community hospital in Central Pennsylvania. At the start of the study's year 38% (4,029 of 10,587 total) of the hospital's inpatient admissions were older adults age 65 and above. During the same time period 12% (471) were persons with dementia (measured by ICD-10 code). Letters of support from the hospital and consultant assisting with access and recruitment were obtained.

Measures

The following explains the methods or instruments of measures used in the parent study (Table 1).

Dementia

The study confirmed dementia with two measurements as well as documented symptoms of dementia over at least a six-month time period. The study defined dementia as a Modified Blessed Dementia Rating

Score (MBDRS) of greater than 3 and an IQCODE of greater than or equal to 3.3. Both of these measures have been widely used for identification of a pre-existing cognitive impairment in outpatient and hospital settings and were specifically developed for proxy administration (Pisani, 2004).

Modified Blessed Dementia Rating Scale (MBDRS)

The MBDRS is a rating scale that correlates with pathological assessment of dementia, discriminates between demented and non-demented subjects, and correlates well with objective patient measures of dementia (Pisani, 2003). The dementia score is based on two methods of evaluation including the evaluation of the patient's ability to complete everyday tasks of living and secondly the patient's ability to complete a series of simple psychological tests (Blessed, 1988) (Appendix B). The first score can fall between 0 (fully preserved capacity) and 28 (reflecting extreme incapacity) after computing scores of 1 for total incompetence in an activity and ½ for partial, variable, and intermittent incapacity in the activity (Blessed, 1988). Competency in tasks related to social, domestic, and practical tasks of everyday life were scored (Blessed, 1988). The second part of the rating is given a score between 0 (complete failure) and 37 (positive score) depending on the patient's performance of psychological tasks including orientation, remote memory, recent memory, and concentration (Blessed, 1988).

IQCODE

The IQCODE is a 16-item questionnaire created to measure cognitive decline over time to provide a longitudinal perspective of cognitive functioning (Pisani, 2004). The variability of IQCODE administration has been shown through the use in person, by television, and by mail interview (Pisani, 2004). In development and cross-validation studies an IQCODE score of greater than 3.3 had a sensitivity of 79% and a specificity of 82% for the diagnosis of dementia. The IQCODE has been used to evaluate the presence of dementia and predict the development of dementia after hospital discharge through direct patient assessment using cognitive screening tests (Pisani, 2004). The IQCODE can assess memory, coping ability, ability to learn, and ability to perform simple arithmetic (Pisani, 2004).

Delirium

Persons with prevalent and incident cases of delirium were enrolled in the study. The study assessed delirium with the Confusion Assessment Model (CAM) and the Delirium Rating Scale (DRS).

Confusion Assessment Model (CAM)

The CAM, a method retrieved from the DSM-III-R, a review of the literature, and an expert panel, identifies nine clinical features of delirium (Inouye, 1990) (Appendix C). The clinical features identified include an acute onset and fluctuating course, inattention, disorganized thinking, altered level of consciousness, disorientation, memory impairment, perceptual disturbances, increased or decreased psychomotor activity, and disturbance of the sleep-wake cycle (Inouye, 1990). A diagnosis of delirium is made based on the presence of four of the mentioned clinical features including 1) acute onset and fluctuating course, 2) inattention, 3) disorganized thinking, and 4) altered level of consciousness (Inouye, 1990). An acute onset and fluctuating course and inattention must be present for a diagnosis of delirium, along with either disorganized thinking or an altered level of consciousness. The CAM has shown to have high sensitivity, high specificity, and a high interrater reliability (Inouye, 1990).

Delirium Rating Scale

The DRS-R-98 consists of a 13-item severity scale for repeated measures and three diagnostic items for initial rating including temporal onset of symptoms, fluctuation of symptoms, and physical aetiology (Scheffer, 2010). The severity items are rated from 0-3 points and include language, thought process, and symptom intensity (Scheffer, 2010). The inter-rater reliability of the DRS-R-98 severity scale was 0.97 with a confidence interval of 95% (0.96-0.98) (Scheffer, 2010). The original study used the severity score which ranges from 0-39 to rate the severity of the delirium.

Delirium Superimposed on Dementia (DSD)

DSD was defined in the study as persons meeting the full diagnosis of dementia according to the MBDRS and also met CAM criteria on either initial or follow-up assessment. The diagnosis of DSD is a combination of the CAM criteria and the MBDRS criteria for dementia.

Severity of Dementia

The Clinical Dementia Rating scale (CDR) was used to stage the level of dementia of study participants. The CDR was administered every other day during the proxy/family interview.

Clinical Dementia Rating Scale (CDR)

Using the CDR, RAs rated the participants level of cognitive functioning by evaluating six areas: memory, orientation, judgement and problem solving, community affairs, home and hobbies, and personal care. Possible scores range from 0-3. The first level or no dementia is 0; the second level is questionable dementia, or 0.5; the third level is mild dementia, or 1; the fourth level is moderate dementia, or 2; and the fifth level is severe dementia, or 3 (Hughes, 1982).

Co-morbidity

To account for patient's co-morbidities the Charlson's Co-morbidity Index (CCI) was utilized.

