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Nurses' Knowledge on Delirium Prevention and Detection
in Hospitalized Adults:
A Quality Improvement Project

by

Kayla Deery

A Major Paper Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Science in Nursing

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Abstract

Delirium, recognized as a medical and psychological emergency, is a symptom of an acute medical condition. Despite the prevalence of delirium in the hospital setting, it continues to be unrecognized, resulting in poor patient outcomes, and exorbitant healthcare cost. Patients with dementia who are chronically ill, as well as patients previously diagnosed with delirium, represent a vulnerable population and require closer surveillance due to their predisposing factors. This quality improvement project goal is to increase nurses' knowledge and understanding of delirium. This was completed through providing education to medical-surgical nurses on the causes of delirium (predisposing and precipitating factors), prevention, use of the confusion assessment method (CAM) screening tool, and detection of delirium. The change in knowledge was measure through an investigator created, 10-question multiple choice, pretest-posttest measurement model. Of the 58 nurses, nine responded and completed the pretest (N=9, 15.5%), while seven completed the educational intervention posttest (N=7, 12%). Results of the quality improvement project yielded a 22.1% increase in nurses' knowledge after the educational intervention. Despite the low participation rate, this project revealed a positive correlation between the educational intervention and nurses' knowledge.

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Nurses' Knowledge on Delirium Prevention and Detection in Hospitalized Adults: A Quality Improvement Project

Background/Statement of the Problem

Delirium is recognized as a medical and psychological emergency, and often a symptom of an acute medical condition. At least 20% of hospitalized adults age 65 and older, will develop delirium in the United States (U.S.). That makes delirium the most common complication of hospitalization for that age group. In addition, patients undergoing certain surgeries or faced with an Intensive Care Unit (ICU) admission, have a significantly larger incidence of delirium (“Harvard Health Publishing”, 2011). What is unknown, but potentially more alarming, is the percentage of patients undiagnosed with delirium. Most research has found the percentage of delirium that is undiagnosed ranges from 20 % to 64% of hospitalized patients. Patients with dementia who are chronically ill, as well as patients previously diagnosed with delirium, represent a vulnerable population and require closer surveillance. This population is more likely to re-experience delirium, exhibit a general decline in health and deterioration of memory and function. This population typically requires long-term care following an acute hospitalization and are at an increased risk of death (“Harvard Health Publishing”, 2011). Delirium is not always easy to identify in the acute care hospital setting, it can be insidious during the hospital stay, resulting in delayed recognition and worse outcomes. Undiagnosed delirium leads to increased morbidity and mortality, prolonged hospital length of stay, and increase healthcare costs. The exact value of healthcare costs attributed to delirium is unknown as a majority of delirium is undiagnosed. However,

according to Leslie et al. (2011), the one-year total direct cost due to delirium ranges from \$143 billion to \$152 billion in the U.S. annually.

Early detection and prevention of delirium is essential. The use of the Confusion Assessment Method (CAM), which can be utilized by both providers and nursing staff, is used to assess more than confusion, it is a tool that can detect and diagnose delirium. The CAM assessment is easy to use, triggers nurses and providers to recognize both rapid and subtle changes in patient cognition, resulting in earlier treatment of delirium. What many providers and nurses find difficult when assessing delirium is differentiating between delirium and dementia. Many times, providers and nurses explain delirium away as just a symptom of dementia. What can make a diagnosis even more difficult is delirium superimposed on dementia. Completing the CAM tool triggers individuals evaluating a patient to think about the key symptoms of delirium, one of which is an acute/sudden (hours to days) change in cognition.

The original CAM was first developed in 1990 by Dr. Sharon Inouye. The CAM was intended for use on the floors to assist non-psychiatrist to assess for delirium. It was adapted for use in the Intensive Care Unit in the form of the CAM-ICU in 2001 (Ely, 2020). The CAM assessment tool is easy to use, its use is generally focused in Intensive Care Units (ICUs) where the prevalence of delirium is highest. Due to the high rates of ICU delirium, many healthcare systems require nursing education departments to facilitate training in delirium prevention and detection specifically for ICU nurses. Many hospitals have not extended the same educational opportunities to medical surgical units resulting in a knowledge gap and increased numbers of undiagnosed delirium. In an article by Hussein et al. (2014), the authors determined increased education on delirium

and instructional use of delirium assessment tools for nurses are necessary to help facilitate prevention and early detection. The purpose of this project is to evaluate whether there is a change in medical surgical nurses' knowledge after implementing an educational intervention on delirium prevention and detection in hospitalized adults.

Literature Review

Databases utilized in this literature review included Google Scholar, CINAHL, UpToDate, Cochrane and PubMed from 2010 to 2020. Inclusion criteria included articles published within 10 years, written in English, participants 18 years and older and inpatient hospitalized settings. Exclusion criteria included any research involving participants under age 18 and research outside of the hospital setting. Key search terms included delirium, medical surgical nursing, delirium prevention, delirium standard of care, nursing education, delirium detection, and nursing knowledge. Terms were used separately and in combination with each other.

Delirium

Delirium, which is a medical and psychological emergency, is sometimes the only symptom of a potentially life-threatening medical condition. The exact cause of delirium varies from person to person and is dependent upon an individual's predisposing factors interacting with precipitating factors. Although delirium can be found in any setting, it is most prevalent in the acute care setting. Delirium is the decompensation of cerebral function resulting in a sudden, usually transient, neuropsychiatric syndrome (Grover & Avasthi, 2018).

Delirium is defined by five key characteristics according to The American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5). The first defining characteristic is a disturbance in attention. This results in the inability to maintain attention, shift attention, sustain attention, and a lack of awareness of the surrounding environment. Inattention is also the defining characteristic that differentiates delirium from other psychological illness, and a main

focus of the DSM-V identification of delirium. The second aspect unique to delirium is a sudden change of cognition. The sudden, acute change in behavior occurs over hours to days. The patient may experience erratic behavioral patterns that fluctuate throughout the day. For example, in the afternoon the patient may be alert, conversant and seem to be at their baseline, however four hours later they are restless and “trying to go home”. As previously stated, these defining characteristics help differentiate delirium from other psychiatric diseases, such as dementia and depression. Dementia, which is commonly confused with delirium, results in a change of behavior over months rather than days. An additional disturbance in cognition is another characteristic of delirium. This would be observed as memory deficits, both short and long-term, disorientation to time, place or person, language disturbances, and impaired visuospatial ability. It also must be proven that the disturbances are not explained by neurocognitive disorders and they do not occur in a severely reduced level of consciousness, like seen with a coma or a post-ictal phase. Lastly, after a provider completes a thorough history and physical exam, including examination of lab data, and deems the disturbance is the result of one or more of the following; a medical condition, medication side effect, or substance intoxication or withdrawal (Francis & Young, 2020; Grover & Avasthi, 2018; Guthrie et al., 2018). One of the fears faced by clinicians associated with the updated DSM-V, is there is too much focus on testing patients for the feature of inattention, and overlooking the significance of altered arousal (“The DSM-5 Criteria”, 2014). Although inattention is a hallmark of delirium, it is important to recognize that patients deemed too sleepy to test for inattention may actually be demonstrating delirium. These authors caution against the risk of missing delirium in these circumstances.

Individual Manifestations of Delirium

There are hallmark clinical symptoms associated with delirium. Symptoms can be categorized into cognitive, non-cognitive, and motoric symptoms. Cognitive symptoms consist of disturbances in memory, inattention, comprehension, orientation, vigilance, and executive functioning. Patients with delirium will suddenly lack the ability to sustain attention, making it difficult to follow simple instructions that require more than one step. Delirious patients may also experience a loss of both long-term and short-term memory with significant impairments to recent memory (Grover & Avasthi, 2018). Non-cognitive impairments, such as a change in sleep-wake cycle and language difficulties may also manifest. Many patients who originally are fluent in a second language may lose the ability to speak and write in that language, then regain the language when delirium resolves.

Perceptual disturbances may take the form of hallucinations, delusions of harm, and misidentification of family members. The delirious patient may believe shadows and objects in the room are a person. Hallucinations may be visual, auditory, or sensory. The hallucinations can be simple, like seeing shadows, or complex, resulting in a patient seeing people and hearing clear voices (Francis & Young, 2020). The increase and decrease of psychomotor activity results in three different subtypes; hyperactive, hypoactive, and mixed. Hyperactive motor subtype manifests with increased restlessness, increased amounts of motor activity, loss of control of activity, and migration (Guthrie et al., 2018). Hypoactive motor subtype has reduced speed of actions, reduced alertness, and patients become withdrawn. Mixed motor has both subtypes with fluctuations throughout the hospitalized course. Different pieces of evidence support

hyperactive as being more common than hypoactive, however this is potentially based on hyperactive motor types having more referrals to psychiatry in the hospital (Grover & Avasthi, 2018). Research speculates this is due to hyperactive patients being more difficult to perform care for and may need more assistance from psychiatry to manage disruptive behavior. Conversely, according to Guthrie et al. (2018) hypoactive subtype is the more common of the subtypes. Regardless of which motor subtype is more commonly encountered, both Grover & Avasthi (2018) and Guthrie et al. (2018) identified hypoactive motor subtype as more difficult to identify and associated with higher mortality rates.

