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DNP Proposal: Delirium Prevention Protocol

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Abstract

Purpose and Rationale

To implement a delirium prevention (DP) sleep protocol to at risk intensive care unit (ICU) patients to reduce delirium incidence and duration.

Synthesis of Evidence

A review of one clinical practice guideline, eight systematic reviews and meta-analysis, four randomized controlled trials, nine quasi-experimental trials, and one qualitative study provided evidence that interventions targeted to improve patients' sleep may decrease delirium incidence and duration in adult patients in the ICU.

Practice Change and Implementation Strategies

Education on scoring of the Intensive Care Delirium Screening Checklist (ICDSC) and interventions to promote sleep will be provided for unit nurses, nursing assistants, advanced practice providers, and physicians. The DNP students will enlist nurse leaders and nurse care coordinators who attend daily rounds to identify at risk patients in the ICU.

Evaluation

Evaluations will be made at the end of the implementation period by using data extracted from the electronic medical records to compare the ICDSC scores during a 5 week period before the staff education to the ICDSC scores 5 weeks following the staff education to determine the incidence and duration of delirium.

Conclusions and Implications for Practice

The incidence and duration of delirium of patients in the ICU will be disseminated to unit leadership. If successful, the DNP students will advocate for the DP sleep protocol to be adopted into the unit's standard of care.

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Delirium is a term used to describe a condition in which patients experience a sudden change in their behavior (Kalish, Gillham, & Unwin, 2014). A delirium diagnosis is often accompanied by various terms such as "altered mental status, acute confusional state, sundowning, encephalopathy, and acute organic brain syndrome" (Kalish et al., 2014, p.150). Delirious patients experience inattention, disorganized thinking, and/or an altered level of consciousness (Kalish et al., 2014). Delirium in the intensive care unit (ICU) environment affects many patients without discrimination. The cognitive dysfunction within vulnerable ICU patients creates adverse outcomes that affect the patient and healthcare system alike.

Risk factors associated with delirium can precipitate incidence among patients with a history of aggravators. Predisposing conditions such as alcoholism and chronic pain, or acute insults such as a severe illness can act as a precipitator (Kalish et al., 2014). Additionally, certain medications are delirium-inducing culprits (Kalish et al., 2014). A full list of components that could cause delirium can be found in Appendix A. These elements are common comorbidities of most ICU patients, which increases their risk for delirium.

Criteria were established to classify delirium behaviors and are outlined in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (European Delirium Association and American Delirium Society, 2014; Kalish et al., 2014). See Appendix B for this information. The DSM-V provides updated criteria from the DSM Fourth edition (DSM-IV) by eliminating the misconception that patients' states of consciousnesses do not disqualify people from being in delirious states. The variable of consciousness was taken out of the equation to classify delirium and substituted with attention deficits (European Delirium Association and American Delirium Society, 2014). Before the DSM-IV, delirium categorization included consciousness states (European Delirium Association and American Delirium Society, 2014). After close analysis,

the European and American Delirium Associations (2014) determined diagnosing delirium with levels of consciousness was not feasible. Instead, incorporating attention characteristics was signaled as a better option to distinguish delirium subtypes (European Delirium Association and American Delirium Society, 2014).

Delirium is separated into three subtypes: hypoactive, hyperactive, and mixed. Each patient can have unique characteristics, creating subtleties of presentation that can be difficult to detect. Hypoactive delirium characterizes itself as a state of sedation, motor slowness, lethargy, and withdrawal from interactions (Krewulak et al., 2018). In contrast, hyperactive delirium is described as demonstrating animated characteristics, including agitation, aggression, hallucinations, and disorientation (Kalish et al., 2014; Krewulak et al., 2018). Lastly, mixed delirium is an integration of hyperactive and hypoactive characteristics that fluctuate (Krewulak et al., 2018). Within these subtypes, studies support hypoactive incidents being most prevalent within the ICU (Krewulak et al., 2018; Gual et al. 2018). Vulnerable populations who suffer from multiple comorbidities are more likely to experience severe adverse effects resulting from delirium (Krewulak et al., 2018; Gual et al. 2018). For this reason alone, it is paramount to establish a sound educational base to ensure clinicians can recognize the signs and symptoms of all subtypes of delirium.