Charlson's Co-morbidity Index (CCI)

The CCI was developed as an index based on patient medical record information and patient self-report that provides a simple measure for estimating the risk of death associated with comorbid illness, while also taking into account the number and seriousness of the comorbid illnesses (Mukherjee, 2010). The CCI is commonly used in health related research to control for confounding variables in research studies and for risk adjustment for quality purposes (Mukherjee, 2010). A large retrospective study showed that demented patients had significantly higher numbers of co-morbid conditions (mean CCI= 1.9) than patients without dementia (mean CCI= 1.0) (Zekry, 2007). Co-morbidity is important to consider during baseline data collection and for follow-up purposes. Co-morbidity affects mortality, health resource utilization, quality of life, and functional status (Mukherjee, 2010).

Mental Status

The Mini Mental Status Exam (MMSE) was administered each day throughout the patient's length of stay (LOS) to assess mental status.

Mini-Mental State Exam (MMSE)

The MMSE is composed of two sections: the first section requires only vocal responses, which covers orientation, memory, and attention, while the second section assess the ability to name, follow verbal and written commands, write a sentence spontaneously, and copy a complex shape

(Folstein, 1974). The maximum score with the two sections combined is 30 (Appendix D). The MMSE is reliable on 24 hour or 28 day retest by single or multiple examiners (Pearson coefficient 0.887 when given twice, 24 hours apart, by the same tester) (Folstein, 1974). The MMSE is a valid test of cognitive function and is useful in the separation of those persons with cognitive disturbances from those without such disturbances (Folstein, 1974).

Environment

Each patient's environment was evaluated daily using the environmental tool adapted from Voyer, et. al. (2009). The tool is made up of two parts: orienting devices and environmental devices (Appendix A).

Orienting devices analyzed in the secondary data analysis included the presence of a clock, calendar, and message/orientation board. The patient received one (1) point towards their total environmental score if the device was present (1=orienting device present) or a zero if the device was absent (0=absent).

Environmental devices analyzed in the secondary data analysis included a roommate, disruptions, a window, lighting, noise, invasive devices, restraints, and room changes. The patient received one (1) point if there was no roommate (roommate absent). If a roommate was present and was not disruptive the patient received one (1) point towards their total score. If a window was present in the patient's room they received one (1) point. If lighting and noise level were adequate within the patient's room they received one (1) point for each category toward their total score. If invasive devices and restraints were absent from the patient's environment they received one (1) point towards their total environmental score. If the patient had no room changes they received one (1) point towards their total score.

Scores for each category are summed (range, 0-11) and the adequacy of the patient's environment could be assessed. With this tool high scores (11) indicate an adequate environment, which positively influences a patient's mental status with an aim to decrease the incidence of delirium. Therefore, low scores (0) indicate an inadequate environment, which negatively affects a patient's mental status and increases the incidence of delirium.

Table 1. Data Collection Variables from Parent Study for Secondary Data Analysis

Patient Variable	What	When	How	Purpose/Question
Modified Blessed Dementia Rating Scale (MBDRS)	Dementia	Within 24 hours of admission	Proxy	Descriptive
Confusion Assessment Model (CAM)	Delirium	Daily	Patient interview & medical record, observation	Primary Outcome
Clinical Dementia Rating scale (CDR)	Dementia severity	Every other day	Proxy	Descriptive
Charlson's Co-morbidity Index (CCI)	Co-morbid illnesses	Admission	Medical Record	Covariate
Mini-Mental State Exam (MMSE)	Mental Status (daily)	Every day	Patient interview	Primary Outcome
Demographics	X	Admission	Medical Record/Proxy	Descriptive
Hearing/Vision Impairment	X	Within 36 hours of admission	Proxy research nurse assessment	Primary Outcome (Environmental)
Clock	X	Admission and daily	Observation	Primary Outcome (Orienting)
Calendar	X	Admission and daily	Observation	Primary Outcome (Orienting)
Message/Orientation Board	X	Admission and daily	Observation	Primary Outcome (Orienting)
Noise level	X	Admission and daily	Observation	Primary Outcome (Environmental)
Amount of light	X	Admission and daily	Observation	Primary Outcome (Environmental)
Presence of a roommate	X	Admission and daily	Observation	Primary Outcome (Environmental)
[Roommate] Disruptive	X	Admission and daily	Observation	Primary Outcome (Environmental)
Presence of a Window	X	Admission and daily	Observation	Primary Outcome (Environment)
Invasive Devices	X	Admission and Daily	Observation	Primary Outcome (Environment)
Restraints	X	Admission and Daily	Observation	Primary Outcome (Environment)
Room Change	X	Admission and Daily	Observation	Primary Outcome (Environment)

Statistical Analysis

Descriptive statistics, Pearson product-moment correlations, and logistic regressions were generated for included variables.

Descriptive statistics were generated for all variables included in the study. The statistics were primarily used to describe the characteristics of the sample from where the data was collected. Descriptive statistics including frequency distributions, measures of central tendency, and measures of dispersion are presented in Table 2.

Pearson product-moment correlations measure the association between two variables. The Pearson correlation coefficient, r, can range in value from +1 to -1. A value of 0 indicates no association between variables. A value greater than 0 indicates a positive relationship meaning both variables move in the same direction; if X increases, Y increases and if X decreases, Y decreases. A value less than 0 indicates a negative, or inverse, relationship meaning the variables move in opposite directions; if X increases, Y decreases and if X decreases, Y increases. The stronger the value is to either +1 or -1 determines the strength of the positive or negative association between variables. A value was considered to represent significance at the 0.5 level.