Pathophysiology of Delirium

The exact pathophysiology of delirium is unknown and will vary depending on individual risk and precipitating factors. However, since delirium is characterized by inattention and cognitive impairments, neurobiology, specifically the global cortical function, is widely studied to help explain the different events believed to lead to delirium (Francis, 2020). Attention to surrounding personal space is governed by the nondominant parietal and frontal lobes, so it is thought a disruption in neurotransmission results in dysfunction of these regions (Francis & Young, 2020). Additionally, cortical function is responsible for insight and judgment. Since perception and insight are impaired with delirium, it is likely the higher cortical function is disrupted. This is especially related to the frontal lobe ability to interpret sensory information (Francis & Young, 2020). Through electroencephalography (EEG), delirium was recognized as a slowing of the dominant posterior alpha rhythm and an abnormal, slow-wave activity regardless of delirium etiology. An exception to that is in incidences

of alcohol and sedative drug withdrawal, instead fast-wave activity was present on EEG. Subcortical structures have also been identified as playing an important role in delirium pathogenesis, which correlates reports of patient with subcortical strokes and basal ganglia abnormalities being more susceptible to delirium. Acetylcholine is another key influencer in the pathology of delirium. Different medication illnesses, thiamine deficiency, hypoxia and hypoglycemia decrease the central nervous system ability to synthesize acetylcholine. Also of interest, older patients were found to have elevated serum anticholinergic activity, though they were not receiving any anticholinergic medications. This leads to the potential of endogenous anticholinergics playing a role in delirium and why elderly are more susceptible. Medical conditions, like sepsis, cause imbalances of other neurotransmitters such as serotonin, aminobutyric acid, norepinephrine, and endorphins and are thought to be linked to a pathophysiologic cause of delirium. Lastly, proinflammatory cytokines, which are activated during sepsis, surgery and large fractures such as hip fractures, cause strong central nervous system effects which can contribute to delirium, particularly hyperactive motor type delirium (Francis & Young, 2020).

Predisposing and Precipitating Factors

Understanding the intricacies of the relationship between neurobiology and delirium will help explain an individual's predisposing and precipitating factors. Predisposing factors are factors that increase an individual's risk for developing delirium and are present prior to a hospital admission. These include dementia, stroke, Parkinson's Disease, sensory impairment, advanced age (older than 70), depression and other psychiatric disorders, living in an institution, comorbidity burden, atrial fibrillation, diabetes, and severity of illness (Francis & Young, 2020; Grover & Avasthi, 2018;

Guthrie et al., 2018). Precipitating factors, on the other hand, are insults to the body that are potentially modifiable and contribute to the development of delirium. Metabolic disturbances, polypharmacy, pain, indwelling bladder catheter, dehydration, anticholinergic medications, immobilization, emotional distress, sleep deprivation, opioids, hypoxia, low hemoglobin, hip fracture, and surgery are all examples of precipitating factors. Individuals with predisposing factors require fewer precipitating factors to develop delirium. Similarly, patients with no predisposing factors will need to be inflicted with more precipitating factors to develop delirium due to their higher reserve (Guthrie et al., 2018). A role of nursing is to recognize predisposing factors, which make a patient vulnerable to delirium and try to mitigate and prevent the precipitating factors.

In a retrospective case-control study by Tomlinson et al. (2016) researchers used an auditing tool to obtain data from patients' medical records to identify risk factors for delirium. Researchers obtained their data by reviewing the medical records of discharged patients of three acute care medical wards. From the data researchers divided the patients into two groups, one with a diagnosis of delirium and a second random control group with no diagnosis of delirium. Inclusion criteria for the delirium group included being over 18 years of age and having no evidence of delirium upon hospital admission. Through a random number generator, the control group was selected with inclusion criteria being admission to the medical unit, over 18 years of age and no evidence of delirium during hospitalization. Exclusion criteria for both groups included patients who came to the hospital already delirious, alcohol or drug use, surgery during hospitalization, admission to the intensive care unit (ICU) during hospitalization or a psychiatric admission. Researchers ended up with 156 subjects in the delirium group and 161

subjects in the control group. Ethics approval was obtained by the healthcare organization and the Ethics Committee at Daekin University (Tomlinson et al., 2016). Using the logistic regression model, researchers identified eight independent predisposing factors associated with the delirium. These included a previous history of delirium, diagnosis of dementia or cognitive impairment, diagnosis of a fracture, or functional impairment (Tomlinson et al., 2016). Three precipitating factors were also identified: adding three or more new medications, abnormal serum sodium levels, and an indwelling bladder catheter (Tomlinson et al., 2016).

In a prospective study conducted in a trauma, non-ICU unit, researchers studied the incidence and risk factors affecting delirium positive patients (Cahill et al., 2017). Through an electronic data collection system consisting of 69 different risk factors, six of the risk factors were found to be statistically significant by the researchers. The six risk factors that were significant for delirium were high school education, indwelling bladder catheter, respiratory distress, lack of ambulation, orthopedic operations, and a mean age of 70 (Cahill et al., 2017). Prior to the study, nurses on the unit were educated on use of a screening tool called the CAM to diagnose delirium positive patients. Inclusion criteria for the study included all patients admitted to the trauma non-ICU unit over 18 years of age. Exclusion criteria consisted of patients admitted to the ICU or step-down unit during their hospitalization. A potential limitation identified is the researchers did not investigate the role of narcotics and benzodiazepines on delirium, which would have been beneficial on a surgical unit (Cahill et al., 2017).

Prevention and Treatment of Delirium

Delirium Treatment

Delirium treatment is aimed at prevention of precipitating factors and reversing the underlying cause. Predisposing factors are well established and if present place those individuals at high risk for developing delirium when hospitalized. Use of non-pharmacologic interventions is the first step in primary prevention of delirium and broadly targets high-risk patients. This involves universal key principles such as avoiding risk factors that aggravate delirium such as dehydration, disruption in sleep, sensory impairment, pain management and prolonged immobilization. Subsequently, when delirium is present, diagnostic test should be performed with treatment of the underlying cause. This includes, and not limited to, serum electrolytes, blood counts, urine analysis, arterial blood gases, toxicology screening, liver function, thyroid function, and thiamine levels if malnutrition is suspected (Francis & Young, 2020; Francis, 2020). Thiamine (B1) is acquired through nutritional intake, both malnutrition and alcohol use place patients at risk for low thiamine levels. Thiamine is responsible for neuronal activity and insufficient thiamine is a leading cause of delirium. According to Francis (2020), thiamine supplementation is recommended for anyone malnourished or delirious regardless of thiamine level.

Delirium Preventative Strategies

Prevention strategies include providing a restorative environment to prevent further physical and cognitive decline. Nursing interventions to prevent delirium focus on maintaining an individual's independence. These interventions include ambulating early and often, removing invasive lines and catheters, promoting use of hearing aids and

glasses, continued reorientation, promotion of night time sleep, blinds and curtains open during the day to expose the environment, and medication reconciliation for deliriogenic medications. Involvement of families and caretakers in prevention strategies is highly effective. Family involvement helps keep individuals at risk of delirium in the present through interactions. Having familiar faces, therapeutic touch, reorientation and assurance from those close to the individual helps decrease delirium and mitigate disruptive behaviors. Lastly, if the delirious behavior becomes dangerous to the patient or caretakers and the previous methods are not effective, then low-dose, short-acting antipsychotics can be utilized as a last resort (Francis, 2020).

Pharmacological interventions are supported with mixed findings. It is universally known that benzodiazepines increase the risk of delirium and are a prominent class of medications on the Beers Criteria by the American Geriatric Society. The exception are those experiencing sedative drug and alcohol withdrawal, in which a benzodiazepine is the standard treatment. Low-dose and short-term use of antipsychotics, haloperidol in fact, is reserved for severe agitation, psychosis and disruptive behaviors that place the delirious patient and caretakers at risk. Due to haloperidol's effect on dopamine receptors, this is contraindicated in patients with Parkinsonism illnesses. The next best choice for this patient population would be an atypical antipsychotic. Atypical antipsychotics have less side-effects compared to haloperidol and have been found to be effective in the treatment of hyperactive delirium, however, the literature indicates there are not enough studies to support their use over haloperidol. Haloperidol and atypical antipsychotics should be used short term as both are linked to an increased risk of stroke and mortality in patients with dementia (Francis, 2020).