Krewulak et al. (2018) identify several different screening tools that can be used to recognize patients with delirium, such as the Confusion Assessment Method for ICU (CAM-ICU) or the Intensive Care Delirium Screening Checklist (ICDSC). Screening tools aid clinicians in steering patient care towards a patient-centered philosophy to improve patient outcomes. Early symptom recognition will benefit patients' long-term outcomes, thus creating a better path to recovery following hospitalization. Hypoactive delirium accounts for 75 percent of

missed delirium diagnoses within the ICU (Krewulak et al., 2018). By detecting delirium characteristics early in the ICU, patient prognosis can potentially improve (Krewulak et al., 2018).

Establishing a diagnosis of delirium is not a single conceptual blanket statement. Delirium has different characteristics compared to other cognitive pathologies. Hypoactive subtype symptoms are often misinterpreted and unintentionally missed, creating extended ICU stays and increased risk of mortality (Gual et al., 2018; Krewulak et al., 2018). More than one third of individuals experiencing delirium in the ICU are not diagnosed with delirium, and a fraction of this magnitude creates an extraordinary burden (Krewulak et al., 2018; Kalish et al., 2014). Dismissing delirium amongst patients causes stress physically, emotionally, and financially.

Vaselevskis et al., (2018) reported that delirium related care added an additional estimated 600 dollars per day to care provided in medical and surgical ICUs. Delirium prevalence within the ICU affects 60 to 80 percent of mechanically ventilated patients and 20 to 50 percent of patients that do not require mechanical ventilation (Kalish et al., 2014; Krewulak et al., 2018). Additionally, delirium is associated with long term deficits as well as increased mortality and morbidity (Leslie & Inouye, 2011). The economic impact delirium has on the United States healthcare system is of great magnitude, the average annual health care costs associated with delirium range from 143 to 152 billion dollars (Leslie & Inouye, 2011). The importance of delirium prevention ignites a focal point of priority. Not only can delirium prevention be a cost-effective intervention, but it also prevents further patient harm associated with delirium. Stakeholders such as insurance companies, healthcare systems, and Medicare

could save money and improve patient outcomes by mandating a delirium prevention policy within hospitals (Leslie & Inouye, 2011).

While delirium is a condition that can be caused by many factors/variables, the impact of sleep related to delirium will be the focal aspect of this project. Sleep algorithms are assets that can become a part of the culture of ICU healthcare if the importance of delirium prevention is prioritized. According to Devlin et al. (2018), sleep deprivation within the ICU community potentiates the risk of developing a cognitive status change by 30 percent. Inadequate sleep is a modifiable component in the ICU that can help prevent delirium (Devlin et al., 2018). Sleep hygiene is a primary weapon against delirium, and as a result, has been added to the previous 2013 Pain, Agitation, and Delirium guidelines (Devlin et al., 2018).

Prophylactic educational interventions provided to physicians, nurses, nurses' aides, occupational and physical therapists, respiratory therapists, and family members can aid in early recognition of delirium (Kalish et al., 2014). Currently, the ICU chosen to implement an intervention does not have an ICU delirium prevention (DP) protocol or algorithm that includes a sleep component. Due to the critical role sleep plays in combating delirium, creating a preventative algorithm can aid in the importance of obtaining quality rest during patient stays (Devlin et al., 2018). Facilitating an opportunity to produce a quality improvement project discerning DP could play a vital role in changing cultural views of obtaining quality sleep within ICU communities.

Purpose of the Project

The purpose of this project is to implement a DP intervention to reduce the incidence and duration of delirium in the ICU. The highlighted Midwest facility ICU currently does not have a protocol implemented to promote sleep as a strategy to prevent delirium. Using a pre and post

interventional phase, the Doctor of Nursing Practice (DNP) students will assess the recorded ICDSC scores and compare the effects of a multifaceted DP algorithm with the current standard practice to combat delirium incidence and duration within the target unit.