Regression analysis predicts the value of an unknown variable knowing the value of the known variable, which is the independent variable. The variable to be predicted in regression analysis is the dependent variable. The independent variable is used to predict the value of the dependent variable. The regression analysis explains as much of the variance in the dependent variable as possible as represented by the regression coefficient R.

Chapter 4: Results

Out of 143 patients enrolled in the study 39.2% (56) were male and 60.8% (87) were female. The mean age was 83.5, with a minimum age of 65 and a maximum age of 96 years; data on age was available for 142 older adults. Mean length of stay (LOS) was 6.6 days, as based on a sample of 83 elders (Table 2b). All 143 patients included in the study met the BLESSED criteria for dementia for enrollment in the study. The incidence, or new onset, of delirium was found in 40.6% (58) of patients. Research assistants (RAs) did not detect delirium during the course of hospitalization in 59.4% (85) of patients (Table 2a).

Table 2a. Selected Characteristics of Study Population Frequency Distributions

Variable	Frequency	Percent
Gender		
Male	56	39.2
Female	87	60.8
Total	143	
Race		
White	139	100.0
Non-white	0	0.0
Total	139	
Delirium at any time during hospitalization (CAM)*		
No	85	59.4
Yes	58	40.6
Total	143	

*Delirium during hospitalization was determined using the Confusion Assessment Model (CAM)

Table 2b. Selected Characteristics of Study Population Summary Descriptive Statistics

Variable	n	Mean	Standard Deviation
Age	142	83.5	6.70
LOS*	83	6.6	4.79
Charlson Co-morbidity Index	138	2.4	1.50
Total days with a positive CAM**	143	0.9	1.61
MMSE***	139	15.9	7.29

*LOS- Length of stay

**CAM- Confusion Assessment Model

***MMSE- Mini Mental Status Exam

Bivariate correlations between individual environmental and orienting devices and the presence and severity of delirium during hospitalization are shown in Table 3. None of these correlations were

statistically significant ($p<0.05$). When total environmental scores were considered a relationship was found between the environment and delirium.

Table 3. Descriptive Statistics and Pearson Product Moment Correlations for Environmental and Orienting Devices and the Presence/Severity of Delirium Any Time During Hospitalization

Variable	Level	Frequency	Valid Percent (%)	Presence of Delirium		Severity of Delirium	
				r	p-value	r	p-value
Clock (1=present, 0=absent)	Present	103	82.4				
	Absent	22	17.6	-0.079	0.383	-0.109	0.226
	Total	125					
Calendar (1=present, 0=absent)	Present	12	9.3				
	Absent	117	90.7	0.058	0.514	-0.008	0.924
	Total	129					
Message/Orientation Board (1=present, 0=absent)	Present	2	66.7				
	Absent	1	33.3	0.000	0.000	0.189	0.879
	Total	3					
Roommate (1= absent, 0=present)	Present	74	52.9				
	Absent	66	47.1	0.091	0.284	0.022	0.793
	Total	140					
Roommate Disruptive (1=absent, 0=present)	Present	4	3.0				
	Absent	131	97.0	0.049	0.576	0.062	0.473
	Total	135					
Lighting (1=adequate, 0=inadequate)	Adequate	124	89.9				
	Not adequate	14	10.1	0.082	0.338	0.035	0.684
	Total	138					
Window (1=present, 0=absent)	Present	97	70.3				
	Absent	41	29.7	0.117	0.170	-0.004	0.959
	Total	138					
Noise Level (1=adequate, 0=inadequate)	Adequate	133	94.6				
	Not adequate	5	3.6	-0.080	0.352	-0.044	0.606
	Total	138					
Invasive Devices (1=absent, 0=present)	Present	118	91.5				
	Absent	11	8.5	-0.043	0.625	-0.008	0.927
	Total	129					
Restraint (1=absent, 0=present)	Present	1	0.7				
	Absent	137	99.3	-0.103	0.228	-0.058	0.500
	Total	138					
Room Change (1=absent, 0=present)	Yes	6	4.5				
	No	128	95.5	-0.120	0.167	-0.001	0.994
	Total	134					
Hearing Impairment (1=absent, 0=present)	Present	23	20.5				
	Absent	89	79.5	0.060	0.527	0.017	0.855
	Total	112					

Statistically significant results were observed when looking at patients' total environmental scores throughout LOS, the total number of days the environmental tool was administered, and their presence of delirium (Table 4). The bivariate correlation between the occurrence of delirium during hospitalization and the total sum of environmental scores throughout LOS is statistically significant and positive, meaning that delirium during hospitalization was more likely to occur among patients with high total environmental scores ($r=0.316$, $p<0.001$). The total number of days the environmental tool was administered throughout LOS was positively correlated with the occurrence of delirium ($r=0.345$, $p<0.001$). However, a patient's initial environmental score was not significantly related to the presence of delirium ($r=0.031$, $p=0.718$).