A large level I teaching hospital implemented a quality improvement project that spanned over five years, with the primary outcome being a decrease in delirium (Rohatgi et al., 2019). The researchers started with a multidisciplinary delirium task force consisting of physicians, nurse leaders, pharmacists, informatics and quality consultants. The task force was responsible for system wide education, staff compliance, implementation of a delirium protocol and continued education of new staff members. Implementation of the quality improvement project comprised of three cycles. Cycle one took place over eight months and consisted of taking account of the facility's current delirium knowledge, burden, diagnosing practices and ability to identify delirium. Education was conducted with nurses to increase awareness and identification of delirium was assisted by including the CAM screening tool in the education (Rohatgi et al., 2019). Providers and nurses were educated on non-pharmacological prevention and pharmacological causes such as the use of benzodiazepines, opioids, and anticholinergics. Cycle two was a ten-month program that focused on three key elements. Additional screening to identify patients at risk for developing delirium, non-pharmacological measures for both CAM positive patients and high-risk patients, and a physician order set developed for delirium prevention and management with continued reinforcement of cycle one. In cycle one, the nursing staff had the CAM screening tool added to the electronic health record flow sheet screen, cycle two added the delirium risk screening to the nursing assessment. Any patient with two or more predisposing factors was considered high risk. When the patient was flagged as high risk or CAM positive, a delirium management protocol consisting of non-pharmacological measures and a physician order set were prompted and implemented by nursing. All CAM positive

patients required notification of the provider. The provider then implemented an order set consisting of non-pharmacological measures, review of medications to minimize delirigenic agents, sleep-cycle regulation, a work-up to identify any potential precipitants, and a specialty consultation if needed (such as psychology). In cycle three of the improvement project the task force implemented a delirium screen in the EHR. The delirium screen helped the clinicians round faster, gave a snapshot of the patients' clinical information, and highlighted potential delirium contributions (Rohatgi et al., 2019).

By utilizing delirium prevention tactics and protocols this quality improvement project resulted in a 25.3% per year decreased odds of a high-risk patient developing delirium from 2015 to 2018. Also of significance, Rohatgi et al. (2019) found the odds of inpatient mortality decreased by 16% per year ($P=.011$) and the odds of a discharge to a nursing home decreased by 17.1% ($P < .001$) per year from 2015 to the end of the study. The researchers contributed the strength of their research to early engagement and continued education for physicians and nurses on delirium prevention measures and delirigenic medications. Limitations of the study were the methods of identifying a patient as delirium positive. The researchers criteria for participation included any patient in restraints, use of a sitter during hospitalization, and an International Classification of Disease (ICD) code of delirium. Being restrained and having a sitter does not automatically indicate acute delirium.

Delirium Screening Tools

Once the predisposing and precipitating factors of delirium are understood, assessment tools are used to help clinicians and nurses identify a delirium positive

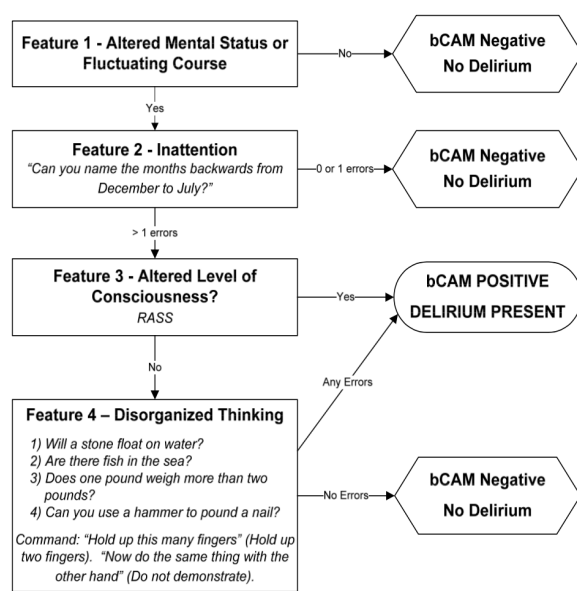
patient. There are many assessment tools used in different patient care settings, however they all focus on two patient factors. The first factor is a mental status questionnaire to assess the patient's cognition, and the second being an observational tool used to observe the patient's behavior (Guthrie et al., 2018). There are instruments used to evaluate the risk of delirium and instruments used to identify the presence and severity of delirium. There are a variety of assessment tools to choose from, but not all have undergone a psychometric evaluation. The most used assessment tool is the CAM (Guthrie et al., 2018). This is a diagnostic observational instrument based on the DSM-IV criteria for delirium. CAM is easy to use and made for clinicians with no psychiatric experience (Guthrie et al., 2018). The CAM is also helpful distinguishing delirium superimposed on dementia. When using the CAM a patient will be asked a series of questions to evaluate their cognition, attention, and ability to follow instructions. The questions are based on four features, which includes acute change in cognition, inattention, disorganized thinking, and altered level of consciousness. For a diagnosis of delirium, the patient must have the first and second features and either the third or fourth plus the previously stated features (Guthrie et al., 2018).

The CAM-ICU was the first modified version of the original CAM assessment tool. The CAM-ICU was later modified into the Brief Confusion Assessment Method (bCAM) to reflect different, non-ICU clinical environments such as the emergency room, medical-surgical and telemetry units. The bCAM uses the CAM algorithm with objective measurements to test for inattention and disorganized thinking in the hospitalized patient. The bCAM has the same four features: (1) alerted mental status or fluctuating course, (2) inattention, (3) altered level of consciousness, (4) disorganized thinking. Like the CAM

and CAM-ICU, the patient must have the first and second feature and either the third or fourth previously stated feature to be CAM positive (Han, 2015). A visualization of this algorithm is presented in Figure 1.

Figure 1

Brief CAM Algorithm



Note. For a diagnosis of delirium, the patient must have the first and second feature and either the third or fourth previously stated feature (Han, 2015).

After concerns that delirium was going undetected on their unit, clinicians conducted a ten-week, observational study in a 12-bed intensive care unit. The researchers compared the ability of the bedside nurses to detect delirium without assistance from an assessment tool to an independent evaluators ability to detect delirium with the CAM-ICU (Mistarz et al., 2011). The researchers used 35 patients that met the inclusion criteria. The inclusion criteria consisted of being an alert ICU patient and both

ventilated and non-ventilated patients were included. Exclusion criteria consisted of non-English speaking and unable to follow commands. The bedside nurses in the study did not receive any additional education on delirium and their previous knowledge was not assessed. There were four nurses who received a total of five hours of delirium education and training to use the CAM-ICU. The assessments were completed first by the nurse with no assessment tool, and within two hours, the nurse trained to use the CAM assessed the same patient. Mistarz et al. (2011) found by using clinical assessment alone, the bedside nurses identified delirium in only 27% of CAM positive patients. Limitations of this study include small sample size, the evaluators were trained to use CAM, but their ability to use it correctly was not identified (Mistarz et al., 2011). This study identified that while ICU nurses spend prolonged time with patients, they continue to be unable to identify delirium without proper training and assessment tools.

Researchers Gesin et al. (2012) developed a task force of multidisciplinary professionals involving pharmacists, ICU physicians, and a clinical nurse to conduct a three phase program measuring nurses' knowledge and perception of delirium. Knowledge and perception were measured after the implementation of a delirium screening tool and multifaceted educational intervention. Knowledge was measured with a researcher created ten-question multiple-choice survey and perception was measured with a five-point Likert scale. Researchers used the Intensive Care Delirium Screening Checklist (ICDSC) to assess delirium in a 29-bed surgical ICU. Twenty bedside nurses from the unit volunteered to partake in the three-part study. The clinical nurse researcher received specialized training on the ICDSC, along with delirium training

from Tufts Medical Center. The nurses' assessment and identification of delirium was compared throughout the three phases against a trained validated judge who is a clinical nurse specialist, by using the ICDSC. The validating judge completed their assessment immediately after the nurses finished their assessment. The first phase of the program measured nursing knowledge and perception with no education and their ability to correctly detect delirium without using an assessment tool. In the second phase nurses were given the original ICDSC 2001 validation study to review 24-hours prior to using it to assess their patients. In phase three, the nurses received a multifaceted educational program on delirium prevention, development, and consequences led by the critical care pharmacist and clinical nurse specialist. There was also a thorough overview and bedside demonstration on how to properly use the ICDSC (Gesin et al., 2012). At the end of three phases, results yielded no significant change in nursing knowledge between phase one (6.1 out of 10) and phase two (6.5 out of 10; $P=.08$), but phase three revealed an increase in knowledge (8.2 out of 10; $P=.001$). Nurses' perception of delirium being "difficult to assess" decreased from 89.5% in phase one, to 63.2% in phase three. The overall agreement between the validating judge and the nurses' assessment and detection of delirium improved throughout the three phases. Phase one had a 69% agreement, phase two had an 81% agreement, and lastly phase three resulted in an 88% agreement (Gesin et al., 2012). The implementation of a screening tool alone resulted in a significant increase of delirium assessment agreement. The limitations of this study included nurses not being randomly chosen and the ICDSC study in phase two might not have been read by the nurses since it was assigned on their personal time.

Strengths of this research include having IRB approval, all patients in the ICU were eligible and there were no patient exclusion criteria.

Nurses Delirium Training and Education

In addition to the negative outcomes experienced by patients and healthcare systems caused by delirium; increased mortality and morbidity, increased healthcare cost, discharge to a long-term care facility and cognitive decline, nurses are also exposed to a subjective burden. The rapid fluctuation in cognition, agitation, hallucinations, and disorganized thinking can make assessing and care for a delirious patient difficult and time consuming in a demanding profession. Nurses are in a unique position to observe and detect fluctuations in patient behavior indicating delirium (McDonnell & Timmins, 2012).