Clinical Practice Problem/Issue Statement

The following clinical practice problem or issue has been translated into a population, intervention, comparison, outcome (PICO) format. In ICU patients meeting DP Protocol Algorithm criteria (P), do patients with the DP protocol ordered (I) compared to patients without the DP protocol ordered (C) affect the delirium incidence and duration measured by the ICDSC tool (O)?

Evidence

Search Strategy

From March 1st, 2020 to September 30th, 2020 databases were explored to include relevant literature. Evidence searches included six databases. These databases included Cumulative Index of Nursing and Allied Health Literature (CINAHL) Complete, Elton B. Stephens Company (EBSCO) MegaFILE, Cochrane Library, Google Scholar, PubMed, ProQuest. Population search terminologies, search dates, databases, and number of search hits and reviews have been documented within Appendix C. Literature was limited to within ten years (2010-2020). Inclusion criteria consisted of peer reviewed, English language, and full text. To condense pertinent literature to the PICO question, multiple search terms, phrases, and acronyms were used. As displayed in Appendix D, terms used within the PICO question were used to search the literature.

Literature meeting the inclusion criteria was initially filtered by a review of the abstracts. Articles with relevance to the proposed project were evaluated in full detail and discussed

between the DNP students leading the project. To broaden the search, patient populations were expanded to medical, cardiac, neurological, and general ICU's. Literature included interventional studies, systematic reviews, and meta-analyses revolving around delirium prevention strategies. Finally, the reference list from each study included was reviewed to identify potential pertinent studies that met the search criteria.

Evaluation of Evidence

Level of evidence. Ackley et al. (2008) developed the level of evidence scale that was used to evaluate the included articles. The graded level of evidence classification for each article in the literature review is within literature tables located in Appendix E. Appendix F describes each level of evidence criteria, along with how many articles utilized in the literature review meeting Ackley et al. (2018) grading criteria. The literature review includes eight level I research articles, five level II, and nine level III articles. One level V qualitative study on the impact of a sleep protocol for staff and patients was included.

Level of effectiveness. To gauge the efficacy of interventions presented in each of the interventional studies within the literature review, each article will be rated using Ackley et al. (2008) level of effectiveness scale. The possible responses include effective, possibly effective, not effective, and possibly harmful. The intervention, reference, and level of effectiveness for all 13 randomized control and quasi-experimental studies will be evaluated (See Appendix G). Of the 13 interventional studies included in the level of effectiveness table, two were effective, nine were possible effective, and two were not effective.

Knowledge gaps. A thorough search of available literature was completed in the process of compiling this literature review. Identified knowledge gaps include literature on the impact individual interventions had on delirium incidence and duration. However, the literature that

included single-component interventions showed no statistical impact. Another gap in the literature is the lack of qualitative research on how delirium prevention strategies impact patients' experiences.

Review of Evidence

After reviewing the literature, 23 articles were selected as evidence. A full description of each individual article is outlined in Appendix E. Included in this table is the purpose of the study, sample size and setting, design, instruments used, statistical analysis done, major findings implications for use in this project proposal, and the article's level of evidence grade. In total, there was one clinical practice guideline, eight systematic review/meta-analysis, four randomized controlled trials, nine quasi-experimental studies, and one qualitative study included for review.

When reviewing the literature for evidence supporting the research question, several themes emerged. All of the studies utilized a validated tool or patient completed survey to collect data. The second theme was the use of non-pharmacologic interventions. Many of the studies included multiple interventions which were "bundled" and offered simultaneously. The third theme was incidence and duration of delirium. These themes are depicted in Appendix H.