Results also indicated that the total sum of environmental scores throughout LOS, with higher scores indicating a more adequate environment, was found to be significantly related to a greater number of days with a positive CAM ($r=0.526$, $p<0.001$). Similarly, the total number of days the environmental tool was administered throughout LOS was positively correlated to the total number of days with a positive CAM ($r=0.576$, $p<0.001$). Again, a patient's initial environmental score was not significantly related to the severity of delirium ($r=-0.041$, $p=0.628$). However, neither the Charlson Co-morbidity Index nor MMSE scores were significantly related to the sum of environmental scores throughout LOS ($r=0.074$, $p=0.394$ and $r=-0.061$, $p=0.480$, respectively), total number of days the environmental tool was administered throughout LOS ($r=0.080$, $p=0.351$ and $r=-0.120$; $p=0.162$, respectively), or patient's initial environmental score ($r=0.044$, $p=0.611$ and $r=0.051$, $p=0.559$, respectively).

Further, LOS was found to be significantly related to the presence and severity of delirium during hospitalization and to influence mental health status measurements, as represented by CAM and MMSE scores (Table 4). Length of stay was positively related to experiencing delirium during hospitalization ($r=0.417$, $p<0.001$), meaning the longer the patient's stay the more likely they were to experience delirium. Moreover, when LOS increased, the severity of delirium increased in patients with dementia, that is they had more days with a positive CAM ($r=0.719$, $p<0.001$). In addition, when a patient's LOS increased, there was a tendency for their MMSE score to decline ($r=-0.198$, $p=0.074$), indicating a poorer mental status score when hospitalized for an extended period of time. The relationship between LOS and the Charlson Co-morbidity Index was not statistically significant ($r=0.108$, $p=0.336$).

Table 4. Pearson Product Moment Correlations Between Length of Stay (LOS) and Delirium and Other Variables

Variable	r	p-value	n
Delirium at any time during hospitalization (CAM)*	0.417	p<0.001	83
Severity of Delirium**	0.719	p<0.001	83
Charlson Co-morbidity Index	0.108	p=0.336	82
MMSE***	-0.198	p=0.074	82

*Delirium during hospitalization was determined using the Confusion Assessment Model (CAM)

**Severity of delirium was determined looking at how many days the patient had a positive CAM during hospitalization

***MMSE- Mini Mental Status Exam

The relationship between the presence of delirium during LOS and the sum of the environmental scores throughout LOS was examined controlling for the number of days the tool was administered using logistic regression analysis. Results indicate that once the total number of days the environmental tool was administered is controlled, the relationship between the sum of environmental scores throughout LOS and the presence of delirium was no longer statistically significant (p=0.174).

Ordinary least squares regression analysis was also used to examine the relationship between the remaining cognitive variables (total days with a positive CAM, Charlson Co-morbidity Index, and MMSE score) and the sum of environmental scores throughout LOS, controlling for the number of days the tool was administered. Results indicate that, after controlling for the number of days the tool was administered, the relationship between the sum of environmental scores throughout LOS and total number of days with a positive CAM was negatively and significantly related (regression coefficient=-0.065, p=0.001). This result indicates that delirium was less severe (occurred less frequently) in more adequate environments.

The regression analysis for MMSE indicated that after controlling for the number of days the tool was administered, the relationship between the sum of environmental scores through LOS and MMSE scores was positively and significantly related (regression coefficient=0.263, p=0.021), indicating that mental status scores were better when environments were more adequate. The relationship between the sum of environmental scores throughout LOS and the Charlson Co-morbidity Index was not statistically significant, even after controlling for the number of days the tool was administered (p=0.838).

Chapter 5: Discussion and Implications

This study has investigated the potentially positive effects the presence of environmental and orienting devices have on the presence and severity of delirium superimposed on dementia in hospitalized older adults. The study design allowed for further investigation into which factors have a positive impact on the development of delirium in persons with dementia. The most significant finding is that total sum of environmental score was related to the total number of days with a positive CAM for delirium. When environmental scores increased, indicating an adequate environment, the total number of days patients exhibited a positive CAM decreased. This means that when a patient's environment contained more environmental and orienting devices the incidence of delirium during hospitalization decreased over time. From this we can say that an association exists between environmental and orienting devices and that a patient's environment may positively influence whether they develop delirium or not.

While each individual environmental and orienting device did not show significant correlation to the incidence of delirium during hospitalization, total environmental scores did show an association. When patient LOS increased, the total environmental scores throughout LOS also increased. In addition, as LOS increased, more patients were found to experience delirium; the longer a patient stayed in the hospital the greater the risk for the development of delirium. In addition, while environmental scores over time (when we controlled for number of days the tool was administered) correlated with a decrease in delirium according to the CAM, environmental scores were found to be positively correlated with mental status according to the MMSE; when patients' environmental scores increased MMSE scores increased, as well. These findings indicate that an adequate environment may influence mental status and an improved environment shows improvement in mental status and may lead to fewer days with delirium.

Although the study did not show strong statistical significance between delirium and individual environmental and orienting devices other variables such as LOS, sum of environmental scores, and CAM and MMSE scores did. The adapted environmental tool used for this study showed positive results, however, there were limitations to its usage. Since the parent study did not focus on environmental and orienting devices there were many instances of missing data throughout the patient's study records. The documentation of environmental and orienting devices included on the environmental tool were not consistently documented which made it difficult to accurately score all patient's environments throughout their entire LOS. To more accurately score a patient's environment, more reliable measurement devices need to be invested in, such as light and noise meters, which would specifically measure the amount of

light and noise present in the patient's room. These types of intensive measurements would allow for more sensitive measures to replace observational reporting, which can be subjective and inaccurate.