McDonnell and Timmins (2012), conducted a descriptive, retrospective study examining the subjective burden of nurses caring for patients with delirium. An additional secondary aim of the study was to discover which aspect of delirium nurses found most difficult to care for. Data was collected for this study through use of a previously administered and adapted, self-reported 20-item questionnaire (McDonnell & Timmins, 2012). Researchers electronically mailed (e-mailed) the questionnaire to 800 nurses of all specialties, registered through the Republic of Ireland. A total of 181 anonymous recipients responded. The researchers used measures of central tendency to analyze the descriptive data derived from the questionnaire. Interestingly, only 33.7% of nurses surveyed received delirium education in their career (McDonnell & Timmins, 2012). Nurses were asked 20 questions regarding delirium burden and patient behaviors. They could score patients exhibiting delirium behaviors as being very difficult (4),

difficult (3), easy (2), and quite easy to manage (1) (McDonnell & Timmins, 2012). Overall, nurses reported all delirium behavior difficult to manage, with hyperactive delirium being “very difficult” to manage with a mean score of 3.41. The only areas the nurses found easy to manage were the symptoms of hypoactive delirium, “patients speaking in a slow hesitant manor” (2.29), and “dealing with patients who are withdrawn/unusually quiet” (2.45) (McDonnell & Timmins, 2012). This is distressing since patients with hypoactive delirium have a poorer prognosis and could become overlooked with busy nursing assignments according to the researchers. Researchers McDonnell and Timmins (2012), did find a significant positive relationship between the amount of delirium education a nurse received and their subjective burden managing the delirium behaviors. Nurses with delirium training experienced less difficulty and stress managing patient care. The poor response rate is a limitation to the study and leaves room for bias and may not be a good representation of the population. Another limitation the researchers addressed was the Likert scale containing four points rather than five, allowing for a median response (McDonnell & Timmins, 2012). Caring for patients with delirium can be difficult and stressful for nurses, but with delirium education the experienced burden can be improved upon.

The ability of nurses to recognize delirium, understand the risk factors, and implement preventative strategies is dependent upon the education provided. A research study that took place in the Netherlands, consisted of a pretest-posttest design with a three-hour e-learning course on delirium after completion of the pretest (Steege et al., 2015). Through the participation of 17 hospitals, the researchers obtained 1,196 staff emails and demographic characteristics. There were 963 invitees who completed the pre-

test and 907 of them completed the post-test. The content of the pre and post knowledge test and e-learning course was developed by a commercial publisher, and reviewed by the research team and Netherlands Center of Excellence in Nursing, during development of the program. Researchers confirmed the content created by the commercial publisher, also remained in agreement with delirium guidelines set by the Dutch guidelines regarding delirium care (Steege et al., 2015). Hospitals held staff meetings and e-mailed the nursing staff regarding the study prior to course availability on the internet. After the first month, if a nurse did not complete the pre-test and learning module, they received a reminder e-mail in order to increase compliance. The pretest was completed by nurses prior to the e-course to obtain nurses' baseline knowledge. Researchers used a validated pre and post-test consisting of 24 random questions from a pool of 82 questions regarding delirium and delirium care. The questions were divided into five categories and consisted of definitions (five questions), risk screening and prevention (seven questions), early recognition (four questions), Delirium Observation Screening scale (two questions) and treatments (six questions) (Steege et al., 2015).

Steege et al. (2015) found pre e-learning baseline pre-test knowledge mean score was 79.3 (0-100 scale), and a post-test mean score of 87.4. Trends identified included nurses 50 years or older mean average score was lower (77) than nurses ages 30-50 and younger than age 30 (79.7 and 79.9) (Steege et al., 2015). Also, nurses with a bachelor's degree or higher scored 81.2 compared to 78.7 with vocational education. When the test scores were divided into the five different categories, the lowest baseline scores were found in the "definition" category. This is also the category that test scores improved the most and were found to have the highest knowledge

increase. The researchers proposed nurses at baseline had the most difficulty with delirium symptoms, course, consequences, and identifying patients at risk (Steeg et al., 2015). An additional outcome discovered by Steeg et al. (2015) was nurses with little work experience (0-1 year) benefited the most from the e-learning course.

This study underwent ethical approval by the review board of Vrije Universiteit Medical Center in Amsterdam. A limitation to this study is the post-test was taken right after the e-learning, so the long-term knowledge retention is unknown. Strengths included the large sample size, the course was developed by a professional publisher, was validated by experts on delirium and it was widely generalizable (Steeg et al., 2015).

The literature review proposes that although delirium is prominent in the acute care setting, many nurses are missing both a thorough understanding of delirium and are unable to identify delirium when present in their patients. There is a need for increased education on delirium and screening tools to prompt the identification of changes in patient cognition and attention associated with delirium.

Theoretical Framework

Improvement of an individual's practice whether nursing, education, law, or other practices is based on acquiring knowledge through research, expertise, and evidence. As an individual's knowledge grows, it results in a change of behaviors, thoughts, feelings, or all three (Lewin, 1951). This is the basis of Kurt Lewin's Change Theory and one of the two frameworks used in this project. Lewin's theory focuses on three stages: unfreezing of the cultural norm, change, and refreezing the to make the new norm.

The first step of Lewin's change theory involves the unfreezing stage. This involves finding a way to encourage individuals, or groups, to let go of previously performed practices and overcome the natural resistance of change to the "status quo". This can be achieved by either increasing driving forces, such as implementing an educational tutorial, or decreasing restraining forces. The change stage involves the implementation of the new norm of thoughts, feelings, and/or behaviors. Lastly, the refreezing stage is needed to enforce the new status quo and is essential in preventing individuals from going back to their previous behavior, thoughts, or feelings (Lewin, 1951). This stage is controversial, as some believe there should never be a refreezing phase since change is constant. On the other hand, majority argue that without Lewin's third stage of refreezing being reinforced many will go back to the old way of doing things (Lewin's Change Theory, 2016).

Based on Lewin's theory there are three forces that affect these stages; driving forces, restraining forces, and equilibrium. Driving forces push for change to occur and encourage reformation (Lewin, 1951). Based on this project, driving forces would include the educational intervention, nurse's willingness to change their practice for a new norm,

nursing readiness to learn, and administrative support to implement change. Restraining forces will counteract driving forces. Restraining forces work against the driving force resulting in impediment of the desired change. This could include a nurse's reluctance to attend the educational intervention, nurses' resistance to change of practice, and lack of support from administration. Equilibrium occurs when change is achieved and driving forces equal restraining forces.

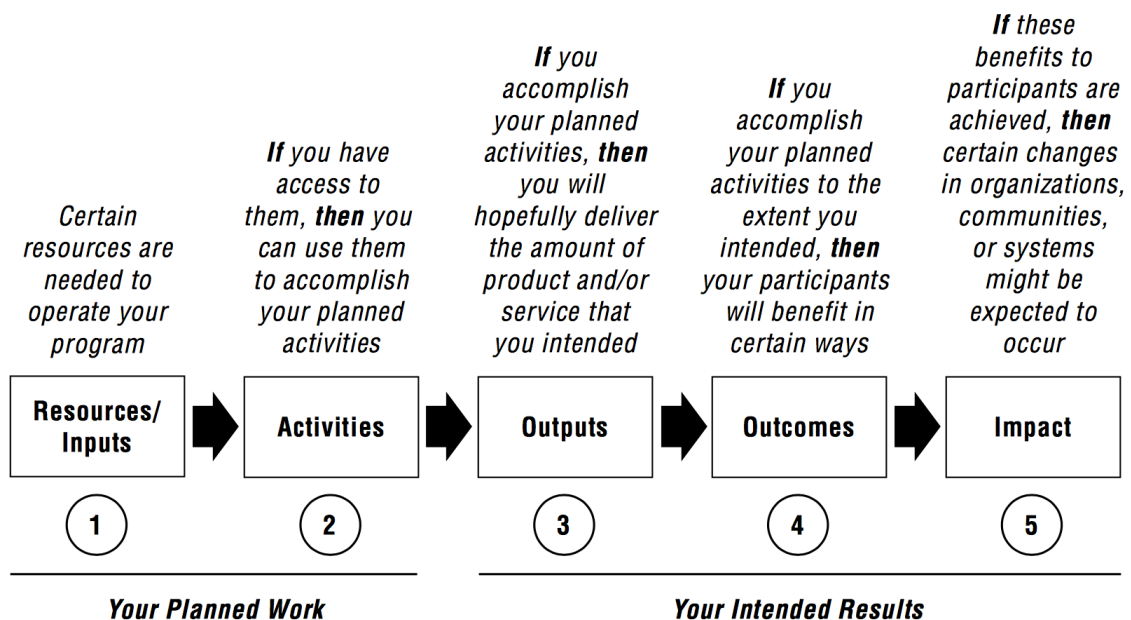
In addition, the logic model from the W.K. Kellogg Foundation will be used as a framework for this project. The logic model, much like a blueprint, is utilized to outline the planning, evaluation, and action of quality improvement projects (W.K. Kellogg Foundation, 2004). The logic model entails organizing inputs, activities, outputs, outcomes, and external factors involved in the program to meet program objectives. In this project the inputs will consist of staff nurse's time, educational environment on the hospital unit, and the educational power point provided on delirium. The output will consist of a pretest, educational session on delirium, and posttest to measure nurse's knowledge. This model is based on "if... then" statements; if we have staff nurses attend educational sessions on delirium then knowledge will be enhanced (W.K. Kellogg Foundation, 2004).