Screening Tools. Most of the studies included reference specific screening tools. The CAM-ICU was utilized in 14 of the 24 articles included in the literature review. Kamdar et al. (2013) required that patients included within the study had a CAM-ICU assessment completed twice a day. Incomplete documentation of delirium screening tool scores was a common reason for exclusion from many of the trials. The other commonly used assessment tool was the ICDSC. Rivosecchi et al. (2015) required that the ICDSC be completed every four hours. By requiring more assessments per day, Rivosecchi et al. was able to trend the duration of delirium as well as the incidence. The third referenced assessment tool is the Neelon and Champagne

Confusion Scale (NEECHAM). Van Rompaey et al. (2012) utilized NEECHAM and found that it was comparable to CAM-ICU in delirium detection. In a systematic review by Flannery et al. (2016), a conclusive recommendation for future research was to utilize a validated tool. Even though Flannery et al. included research that had NEECHAM scores, they encourage the use of either the CAM-ICU or ICDSC at least once per shift for detecting delirium. The fourth delirium scale that was present within the included literature was the DSM-IV (Flannery, 2016). This scale has since been updated to the DSM-V, defined previously. While many different tools exist for detecting delirium, this proposal will be using the ICDSC currently being used at the chosen clinical site. The ICDSC was validated by Bergeron et al. (2001).

Interventions. The articles included in the literature review and theme matrix utilized a variety of interventions including eye masks, ear plugs, noise reduction strategies, clustering cares, reducing light stimulation, therapeutic cares, family participation, and bundled interventions. Most of the studies included in the literature review used a care bundle, a multifaceted strategy, to assess the impact on delirium (Devlin et al., 2018; Patel et al., 2014; Rivosecchi et al., 2016; Van de Pol et al., 2017). Flannery et al. (2016) published a systematic review that evaluated outcomes of interventions incorporating education, light therapy, noise reduction, pharmacological, and sleep bundle strategies to prevent delirium. However, Flannery et al. made no specific recommendations regarding which intervention was best, hence there are no interventions selected within the theme matrix. Van de pol et al. (2017) utilized five of the six interventions within one study and implemented a four-step approach to sleep promotion: (a) decrease staff noise, (b) cluster patient care and adjust equipment alarm volumes, (c) closing patient doors and providing ear plugs, and (d) efforts to minimize noise in the room. Concluding results indicated a statistically significant decreased trends in delirium incidence ($p = .02$),

decreased utilization of sleep-inducing medications ($p < .001$), and a decreased perception of nighttime noise of 70 decibels to 65 decibels (Van de pol et al., 2017). Devlin et al. (2018) Pain, Agitation/ Sedation, Delirium, Immobility, and Sleep disruption (PADIS) Critical Practice Guideline (CPG) concluded with 37 total practice recommendations, 34 conditional and 3 strong, within the critical care environment. None of the strong recommendations are associated with the Sleep Improvement or Delirium sections, however, both of these sections had multiple conditional recommendations that may improve patient outcomes (Devlin et al., 2018).

Eye Masks & Ear Plugs. Demoule et al. (2017) evaluated the impact of wearing eye masks and ear plugs on sleep and delirium rates. Utilizing polysomnography, Demoule et al. were able to demonstrate that the use of eye masks and ear plugs had a positive impact on decreasing prolonged awakenings during the night ($p = .02$); however, they were unable to find a statistically significant difference between the control and intervention group's impact on delirium rates at the 90-day follow up ($p = 1$). Van Rompaey et al. (2012) found that use of ear plugs at night reduced the risk of delirium by 53% (Hazard Ratio [HR] .047, Confidence Interval [CI] [.27, .82]. $p = .008$). Hu et al. (2015) found that the use of ear plugs and/or eye masks significantly decreased the risk of delirium (risk ratio [RR] 0.55, CI [.38, .80], $p = .020$). Lastly, Locihová et al. (2018) found that the use of eye masks and ear plugs positively impacted patients' perceived sleep quality.

Noise Reduction. While none of the studies explicitly discussed the impact of noise reduction on delirium, several of the studies employed noise reduction as a part of the bundle of cares for delirium prevention. In order to measure the level of sound, Patel et al. (2014) used a targeted approach to decrease sound in patient care areas including: closing all doors, turning equipment and phones to night mode, limiting conversations in patient area to only clinical

discussions, encouraging staff and visitors to speak quietly and offering earplugs to all patients. Doing these targeted interventions, the mean sound level decreased by a statistically significant amount pre and post intervention ($p = .002$). Smith and Grami (2017) used a sound meter at patients' bedside to strive to maintain a volume level below 80 decibels, but found this was often difficult to achieve given the nature of the environment and machines present. Van de Pol et al. (2017) found that after the implementation of their nocturnal sound-reduction protocol the incidence of delirium had a sharp decline between the pre and post time periods ($p = .02$). In Kamdar et al. (2013) bundled intervention, noise reduction was included. Consequently, the post-QI group reported lower daily noise ratings than the baseline group ($p = .001$; Kamdar et al., 2013).