A previous study which investigated the patient's environment explored the effect of environment on awareness in persons with dementia (Nelis, 2011). These studies have shown that nurses and other staff categorize persons with dementia as "unaware" and are less willing to interact with them . Awareness is a vague term that is influenced by many factors including psychological, physical, and emotional factors. There is a great range of levels of awareness in persons with dementia, which has a great deal to do with their self-concept. Although persons with dementia experience negative feelings towards self-concept, sense of identity, and awareness, these concepts are still maintained throughout the course of dementia (Nelis, 2011). Positive effects of support, addressing emotional symptoms such as anxiety and depression, responding to individuality, and providing a positive environment with engaging activities have shown to improve awareness in persons with dementia (Nelis, 2011)

In addition, a study by Flaherty and colleagues (2011) found that the implementation of a Delirium Room (a four-bed patient room within a hospital unit that provides 24-hour nursing care, emphasizes nonpharmacological approaches to care, and is completely free of physical restraints) leads to improved patient safety and the potential lessening of negative outcomes associated with delirium. Other studies have investigated environmental factors within nonpharmacological approaches to nursing care and their relation to delirium, but this has not been the pure focus of research studies.

The need for further studies which specifically investigate environmental variables which relate to the incidence and severity of delirium superimposed on dementia is imperative. Nonpharmacological approaches to nursing care have shown promising results, especially in those with cognitive deficits. Further, a more comprehensive understanding of dementia and delirium in nurses will positively affect the sensitive detection of altered confusion in these patients.

Nurses, as well as nursing assistants, volunteers, physicians, and other trained professionals are able to utilize resources and implement strategies for the prevention and management of delirium. There are a multitude of online resources available for reference that provide information about DSD and evidence based practice guidelines established for the care of these older adults (Table 5). Some of these resources include the Hospital Elder Life Program (HELP) and Gero Nurse Online, which provide information regarding nursing care and the prevention of delirium in older adults.

Table 5. Resources for Delirium Prevention and Management

Resource	Website	Description
Hospital Elder Life Program (HELP)	http://www.hospitalelderlifeprogram.org/public/public-main.php	Provides information about recognizing and preventing delirium in hospitalized older adults
Gero Nurse Online	http://www.geronurseonline.org/	Provides information regarding nursing care of older adults
How To Try This	http://www.nursingcenter.com/library/static.asp?pageid=730390	Provides clinical and professional information for evidence based practice needs
Vancouver Island Health Authority	http://www.viha.ca/mhas/resources/delirium/tools.htm	Provides information for professionals and family members who support those who develop dementia, includes videos
ConsultGeriRN.org	http://consultgerirn.org/?gclid=CN-by9GIha8CFeYRNAodhH6-1A	Provides evidence based comments to reduce delirium in hospitalized older adults

*Sites accessed March 25, 2012

In addition, there are many intervention strategies that can easily be implemented within nursing practice to prevent and manage delirious episodes, such as keeping patients oriented to their environment and supplying patients with activities to promote cognitive stimulation (Table 6). Reducing the frequency and complications associated with delirium is the most effective strategy to prevent delirium. Interventions recommended to prevent delirium frequently overlap with those aimed at managing delirium. Using the provided online resources and intervention strategies, caregivers should try to restore physical and mental functioning to the patients individualized baseline status. Although there has been some research conducted in this area, there are few studies that have solely investigated the environment's influence on delirium and DSD. Similar to the results found in this study, a study by Voyer and colleagues (2011) concluded that the adequacy of physical environment was found to be significantly associated with the severity of delirium in univariate analysis, but not in multivariate analysis.

Table 6. Nursing Interventions for the Prevention and Management of Delirium

Intervention	Rationale
Comprehensive assessment of patient's baseline mental status	To be able to recognize slight changes in a patient's mental status
Avoid potentially inappropriate medication use and provide nonpharmacologic methods of relief when at all possible	Age-related changes can influence medication actions and produce negative consequences
Prevent and treat infection promptly	Infection is one of the most common causes of change in mental status
Provide sensory aids	Sensory impairments have shown to be a risk factor for delirium
Keep patient oriented to their environment (i.e. orientation board, clock, calendar)	Short term memory may decline in persons with cognitive impairment
Minimize environmental stimuli patients receive (i.e. excessive noise, inadequate lighting, restraints, invasive devices, room changes, disruptive roommate)	Environmental variables have been shown to influence change in mental status
Supply patient with activities to promote cognitive stimulation (i.e. books, puzzles, writing, board games)	Cognitive stimulation is a protective mechanism for dementia and may increase cognitive reserve
Individualize care and provide support to the patient and their family	Education of family members will help with the detection of delirium.

The recognition of delirium and delirium superimposed on dementia in the hospital setting by nurses and other medical professionals is poor. Often orientation is assessed to the extent of "person oriented to person, place, time and event," which fails a proper mental status examination. Obtaining a comprehensive baseline mental status on admission, along with the implementation and reference to the intervention strategies and resources mentioned earlier, the detection of delirium and delirium superimposed on dementia would greatly improve. Though this study defined higher scores as an "adequate environment" we need to do further research to understand what the best environment is for persons with dementia and delirium. In addition, studies that specifically research the effects the environment has on the incidence and severity of delirium in hospitalized older adults with dementia will positively influence the long term outcomes they are ultimately facing today.