The logic model is constructed to link both short-term and long-term outcome goals. Short-term outcome goals will include participation and attendance of the nurses in the educational session. The long-term goal would occur as a change in medical surgical nurses' delirium knowledge after the educational session. External factors are areas outside the control of the project, such as nurses' willingness to attend the educational session. Another characteristic of the logic model is its flexibility and its ability to change

as the project evolves. As new information is obtained, or there are changes in the input and output, an adaptable change to the original model will occur (W.K. Kellogg Foundation, 2004).

Figure 2

How to read the logic model



(W.K. Kellogg Foundation, 2004)

Method

Purpose

The purpose of this project is to evaluate whether there is a change in medical surgical nurses' knowledge after implementing an educational intervention on delirium prevention and detection in hospitalized adults.

Design

This project design is a quality improvement project, which will consist of a pretest, educational intervention, and a posttest. There was no previously published validated tool that pertained to the context focused on in this project. A 10-question, multiple choice survey was created by this investigator that underwent pilot testing by ten registered nurses and a Clinical Nurse Educator (CNS) working with the medical-surgical units, to ensure validity prior to IRB submission. The CNS is an advanced practice provider with additional certification and a career focus on delirium management. The total time needed to complete the pretest and posttest did not exceed five minutes in the pilot study.

Setting

This project took place in a Southern New England, 129 bed, non-teaching community hospital. This hospital received its fourth Magnet designation in October 2019 by American Nurses Credentialing Center (ANCC). Although the Southern New England hospital offers labor and delivery, children's behavioral health and an adult rehabilitation, these areas were excluded. This project took place on two adult medical-surgical units. Unit 1, is a 29-bed non-cardiac monitored unit that cares for surgical and

general medical populations. Unit 2 is a 21-bed telemetry unit caring for heart failure, chest pain and other medical conditions. The ICU was not included in this project.

Organizational Factors

With hospital support, the implementation of this quality improvement project took place with registered nurses on two medical-surgical units. This project has been discussed with, and was supported by the CNS nurse educator, Magnet Coordinator of Newport Hospital. This project was approved by the Chief Nursing Officer (Appendix A). Letters of support by were supplied for IRB approval. In addition to leadership, support of the nurse manager of the two medical-surgical units was obtained with an informal e-mail describing the quality improvement project (Appendix B).

Sample

There was a total of 58 per diem, part-time and fulltime registered nurses eligible to participate in this project. All nurses at the program site are registered nurses. The hospital is a magnet hospital, meaning 80% percentage of their registered nurses have a bachelor's degree, they demonstrate excellence in nursing care, as well as fostering nursing professional practice. There was no demographic or identifiable information requested of the nurses for this project.

Framework

The quality improvement proposal was completed in the spring of 2020 with identification of the first reader. In September 2020, the evidence-based education tutorial was constructed along with the pretest and posttest measurement tool by this investigator. The pretest and posttest consisted of a 10-question, multiple choice survey about general delirium knowledge (Appendix C). The educational intervention was a 12-

slide power point with an introduction to delirium, causes of delirium, presentation of the different subtypes, prevention, use of the CAM screening tool, and finally a case presentation (Appendix D). The educational intervention was piloted with ten registered nurses from an outside hospital setting. The quality improvement proposal was submitted to the Lifespan IRB in October 2020. In December 2020, this investigator completed lifespan training requirements to obtain volunteer access prior to being granted Institutional Review Board (IRB) approval. Lifespan IRB approval occurred in January 2021. The project was then submitted and approved by Rhode Island College IRB in early January.

The original project proposal plan entailed this investigator presenting the educational interventional over a three-week span on the medical surgical floors. The former proposal implementation required an adjustment due to Covid-19 restrictions, staffing shortages, and increased work burden on the nurses. In collaboration with CNS nurse educator, it was decided the project will be implemented via e-mail rather than in-person. Access to Qualtrics web based anonymous survey system was granted through a Rhode Island College contract. The pretest and posttest survey were transferred to the Qualtrics system to maintain nurses' anonymity. The educational intervention was audio recorded for each slide. However, it was later established the nursing staff computers do not have access to audio, so the audio recording was removed, and a power point script was generated for the nurses to read. The changed quality improvement project was resubmitted to Lifespan IRB in February, and approval was obtained at that time.

Ethical

There was less than minimal risk involved by participating in this quality improvement project. Ethical considerations include coercion by staff nurses since the investigator of this project was recently a nurse at the facility however, worked in the ICU per diem, so there has not been previous contact with the medical-surgical staff nurses. Lifespan and Rhode Island College IRB approval was obtained. The staff nurses are not a protected population and confidentiality was upheld by using the anonymous survey system. There was no demographical data collected on the survey. Also, as there were no markers identifying nurses to their survey, and there was no analytic correlation between the individual nurses' pretest and posttest results.

Procedure

After the final Lifespan and Rhode Island College IRB approval was obtained, an informal e-mail was sent to the unit manager outlining a plan for the educational intervention. In March 2021, the educational intervention was sent out in an e-mail to the medical surgical staff nurses (Appendix E). In the e-mail, this investigator's status as a graduate student and the goals of the quality improvement project were stated. An outline of the educational intervention, and the steps to complete the intervention were explained. The nurses were to complete the pretest, review the power point with the attached script, followed by completion of the posttest. Also, within the e-mail, the instructions to the pretest and posttest link through Qualtrics. The e-mail also reiterated that the anonymous completion of the educational intervention was on a volunteer basis, and completion of the surveys implied consent.

Two-weeks after the initial educational intervention was sent to the staff nurses, a second e-mail was sent to both reiterating the quality improvement project and to

increase staff participation. The final cut off for staff nurses to complete the project was April 10, 2021.

Data Analysis

The results were analyzed with the use of descriptive statistics, specifically the use of mean, to measure the nurses' delirium knowledge, and the effectiveness of the educational intervention. With the use of percentages, questions one through ten were analyzed and then compared for the value of change from the pretest, to post-educational intervention posttest. As previously reviewed, there were no identifiable marks to match the individuals pretest to the posttest, so the test questions were analyzed as a whole.

Results

This quality improvement project was presented to a total of 58 medical surgical nurses. Of the 58 nurses, nine responded and completed the pretest (N=9, 15.52%), while seven completed the educational intervention posttest (N=7, 12%). The data is being analyzed as a whole and not by an individual's pretest/posttest, as such, all completed surveys will be used in the data analysis. All of the ten questions were multiple choice. Table 1 displays the nurses who participated in the project, and the percentage of accuracy for each question in the pretest and posttest.

Table 1:

Pretest and Post Educational Intervention Posttest Result Evaluation

Question (Correct Answer)	Pretest (N=9)	Posttest (N=7)
1 (B)	44.4% (4/9)	71.4% (5/7)
2 (B)	33.3% (3/9)	42.9% (3/7)
3 (C)	11.1% (1/9)	42.9% (3/7)
4 (C)	77.8% (7/9)	100% (7/7)
5 (A)	55.6% (5/9)	71.4% (5/7)
6 (D)	33.3% (3/9)	71.4% (5/7)
7 (D)	55.6% (5/9)	85.7% (6/7)
8 (A)	77.8% (7/9)	100% (7/7)
9 (C)	100% (9/9)	100% (7/7)
10 (B)	77.8% (7/9)	85.7 (6/7)

Question two and three revealed the largest delirium knowledge gap for the medical-surgical nurses. Question two, asked nurses to identify a predisposing factor of delirium. Three out of nine nurses (33.3%) responded with the correct reply. The posttest response was 42.9% accuracy, revealing an increase of 9.5%. One out of nine nurses (11.1%) correctly responded to question three, regarding precipitating factors causing delirium development. The posttest respondents' accuracy was 42.9%. Question six, identifying the key feature of delirium was met with 33.3% accuracy in the pretest. This question had the greatest rise in accuracy by the respondents on the posttest (71.4%), as evidence by a 38.1% increase in scores. When asked what actions should be taken to prevent delirium, there was 100% accuracy in both the pretest and in the posttest by the nurses regarding question nine. Aside from question nine, which both pretest and posttest received 100% accuracy by the respondents, all questions displayed an increase in accurate responses.

Summary and Conclusions

With regard to the inpatient hospital setting, delirium is the most common psychiatric syndrome encountered. It is a medical emergency with pathophysiologic consequence of a medical illness or exposure to a toxin (Thom et al., 2019). Despite the prevalence of delirium, 20% to 62% in the hospitalized adult, and up to 87% in the critically ill adult, delirium continues to be under recognized and poorly managed. As there are no biomarkers to diagnose delirium, it is based on clinical evaluation, specifically with a validated delirium screening tool such as the CAM. The CAM tool has been favorably utilized in the hospital setting as a result of its high sensitivity and specificity in identifying delirium. Delirium, and the number of days a patient spends in a delirious state is directly related to increased mortality, long-term cognitive dysfunction, and increased healthcare cost (Powell et al., 2019). Prevention and nursing education are central to decrease these detrimental consequences associated with delirium. There is a need for increased nursing education on delirium and the CAM screening tool to prompt the early identification and inhibition of delirium.