Clustering Cares. As a part of Kamdar et al. (2013) multicomponent bundle interventions, clustering cares was a key element introduced early in the quality improvement project. As a result of Kamdar et al. integrating the bundle, results showed a decreased incidence of delirium (Odds ratio [OR] .46, CI [.23, .89], $p = .02$). Zhang et al. (2017) used a nursing protocol to target the risk factors associated with delirium. As a part of this protocol, Zhang et al. had the nursing staff cluster cares between 2300 and 0500 to limit times the patient would be inadvertently woken. As a result of Zhang et al. protocol, the authors found that the onset for delirium was later in the intervention group (63% of all delirium cases within the intervention group occurred on postoperative days three through six, compared to 82.93% in the control group occurring on postoperative days zero through two, $p < .001$).

Minimal Interruptions Timeframes. A few of the studies included set timeframes where staff were instructed to minimally interrupt patient sleep unless absolutely necessary. Previously described, Zhang et al. (2017) set 2300 to 0500 as their timeframe. The timeframe was not

measured as an individual intervention but rather as a part of the study's delirium prevention bundle which resulted in a statistically significant decrease ($p = .001$) in delirium incidence (Zhang et al., 2017). For Foster et al. (2013) the designated sleep period was between 2200 and 0400 but showed no indication of significant delirium reduction (28% vs 31%) from implementing a multifaceted strategy. Patel et al. (2014) set aside 2300 to 0700 as their nighttime period for their nonpharmacological intervention bundle. Delirium incidence ($p < .001$) and delirium duration ($p = .021$) both showed decreases and proved to be statistically significant as a result (Patel et al., 2014). Smith and Grami (2017) denoted 0000 to 0400 as their rest time. Even though results of the study showed the odds of delirium was reduced ($p = .001$), Smith and Grami indicated that the sleep promotion period of 0000 to 0400 was difficult to achieve due to light stimulation, noise, and lack of hypnotic medication administration documentation after 0200. Finally, Van de Pol et al. (2017) used a sound meter to determine interruptions in patients' rooms between the hours of 2330 and 0730. By decreasing noise levels from 2330 to 0730, the study resulted in a statistically significant decreased trend ($p = .02$) in delirium incidence (Van de Pol et al., 2017).

Reducing Light. In combination with ear plugs and eye masks, Demoule et al. (2017) used light reduction as an intervention strategy. Albeit there was no evidence of delirium reduction, by using sleep wear and light reduction Demoule et al. concluded longer sleep durations ($p = .039$) and decreased prolonged awakenings ($p = .002$) among their patient sample. Patel et al. (2014) was able to claim 100% compliance with dimming the main ICU lights between 2300 and 0700 as well as utilizing bedside lighting in patient care areas. The results of Patel et al. study showed a reduction in delirium incidence ($p = < .001$) and duration ($p = .021$). Rivosecchi et al. (2015) determined that dimmed hallways were a non-feasible intervention so

did not explicitly evaluate reducing lights as an outcome, nor did they elaborate on why they deemed the intervention non-feasible. The sound reducing study published Van de Pol et al. (2017) was aimed at reducing noise, but as a part of this study, they also reduced lighting at night and allowed for natural light during the day. Amongst these four studies, Patel et al. was the solo study to measure light by using an environmental meter measuring light levels in lux. Although dimming of lights was incorporated into several 'bundled' interventions (Demoule et al., 2017; Foster et al., 2013; Kamdar et al., 2013; Patel et al., 2014; Rivosecchi et al., 2016; Smith et al., 2017; Trogrlic et al., 2015; Van de Pol et al., 2017), light reduction was not identified as a single influencer of delirium reduction.