Appendix A

Adequacy of Physical Environment 11-item Tool (range = 0-11)
(Adapted from Voyer, Richard, Doucet, 2011)

Orienting Objects

Clock (present vs not present)	1= present, 0= absent_____
Calendar (present vs not present)	1= present, 0= absent_____
Message/orientation board (present vs not present)	1= present, 0= absent_____

Room and Environment Characteristics

Roommate present (present vs absent)	1= absent, 0= present_____
Roommate disruptive (present vs absent)	1= absent, 0= present_____
Lighting (adequate vs not adequate)	1= adequate, 0= not adequate_____
Window (present vs not present)	1= present, 0= absent_____
Noise level (adequate vs not adequate)	1= adequate, 0= not adequate_____
Invasive devices (present vs absent)	1= absent, 0= present_____
Restraint (present vs absent)	1= absent, 0= present_____
Room change (yes vs no)	1= no, 0= yes_____

SUM (adequacy of environment) = _____
CAM _____
MMSE _____

HIGH SCORES TEND TO SUGGEST AN ADEQUATE ENVIRONMENT

Appendix B

MODIFIED BLESSED DEMENTIA RATING SCALE (MBDRS)

Note: If unable to rate due to refusal or "don't know" then please write this in the margin.

*I. Check the box which best rates level of memory and performance during the **past 6 months***

During the 6 months prior to hospitalization have you noticed any problem with (Patient name)'s ability…..(REPEAT PROMPT FOR QUESTIONS 1-8)	**0**	**0.5**	**1**
1) to perform usual household tasks?			
2) to cope with small sums of money?			
3) to remember a short list of items, such as a shopping list?			
4) to find way about indoors, either in home or in other familiar locations?			
5) to find way around familiar streets? (on foot or by car)			
6) to grasp situations, or to recognize surroundings or people?			
7) to recall recent events?			
8) tendency to dwell in the past?			

0 = No problem
0.5 = Some problem (e.g. sometimes, partial)
1= Severe problem or inability

II. For each ADL below, choose which one currently (past 2 weeks/prior to this illness) describes the patient with dementia

	Eating
0	Feeds self without assistance.
1	Feeds self with minor assistance.
2	Feeds self with much assistance.
3	Has to be fed.

	Dressing
0	Unaided.
1	Occasionally misplaces buttons, etc. Requires some help.
2	Wrong sequences, forgets items, requires much assistance.
3	Unable to dress.

	Toilet
0	Cleans, cares for self at toilet.
1	Occasional incontinence, or needs to be reminded.
2	Frequent incontinence, or needs much assistance.
3	Little or no control.

III. Total Score of Modified Blessed Dementia Scale (0-17) score >3 consistent w/ dementia

Appendix C

CONFUSION ASSESSMENT METHOD (CAM) WORKSHEET

I. ACUTE ONSET AND FLUCTUATING COURSE **BOX 1**

a) Is there evidence of an acute change in mental status from the patient's baseline? ☐YES ☐NO

b) Did the (abnormal) behavior fluctuate during the day, that is, tend to come and go or increase and decrease in severity? ☐YES ¢ NO

II. INATTENTION

Did the patient have difficulty focusing attention, for example, being easily distractible or having difficulty keeping track of what was being said? ☐YES ☐NO

III. DISORGANIZED THINKING

BOX 2

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? ☐YES ☐NO

IV. ALTERED LEVEL OF CONSCIOUSNESS

Overall, how would you rate the patient's level of consciousness?

☐Alert (normal)

☐Vigilant (hyperalert)
☐Lethargic (drowsy, easily aroused)
☐Stupor (difficult to arouse)
☐Coma (unarousable)

☐YES

Do any checks appear in this box? ☐NO

Positive for delirium per CAM (based on above CAM) ? ☐NO ☐YES

If all items in Box 1 are checked and at least 1 item in Box 2 is checked a diagnosis of delirium is suggested. They have to have both items 1 and 2 present and either 3 or 4

If patient does not meet full criteria but 2 or more items are checked YES, mark YES for Subsyndromal Delirium.

☐NO ☐YES

Appendix D

Mini-Mental Status Evaluation

Maximum Score	Score		Orientation
5		( )	What is the date? (year, season, day, month)
5		( )	Where are we? (city, state, hospital, floor)
			Registration
3		( )	Name 3 objects. Speak slowly allowing one second for each object. Repeat the list until all three are learned. One point for each correct answer. Count and record trials. Number of trials _____
			Attention and Calculation
5		( )	Serial 7's. One point for each correct. Stop after 5 answers. Alternatively, spell "world" backwards.
			Recall
3		( )	Ask for 3 objects repeated above. One point for each correct answer.
			Language
6		( )	Name a pencil, and watch. Repeat the following: "No if's and's or but's." (1 point each for total of 3 points) Follow a 3 stage command: "Take a paper in your right hand, fold it in half, and put it on the floor." (3 points) Have the client read and obey the following:
1		( )	Close your eyes. (1 point)
1		( )	Copy design. (1 point)
1		( )	Write a sentence (1 point)
		( )	Total score

Asses level of consciousness along a continuum:

Alert Drowsy Stupor Coma

Used with permission.