In light of the aging population and increased medical complexity of patients, this investigator created a quality improvement project with the aim of increasing medical surgical nurses' knowledge and understanding of delirium. The objective was to increase nurses' knowledge, provide education on the prevalence of delirium, the motor active subtypes, predisposing and precipitating factors, prevention, and use of the CAM screening tool. This occurred on two medical surgical floors in a Southern New England hospital. The project was evaluated using a pretest and posttest measurement model. The pretest and posttest contained the same ten multiple choice questions. The nurses first

completed the pretest through a web-based survey system that allowed all pretest/posttest to remain anonymous. The nurses then read a 12-slide evidence-based education tutorial with attached script. After completion of the educational tutorial the participants completed the posttest through the same web-based system.

Of the 58 nurses on the medical surgical floor, nine nurses completed the pretest and seven complete the educational intervention and posttest. This resulted in 12% rate of participation by the nurses. Test result total score increased in all 10-questions after the educational intervention. The pretest and posttest were not paired to individual nurses, so the data was reviewed and analyzed as a whole.

Questions two and three focused on identifying predisposing and precipitating factors of delirium. The nurses scored significantly lower on this topic. Question two asked, “Which one of these patients is predisposed to delirium?”, which 33.3% correctly answered depression on the pretest, and 42.9% on the posttest. Question three ask, “Which of the following is a precipitating factor in developing delirium?”, which 11.1% correctly answered infection in the pretest, and 42.9% answered correctly in the posttest. Topics nurses scored the highest on the pretest was delirium preventative strategies. Every nurse correctly answered question nine on the pretest and posttest, “Your patient just came up to you from the ICU and there is a concern she is developing delirium. What actions should you take to prevent delirium?”. Research by Thom et al., (2019) supports delirium prevention techniques as the most important measure to combat delirium. This highlights the importance of prevention, and previous delirium experience nursing care has focused on.

Outside of delirium tremens and palliative care, benzodiazepines will exponentially increase the developmental risk and severity of delirium, which is why it is not advised for hyperactive delirium (Li, Y et al., 2020). First choice treatment of severe hyperactive delirium is low dose Haloperidol. Questions four and seven focused on medications management related to delirium. Question four states, “Your patient with dementia has severe hyperactive delirium, which medication should be used?”, in the pretest 77.8% of nurses answered correctly with Haldol, while the posttest 100% of nurses responded correctly. Question seven inquired, “You have established your day one post-surgical hip fracture patient has delirium. He has become increasingly agitated and his behavior is escalating. What medication is not advised?”. Although 85.7% of participant correctly answered Ativan on the posttest, 14.3% still incorrectly answered morphine. This leads to question if pain treatment could potentially be inappropriately withheld from patients faced with delirium.

The greatest improvement in nursing knowledge was related to the key identifying feature of delirium, inattention. Pretest 33.3% of respondents answered this correctly, posttest this was answered with 71.4% accuracy. This was a 38.1% increase with an educational intervention. The lowest improvement was question ten, related to delirium identification. Depression is commonly mistaken for delirium, and conversely delirium is commonly mistaken for dementia. Question ten was a case study involving an elderly woman who developed delirium during her hospital stay. There was a 7.9% increase in posttest results compared to pretest results (pretest 77.8%; posttest 85.7%). However, due to the low sample size one participants answer makes up 14.3% of the results.

The greatest limitation to this quality improvement project was the covid-19 pandemic. The medical surgical floors where this project was implemented on experienced dramatic staff resignations, and a sparse supply of travel nurses who were not eligible to participate in this project. While this project was embraced wholeheartedly in the beginning stages, nursing leadership and staff nurses' attention was diverted and fully consumed by the pandemic. This resulted in poor nursing participation and an inadequate sample. Of the 58 nurses, nine responded and completed the pretest (N=9, 15.5%), while seven completed the educational intervention posttest (N=7, 12%). The project and educational intervention were e-mailed to the nurses and left open for just short of a month to be completed. Low participation could be due to nurses not checking their e-mail, and lack of flyers or backing from nurse leadership. This investigator was not permitted to enter the medical surgical units during implementation as there was a covid-19 surge preventing any outside bodies from entering the hospital. Nurses were working with limited staff and sick, time-consuming covid-19 patients at the time of the implementation. Many nurses had scarce time away from the bedside to complete the web-based project, which contributing to a low participation census.

Completing the education through e-mail and reading a power point was another limiting factor. Had this presentation been in person, nurses may have been more inclined to participate in the project. Due to this project being completed on nurses' own time, it is unclear if the educational tutorial was read in its entirety or just skimmed through. Also, due to the online nature of this project, nine nurses completed the pretest, but only seven completed the posttest.

Despite the low participation rate, this project showed a correlation between the educational intervention and an increase in nurses' knowledge. Research by Gesin et al., (2012) demonstrated that nurses' knowledge and perception of knowledge increased with in person educational sessions as opposed to online e-learning. As an investigator during a pandemic it was convenient to send nursing staff e-mails to complete the project. However, the lack of personal interactions likely resulted in low participation. It is unclear if posttest results would have demonstrated an enhanced understanding of the delirium content had the content been presented in person.

Recommendations and Implications for Advanced Nursing Practice

Despite the devastating ramifications to a patients' mortality, morbidity, long-term cognition and quality of life, a thorough hospital wide delirium education program and bundle is not main stay. For instance, there are multiple hospital policies related to bundles in prevent of pressure injuries, catheter associated urinary tract infections (CAUTI), falls, and steps to prevent hospital readmissions. This is partly due to hospital reimbursement associated with Medicare and Medicaid. However, according to the Agency for Healthcare Research and Quality (AHRQ), the mean cost per patient of a CAUTI is \$13,793, falls \$6,694, and pressure injuries \$14,506. Leslie et al., (2008) estimates the direct health care cost to care for a hyperactive delirium patient to be \$60,516-\$64,421 in additional health care cost. That amounts to \$143 billion to \$152 billion in annual healthcare cost related to delirium. According to AHRQ, the annual cost of CAUTIs is \$340-450 million, nonfatal falls \$50 billion, fatal falls \$754 million, and pressure injuries \$9.1-\$11.6 billion annually. If you add every CAUTI, fall and pressure injury together, that is still not half of the healthcare dollars spent on delirium. Yet, there is no established delirium bundle, policy or required supplemental nursing education. In regard to United States healthcare, baby boomers are aging, leading to a rapidly increasing older adult population. In addition, patients are more medically complex, resulting in greater predisposing and precipitating factors, ensuing delirium development. As such, we are on a precipice, not only is delirium education essential, the focus must change from tertiary treatment of a delirious patient, to primary delirium prevention for every patient, especially those most vulnerable.

One of the greatest benefits of an Advance Practice Registered Nurse (APRN) is their experience as a nurse. Before becoming an APRN nurse leader, most spent their nursing time at the bedside, assessing, caring, and mastering the facilitation of interdisciplinary communication. APRNs come from a unique nursing position, enabling them to understand the dynamics of patient care flow. They understand the implications of hospital policies and protocols and have acquired advanced training to interpret research to promote evidence-based change. For this reason, APRNs excel at synthesizing evidence-based research and using it to improve patient outcomes. This is why APRNs are in a key position to create a system wide task force to improve delirium education, and as a result improve patient outcomes, and decrease healthcare cost.

Research by Gesin et al., (2012) and Rohatgi et al., (2019) enforced the importance of in person educational sessions when providing system changes. The researchers also emphasized the importance of multidisciplinary collaboration when implementing delirium prevention. Each member of the healthcare team has a role to play in delirium prevention and treatment. Delirium goes beyond nurses at the bedside, it encompassed pharmacy, social work, case management, nursing informatics, physical therapy, occupational therapy, and healthcare providers.

When a patient has a change in mentation, or a physiologic decline, nurses are the first to respond. They are in and out of their patients' room throughout the day and are in a central position to identify the clinical pearls associated with delirium, and implement delirium protocols. This quality improvement project demonstrated nurses are lacking rudimentary delirium knowledge, but exhibited improved knowledge when education was provided. The APRN is in a position to implement in-person educational tutorials and

support nursing protocols for patients at risk to develop delirium, and those currently experiencing delirium. The electronic health record (EHR) can assist nurses by screening patients at risk for developing delirium. For instance, the CAM tool and the instructions to complete it, are within the healthcare systems ability to provide nurses and other clinicians access to complete the screening tool during their assessment documentation. With the assistance of nursing informatics, the EHR can alert nurses to patients who have been previously diagnosed with delirium, and those at risk for developing delirium. This can prompt nurses to identify patients at risk to develop delirium during sign-out, much like fall risk patients.