References

Blessed, G., Tomlinson, B., & Roth, M. (1988). Blessed-Roth Dementia Scale (DS). *Psychopharmacology bulletin, 24*(4), 705-705.

Burns, N., & Grove, S. K. (2007). *Understanding nursing research: building an evidence-based practice* (4th ed.). St. Louis, Mo.: Saunders Elsevier

de Rooij, S. E., Schuurmans, M. J., & Van der Mast, R. C. (2005, February 18). Clinical subtypes of delirium and their relevance for daily clinical practice: a systematic review. *International Journal of Geriatric Psychiatry, 20*, 609-615.

Fick, D. M., Agostini, J. V., & Inouye, S. K. (2002). Delirium Superimposed on Dementia: A Systematic Review. *Journal of American Geriatrics Society, 50*, 1723-1732.

Flaherty, J., & Little, M. (2011). Matching the Environment to Patients with Delirium: Lessons Learned from the Delirium Room, a Restraint-Free Environment for Older Hospitalized Adults with Delirium. *Journal of the American Geriatrics Society, 59*(Issue Supplement s2), S295-S300. Retrieved January 17, 2012, from http://onlinelibrary.wiley.com/doi/10.1111/j.1532-5415.2011.03678.x/full

Folstein, M. F., Folstein, S. E., & McHugh, P. R. (1974). Mini-Mental State" A Practical Method For Grading the Cognitive State of Patients for the Clinician. *Journal of Psychiatric Research, 12*(3), 189-198. Retrieved April 28, 2011, from the ScienceDirect database.

Folstein, MF and SE: Journal of Psychiatric Research, Volume 12, pages 189-198, Elsevier Science, Ltd., Pergamon Imprints 134 ,Oxford, England, 1975.)

Gaudreau, J., Gagnon, P., Roy, M., Harel, F., & Tremblay, A. (2005). Association Between Psychoactive Medications and Delirium in Hospitalized Patients: A Critical Review. *The Academy of Psychosomatic Medicine , 23*(27), 6712-6718. Retrieved March 24, 2011, from http://psy.psychiatryonline.org.ezaccess.libraries.psu.edu/cgi/content/full/46/4/302

Inouye, S. K., van Dyck, C. H., Alessi, C. A., Balkin, S., Siegal, A. P., & Horwitz, R. I. (1990). Clarifying Confusion: The Confusion Assessment Method. *Annals of Internal Medicine, 113*(12), 941-948.

Inouye, S. K. (2006, March 16). Delirium in Older Persons. *New England Journal of Medicine, 354*, 1157-1165.

Leslie, D. L., Marcantonio, E. R., Zhang, Y., Leo-Summers, L., & Inouye, S. K. (2008). One-Year Health Care Costs Associated With Delirium in the Elderly Population . *Archives of Internal Medicine, 168*(1), 27-32. Retrieved March 24, 2011, from http://archinte.ama-assn.org.ezaccess.libraries.psu.edu/cgi/content/full/168/1/27?eaf

Lund, A., & Lund, M. (n.d.). Pearson Product-Moment Correlation. *Laerd Statistics*. Retrieved March 16, 2012, from https://statistics.laerd.com/statistical-guides/pearson-correlation-coefficient-statistical-guide.php

Marcantonio, E. R., Juarez, G., Goldman, L., Mangione, C. M., Ludwig, L. E., Lind, L., et al. (1994). The Relationship of Postoperative Delirium With Psychoactive Medications. *The Journal of the American Medical Association, 272*(19), 1518-1522.

McAvay, G. J., Van Ness, P. H., Bogardus Jr., S. T., Zhang, Y., Leslie, D. L., Leo-Summers, L. S., et al. (2007). Depressive Symptoms and the Risk of Incident Delirium in Older Hospitalized Adults. *Journal of the American Geriatric Society, 55*(5), 684-691. Retrieved April 28, 2011, from the Wiley Online Libraray database.

McCusker, J., Cole, M., & Abrahamowicz, M. (2001). Environmental Risk Factors for Delirium in Hospitalized Older People. *Journal of American Geriatrics Society, 29*, 1327-1334.

Mukherjee, B., Ou, H., & Erickson, S. R. (2010). A new comorbidity index: the health-related quality of life comorbidity index. *Journal of Clinical Epidemiology, 64*(3), 309-319. Retrieved April 28, 2011, from the ScienceDirect database.

Nelis SM, Clare L, Martyr A, Markova I, Roth I, Woods RT, Whitaker CJ, Morris RG. Aging and Mental Health. 2011 Nov;15(8):961-9. Retrieved March 15, 2011 from PubMed database.

O'Keeffe, E., Mukhtar, O., & O'Keeffe, S. T. (2012). Orientation to time as a guide to the presence and severity of cognitive impairment in older hospital patients. Journal of Neurological Neurosurgical Psychiatry, N/A(N/A), 1-5. Retrieved March 24, 2011, from http://jnnp.bmj.com.ezaccess.libraries.psu.edu/content/early/2010/09/18/jnnp.2010.214817.long. Published online first 18 September 2010.