While nurses are at the patients' bedside night and day, they are not the only discipline crucial to decreasing delirium. Other disciplines, such as pharmacist are essential. Many patients are on multiple medications that are deliriogenic, or they may be starting new medications in the hospital course that can exacerbate delirium. Pharmacy has a key role in identifying these medications and are a valuable resource to healthcare providers when selecting medications. Other central disciplines include physical therapy and occupational therapy. Essential to delirium prevention is mobility, a normal sleep-wake cycle, and functional independence. Both physical therapy and occupational therapy assist in obtaining these patient goals. Likewise, healthcare providers caring for patients are essential to a delirium task force to recognize, prevent and mitigate precipitating factors. An APRN run task force, with assistance by multiple disciplines, are united under common objectives. To improve patient outcomes by preventing delirium through staff education (specific to that discipline), prevention, identification, and modification of delirium exacerbating factors.

The APRN is a leader in change, seeking to improve patient outcomes through the critical appraisal of evidence for reliability, validity, generalizability, and its application to create improved evidence-based practice change. This project revealed that increased delirium education needs to be provided to nurses, with a future scope encompassing multiple disciplines. In addition, nurses would benefit by focused education on predisposing and precipitating factors related to delirium development. Delirium is prevalent system wide, with future implementation of education and system changes lead by APRNs, there is opportunity to improve patient outcomes and improve healthcare cost.

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Appendix A

Letter of support by Dr. Orla Brandos, Chief Nursing Officer of Newport Hospital



October 25, 2020

Lifespan Institutional Review Board
Providence, RI

Dear Lifespan Institutional Review Board:

I am writing to you today to express my full support for exempt status of the proposal "Nurses' Knowledge on Delirium Prevention and Detection in Hospitalized Adults: A Quality Improvement Project", submitted by Kayla Deery BSN, RN, a graduate student in the Acute Care Nurse Practitioner program at Rhode Island College. Delirium is unrecognized in anywhere from 20-64% of hospitalized adults, as evidenced in the literature, leads to increased patient morbidity, mortality and healthcare cost.

This quality improvement project, led by Kayla Deery and mentored by Dr. Salera-Vieira, DNP, PNS, APRN-CNS, RNC, will measure nurses' knowledge regarding delirium before and after an educational intervention. The knowledge will be measure with the same pre and posttest. The educational intervention will be a 15-minute power point consisting of an introduction to delirium, the causes of delirium, hypoactive/hyperactive/mixed subtypes, use of the CAM, and finally prevention.

Due to the quality improvement nature of this proposed project, I fully support the request for exempt status.

Sincerely,

A handwritten signature in black ink that reads "Orla Brandos".

Orla Brandos, DNP, MBA, RN, CPHQ, NEA-BC, FACHE
Vice President, Patient Care Services
& Chief Nursing Officer
Newport Hospital
11 Friendship Street
Newport, RI 02840
Office: 401-845-1530

Appendix B

Informal e-mail outlining the quality improvement project to the nurse manager

Hello,

My name is Kayla Deery and I am a graduate student in the Acute Care Nurse Practitioner program at Rhode Island College. I started my nursing career as a clinical nurse intern at The Miriam Hospital back in 2009. My career took me from Miriam to eventually Newport Hospital where I worked per diem in the ICU until this past fall. There is a unique camaraderie and support between the nursing staff and administration at Newport Hospital that facilitates excellence in nursing care. For this reason, I was hoping to bring my masters project onto your unit.

Most research has found the percentage of delirium that is undiagnosed ranges from 20% to as high as 64% of hospitalized patients. Of hospitalized adults age 65 and older, at least 20% will develop delirium in the United States. Undiagnosed delirium leads to increased morbidity and mortality, prolonged hospitalized length of stay, and increase healthcare costs. For these reasons I have chosen to implement a quality improvement project to increase delirium knowledge for Turner 2 and Turner 4 nurses. My plan is to meet with nursing staff and review a power point that focuses on the following: An introduction to delirium, the causes of delirium (including predisposing and precipitating factors), hypoactive/hyperactive/mixed subtypes, use of the brief CAM, and finally prevention. I understand all too well how important nurses' time is so I would not make this presentation longer than 15-minutes. I am also going to administer (with the nursing staff consent) an anonymous 10 question, pre and posttest to measure their knowledge (the pre and posttest will be the same test).

If my timeline goes as planned, my goal was to present this project to the staff nurses starting at the mid-January and come onto the unit over 2-3 weeks. My plan was to try and catch nurses coming off their shifts and if needed, I will come to the unit in the middle of shifts in the hope they can spare 15 minutes. Being a current bedside nurse, I very much understand how precious 15 minutes in the middle of your shift is.

Thank you so much and I truly appreciate the time you have taken to review this. Please reach out to me at kdeery_7490@email.ric.edu if you have any question, concerns or different ideas for implementation.

Thank you again,
Kayla Deery

Appendix C

Delirium Survey

By completing this anonymous survey, you are agreeing to be a part of a Quality Improvement project conducted by a nurse practitioner student for completion of her major paper.

1. It is believed up to what percentage of hospitalized adults will experience delirium during their stay?

- a. 27%
- b. 64%
- c. 45%
- d. 88%

2. Which one of these patients is predisposed to delirium?

- a. 32-year-old woman who just underwent an appendectomy and is in pain
- b. 52-year-old man with a significant history of depression
- c. 68-year-old woman with a new anemia
- d. All the above

3. Which of the following is a precipitating factor in developing delirium?

- a. Dementia
- b. Past history of stroke
- c. Infection
- d. Advanced age

4. Your patient with dementia has severe hyperactive delirium, which medication should be used?

- a. Ativan (lorazepam)
- b. Benadryl (diphenhydramine)
- c. Haldol (haloperidol)
- d. Xanax (alprazolam)

5. Which patient is more likely to have a poor outcome?

- a. Your nursing home patient who is very sleepy this admission and not interacting during assessments
- b. Your 62-year-old patient was intubated in the ICU for 3 days, is restless, forgets where he is sometimes and trying to get in and out of bed
- c. Your patient who has been appropriate most of the day, but her mentation has fluctuated during the day and she will suddenly become restless and not know where she is
- d. 22-year-old man who admits to smoking marijuana daily and binge drinking most weekends

6. What is the key identifying feature of delirium?

- a. Restlessness
- b. Old age
- c. Dementia
- d. Inattention

7. You have established your day 1 post-surgical hip fracture patient has delirium. He has become increasingly agitated and his behavior is escalating. What medication is NOT advised?

- a. Haldol (haloperidol)
- b. Morphine
- c. Ativan (lorazepam)
- d. Tylenol (acetaminophen)

8. What screening tool is best used to detect delirium?

- a. bCAM
- b. Mini-Mental State Exam (MMSE)
- c. Clock-drawing test
- d. Nursing assessment

9. Your patient just came up to you from the ICU and there is a concern she is developing delirium. What actions should you take to prevent delirium?

- a. Keep the room dark and let her get lots of sleep, she has been through a lot
- b. Tell the family to go home, all their talking to her will make her more confused
- c. Open the blinds to allow natural light in, remove the foley catheter and ambulate the patient as soon and as often as possible
- d. All the above

10. You have an 86-year-old woman who was admitted with a urinary infection, she becomes confused on your nightshift, she is restless, unable to redirect, trying to pull out her IV's and getting out of bed so she can "get back to her bedroom". She lives at home with her daughter who states this is odd behavior for her mother. What is most likely going on?

- a. She likely has dementia that her family does not know about
- b. She is experiencing delirium
- c. All the above
- d. None of the above

Appendix D

Scripted delirium power point used as education tutorial

Slide 1.

Hello, my name is Kayla Deery and I am a nursing graduate student at Rhode Island College. First and foremost, I want to thank you for taking the time to complete this educational session on Delirium. I myself am also a current bedside nurse and I appreciate you taking the time to help me complete my master's degree requirement. That being said, this is a small piece in understanding delirium. But hopefully, by the end of this power point you will gain some new knowledge to aid you in improving patient care.

Slide 2.

The point of this project is to increase your general delirium knowledge. The sessions objectives include, 1. Identify why delirium education is essential, 2. Define delirium and the different Predisposing and Precipitating factors placing the hospitalized patient at risk, 4. Gain an understanding of the Brief Confusion Assessment Method, which is the (bCAM), and how to utilize this tool to detect delirium. Lastly 4. Determine what preventative measures nurses can use to prevent delirium in their patients.

Slide 3.

Delirium is a medical and psychological emergency, it is sometimes the only symptom of a potentially life-threatening medical condition.

Though the mechanism that causes delirium is still not fully understood, it is the decompensation of cerebral function resulting in a sudden (which differentiates it from dementia), usually transient, neuropsychiatric syndrome.

Delirium is defined by five key characteristics according to DSM-5

1. Disturbance in attention, this is the key indicator of delirium (patient's with delirium cannot follow simple instructions, they cannot focus when receiving their care and are very easily distracted and sometimes fixated on a subject)
2. Sudden, acute change in behavior (so when family members tell you the patient does not usually act like this, it is imperative to listen)
3. Behavioral patterns that fluctuate throughout the day (In the morning they are alert, oriented and a couple hours later they seem confused and agitated or very drowsy)
4. Disturbance in cognition
5. The disturbances are not caused by neurocognitive disorders (psychiatric illness, post ictal from a seizure)

Slide 4.

Here are three different subtypes of behavior associated with delirium.

- First, and the most well-known and usually most difficult to manage due to the patient's behavior is Hyperactive: we have all seen it, it is an increased

restlessness, increased amount of motor activity, loss of control of activity, and migration.

- The second type and much harder to identify is hypoactive: reduced speed of actions, reduced alertness, patients become withdrawn, quiet and sleeping most of the day; this subtype is associated with worse outcomes than the other motor types and higher mortality rates!
- Lastly is mixed: this is both subtypes with fluctuations throughout the hospitalized course

Slide 5. Impact Delirium has on the Hospitalized Adult

Delirium has a large impact on our hospitalized patients. Of hospitalized adults age 65 and older, at least 20% will develop delirium- it is the most common hospitalized complication of this age group

Research has found the percentage of delirium that is undiagnosed ranges from 20 % to 64% of hospitalized patients.

Undiagnosed delirium leads to increased morbidity and mortality, prolonged hospitalized length of stay, and increased healthcare burden and costs. What I discovered doing this project and really alarmed me is delirium in the hospital can result in permanent cognitive delay to our patients. The one-year total direct cost due to delirium ranges from \$143 billion to \$152 billion in the U.S. annually

Slide 6.

Predisposing factors are characteristics a patient has prior to their admission. These include dementia, depression, stroke, Parkinson's disease, sensory impairment, comorbidity burden, advanced age, living in an institution, atrial fibrillation, diabetes and severity of illness.

So, these patients require less insult by infection, electrolyte imbalances and other causes for hospitalizations than someone who does not have any of these factors to develop delirium.

A role of nursing is to recognize predisposing factors, which makes a patient vulnerable to delirium, then we need to try to mitigate and prevent the precipitating factors

Slide 7.

Precipitating factors are insults to the body that are sometimes modifiable. This includes pain, so even though narcotics can cause delirium and can be a precipitating factor, pain needs to be treated appropriately.

Others include polypharmacy, which many patients have a home medication list longer than their grocery list, foley catheters, dehydration, anticholinergic medications, immobilization (have to get patients out of bed and moving), low hemoglobin, emotional distress (why family involvement is so important), sleep deprivation (all those patients you get from ICU have an increased risk of delirium because there is no way they have had good night sleep while there), opioids, hypoxia, hip fracture and surgery.

Slide 8.

Long story short, medications are not first choice treatment in delirium. But when nonpharmacologic treatment fails the first line medication intervention is antipsychotics-like Haldol -Haloperidol (be aware of QTc prolongation) and this is only for severe agitation when the patient become a danger to themselves and others.

- When treating pain use a multimodal approach to help decrease opioid use, pain treatment should involve multiple interventions, ice/heat, Tylenol, movement, ect.
- Minimize over sedation, be aware of BEERS criteria in the elderly.

You can also consult pharmacy to review medications in patients with polypharmacy

- Restart psychiatric medications as soon as appropriate, most patients have been on these medications for years and a stop of these medications can cause major complications.

Consider substance withdrawal from benzos, narcotics and alcohol

- In delirium (except for in alcohol withdrawal!) benzodiazepines like Ativan and Xanax will make delirium worse.

Existing evidence supports the use of benzodiazepines in only two specific delirium settings: persistent agitation in patients with terminal delirium and delirium tremens (which is alcohol withdrawal). In the setting of terminal delirium, the goal of care is to maximize comfort, recognizing that patients are unlikely to recover from their delirium (Your CMO and hospice patient).- palliative sedation

Slide 9.

Nursing interventions to prevent delirium focus on maintaining your patient's independence.

- Non- pharmacologic interventions is nursing driven, avoiding risk factors that aggravate delirium such as dehydration, disruption in sleep, sensory impairment (make sure their glasses are on and hearing aids are in place during the day), pain management and prolonged immobilization (encourage early ambulation).
- Removal of foley catheter and any extra lines/invasive equipment.
- Promotion of night time sleep, blinds and curtains open during the day to expose the environment, keep your patient's body in synch with their circadian rhythm.
- Involve family to help continually reorient patient, many studies show that family interaction helps keep the patient oriented and improved outcomes. Reconciliation for deliriogenic medications. If the delirious behavior becomes dangerous to the patient or caretakers and the previous methods are not effective, then low-dose, short-acting antipsychotics like Haldol can be utilized as a last resort.

Slide 10.

The brief cam is an assessment tool used to aid in identifying delirium positive patients.

It is very quick to use and the more you use it the easier it is to incorporate into your patient assessment, it takes maybe 1-2 minute once you get in the habit of using it.

This is in your epic flowsheet and the directions for its use are written on the right of your screen when you click on it.

- When using the CAM, a patient will be asked a series of questions to evaluate their cognition, attention, and ability to follow instructions.

- The bCAM has FOUR features: (1) **Alerted mental status or fluctuating course & (2) Inattention** (3) altered level of consciousness, (4) disorganized thinking.
- For a diagnosis of delirium, the patient must have the first and second feature and either the third or fourth previously stated feature.
- Feature 1 & 2 must be positive, plus either 3 or 4 must be positive

Slide 11.

This is the algorithm you would use to complete the basic CAM and identify a delirium positive patient.

- First look at feature 1- you will identify altered mental status or fluctuating course. Here you can ask the family, “is this new behavior” or when they say something like “Mom/Dad is usually very sharp and lives alone and I have never seen them like this.” Or if in report you are told they are alert, oriented and you are meeting a totally different version of the patient... you would say this is positive and move onto the next feature of inattention.
- Feature 2 Inattention is key to differentiate delirium from other psychiatric diseases. Ask the patient to name the months backwards from December to July, more than 1 error is positive.
- Feature 3, Altered level of consciousness, anything other than alert and awake on your RASS scale is positive.
- Feature 4, disorganized thinking you will ask a series of yes or no questions and any errors will mean a positive result. (1. Will a stone float on water?, 2. Are there fish in the sea?, 3. Does one pound weight more than 2 pounds?, 4. Can you use a hammer to pound a nail?) Or you can have them follow a command: “Hold up this many fingers” (you would hold up 2 fingers) with your right hand, (then once the patient does that, put your hand down and show no fingers) then ask them “now do the same with the other hand” (and do not demonstrate).
- Feature 1 and 2 must be positive and if either feature 3 or 4 are positive the patient is positive.

Slide 12.

I am just going to present a quick case study to put the basic CAM to use. Mrs. Brewer is 79-years-old and admitted yesterday to your unit for sepsis due to a UTI. She was made a sitter overnight due to climbing out of bed, restlessness and trying to pull out her IVs. This morning when you go in to assess her, she thinks she is on her boat and loses focus when you ask her basic questions. When speaking to her daughter, she states her mother lives home alone, drives, and performs her own house hold chores and is “sharp as a tack”.

- When looking at feature 1: altered mental status or fluctuating course: You are going to use her family as a reference and this is new behavior, so feature 1 is positive.
- Feature 2: Inattention: We are going to pretend Mrs. Brewer was able name months December and November, so this is also positive

- Feature 3: Altered level of consciousness: We are going to say she is restless since she has a sitter, so this feature is positive since it will make her RASS +1 and you can end here.
- You can say Mrs. Brewer is positive for delirium.

Appendix E

Final e-mail sent to staff nurses to access educational intervention

T2 and T4 RN's,

My name is Kayla Deery, and I am a nurse practitioner student at Rhode Island College. Part of the graduation curriculum involves completion of a master's project regarding a subject we feel passionately about. That being said, I am excited to make you aware of a Quality Improvement (QI) project that will be taking place. My original plan was to come onto the unit and teach about delirium and patient factors associated with delirium. Due to covid, there were some changes made and the project needed to be presented via e-mail.

The instructions are as follows..

1. Please click on the link below- Delirium Knowledge Pretest- This is a short 10-question multiple choice survey. This is an anonymous system and I will never see who completes the test, I will just be given the answers selected
2. Please open the attached power point. Since I cannot be there in person and audio cannot play on your system, I typed out what I would have said in the notes section of the power point. So do not view it as a slide show. I know that it can be difficult just to read someone's notes and I really appreciate you doing this. The power point is only 12-slides.
3. After viewing the power point please click on the link below- Delirium Knowledge Posttest. It will be the exact same questions as the pretest, and it will once again be anonymous.

Anticipated benefits of participating in this project include increased satisfaction in work performance, and professional pride in providing care confidently using the most scientifically sound and contemporary recommendations. If you do not wish to participate, you are still welcome to view the delirium power point.

There is less than minimal risk involved in this quality improvement project as the test will be anonymous and there will be no identifiable information requested. The completed test will be anonymous through a system called Qualtrics. The aim of this project is to increase nurses' knowledge to understand, detect and prevent delirium.

Step 1. Delirium Knowledge Pretest

https://ric.qualtrics.com/jfe/form/SV_b2CH0CpoHhS35gG

Step 2: Please view power point attached

Step 3. Delirium Knowledge Posttest

https://ric.qualtrics.com/jfe/form/SV_8q3UhLszlLIFcuW

By completing the pretest with the links provided you are agreeing to be a part of this quality improvement project. If you choose not to be a part of the project you are still welcome to view the educational intervention.

Thank you for your time and feel free to contact me with any questions,

Kayla Deery

Kdeery_7490@email.ric.edu