Pisani, M. A., Inouye, S. K., McNicoll, L., & Redlich, C. A. (2003). Screening for Preexisting Cognitive Impairment in Older Intensive Care Unit Patients: Use of Proxy Assessment. *Journal of American Geriatrics Society, 51*(5), 689-693. Retrieved April 28, 2011, from the Wiley Online Library database.

Rompaey, B. V., Elseviers, M. M., & Schuurmans, M. J. (2009, May 20). Risk factors for delirium in intensive care patients: a prospective cohort study. *Critical Care, 13*, 77.

Scheffer, A. C., van Munster, B. C., Schuurmans, M. J., & de Rooij, S. E. (2010). Assessing severity of delirium by the Delirium Observation Screening Scale . *International Journal of Geriatric Psychiatry, 26*(3), 284-291. Retrieved April 28, 2011, from the Wiley Online Library database.

Schor, J. D., Levkoff, S. E., Lipsitz, L. A., Reilly, C. H., Cleary, P. D., Rowe, J. W., et al. (1992). Risk Factors for Delirium in Hospitalized Elderly. *The Journal of the American Medical Association, 267*(6), 827-831. Retrieved March 24, 2011, from http://jama.ama-assn.org.ezaccess.libraries.psu.edu/content/267/6/827.full.pdf+html

Steis, M. R., & Fick, D. M. (2008). Are Nurses Recognizing Delirium? A Systematic Review. *Journal of Gerontological Nursing, 34*(9), 40-48.

Stommel, M., & Wills, C. (2004). *Clinical research: concepts and principles for advanced practice nurses*. Philadelphia: Lippincott Williams & Wilkins.

Voyer, P., Richard, S., Doucet, L., & Carmichael, P. (2011). Factors Associated With Delirium Severity Among Older Persons With Dementia. *Journal of Neuroscience Nursing , 43*(2), 62-69.

Voyer, P., McCusker, J., & Cole, M. G. (2006, April). Influence of Prior Cognitive Impairment on the Severity of Delirium Symptoms Among Older Patients. *Journal of Neuroscience Nursing, 38, 2.*

Zekry, D., Herrmann, F. R., Grandjean, R., Meynet, M., Michel, J., Gold, G., et al. (2007). Demented versus non-demented very old inpatients: the same comorbidities but poorer functional and nutritional status. *Age and Ageing, 37*(1), 83-89. Retrieved April 28, 2011, from the Oxford Journals database.

Academic Vita

Brittney Christine DiMeglio
21 Woodward Drive, Belle Mead, NJ 08502
908.240.1654, Email: bdimeglio10@gmail.com

Relevant Data:

Born: July 17, 1990, Princeton, NJ

Educational Background:

B.S., Nursing, May 2012, the Pennsylvania State University, University Park, PA

Honors and Awards:

- Dean's List 6 of 7 semesters, the Pennsylvania State University, 2008-2011
- 1st Place recipient in BS/MS Poster Presentation at the Eastern Nursing Research Society 24th Annual Scientific Meeting, the Pennsylvania State University, 2012
- Undergraduate representative at the Eastern Nursing Research Society 24th Annual Scientific Meeting, the Pennsylvania State University, 2012
- New Jersey Hospital Association Health Careers Scholarship, New Jersey Hospital Association, 2011
- Schreyer Honors Thesis Research Grant, the Pennsylvania State University Schreyer Honors College, 2011
- Joseph Vincent Paterno Honorary Scholarship, the Pennsylvania State University, 2010
- Schreyer Ambassador Travel Grant, the Pennsylvania State University Schreyer Honors College, 2010

Association Memberships:

- Sigma Theta Tau International Nursing Honor Society, the Pennsylvania State University, 2011
- Schreyer Honors College, the Pennsylvania State University, 2010
- Global Medical Brigades, the Pennsylvania State University, 2010-2011

Professional Experience:

- **HealthSouth Nittany Valley Rehabilitation Hospital, May 2011-Present**
  As a Rehabilitation Nurse Technician in a 73-bed acute rehabilitation hospital I interact with nursing staff to complete tasks while promoting excellent patient satisfactions and outcomes. I am given a patient assignment where I assist with activities of daily living; communicate and document patient information; and organize, plan, and manage time efficiently to complete assignments.

- **Brookline Village, the Terrace at Brookline, March 2010-April 2011**
  As a nursing assistant in a memory care facility for patients with Alzheimer's and dementia, I provided care to assigned patients where I assisted will all aspects of daily living including personal care, hygiene, and feeding. I learned time management, communication, teamwork, patient care, and redirection skills specific to confused residents.

Research:

I am interested in delirium superimposed on dementia, particularly the environment's effect on this. Specifically, my honors thesis explores the relationship between environmental and orienting devices and their effects on the presence and severity of delirium superimposed on dementia in hospitalized older adults.

Honors Thesis Title: The Effects of Environmental and Orienting Devices on the Prevalence and Severity of Delirium Superimposed on Dementia in Hospitalized Older Adults

References:

- Donna M. Fick, Professor of Nursing, the Pennsylvania State University, dmf21@psu.edu
- Mary Ellen Yonushonis, Instructor in Nursing, mey1@psu.edu
- Sarah McVeigh, Instructor in Nursing, seb266@psu.edu