Therapeutic Cares. In Hu et al.'s (2015) systemic review of the literature on sleep promotion in the ICU, the evidence for therapeutic cares was low quality. Within their work, they reported a study's benefit of relaxation techniques, back massage plus relaxing music, on prolonging sleep by at least one hour ($p = .03$) with no significant impact on delirium incidence or duration (Hu et al., 2015). Johnson et al. (2018) utilized music therapy as their primary intervention to decrease the physiologic triggers for delirium, blood pressure and heart rate, by statistically significant margins ($p = .003$ and $p = .001$, respectively).

Family Participation. Bannon et al. (2019) used their qualitative research to delve into staff and patient perception of a delirium bundle. Bannon et al. reported that staff felt family was a facilitator for the intervention as family would create familiarity and safety for the patient. Bannon et al. reported that family members and patients felt flexible visitation was a facilitator for the bundle as it would allow for family participation in therapies and stagger visitors as not to tire the patient. Zhang et al. (2017) used family visits as part of their intervention bundle by having family members present for at least 30 minutes twice a day to provide reorientation,

cognitive activities, and early mobility assistance. Zhang et al. also reported that family presence required increased, intentional nursing presence, so although benefits were seen with planned family visits, the practice has not been sustainable within their unit. Martínez et al. (2017) used a multicomponent approach that included family, specifically requesting that family provide familiar elements such as photographs for environmental stimulation. The result of Martínez et al. study showed a significant reduction in delirium incidence (RR = .62; CI [.40, .94]; p = .02).

Bundled Interventions. Hu et al. (2015), Kamdar et al. (2013), Martínez et al. (2017), Zhang et al. (2017), and Foster et al. (2013) all utilized three delirium prevention interventions within their study to promote sleep. As previously mentioned, all of these studies showed statistically significant reductions in delirium incidence (Hu et al., 2015; Kamdar et al., 2013; Martinez et al, 2017; Zhang et al., 2017) except for Foster et al. Devlin et al. (2018) and Rivosecchi et al. (2016) incorporated four interventions within their suggested delirium prevention bundles. Devlin et al. and Rivosecchi et al. indicated a decrease in delirium incidence, but Rivosecchi et al. also indicated a decrease in delirium duration. Patel et al. (2014), Smith et al. (2017), and Van de Pol et al. (2017) integrated five interventions into their delirium reduction bundle which resulted in decreased incidence of delirium. Trogrlic et al. (2015) was most aggressive by utilizing seven interventions and were successfully able to decrease delirium incidence.

Van Rompaey et al. (2017) and Johnson et al. (2018) only used one intervention, and Demoule et al. (2017) and Lochiova et al. (2018) used two interventions. The studies that used two or less interventions did not indicate a reduction in delirium incidence or duration (Demoule et al., 2017; Johnson et al., 2018; Lochiova et al., 2018; Van Rompaey et al., 2017).

Concluding Themes. The articles that monitored for delirium duration were able to demonstrate a reduction at the conclusion of the study (Flannery et al., 2016; Patel et al., 2014; Rivosecchi et al., 2016). The majority of studies included in the theme matrix documented a decrease in delirium incidence. Interestingly, the two studies that chose to monitor one or two interventions were unable to demonstrate a reduction in incidence or duration of delirium (Demoule et al., 2017; Van Rompaey et al., 2012). Even though there was no statistical significance in Demoule et al. (2017) study using ear plugs and eye masks, their results indicated that patients slept longer without prolonged awakenings. Van Rompaey et al. (2012) was unable to decrease delirium incidence with earplugs and eye masks, but Van Rompaey et al. and Hu et al. (2015) were able to effectively decrease the risk of delirium in patients. Due to poor documentation by bedside staff, Foster et al. (2013) had difficulty showing an improvement in either delirium incidence or delirium duration. All other studies included three or more interventions with in the study and were able to demonstrate a decrease in delirium incidence (Bounds et al., 2016; Devlin et al., 2018; Flannery et al., 2016; Hu et al., 2015; Kamdar et al., 2013; Martínez et al., 2017; Patel et al., 2014; Rivosecchi et al., 2016; Smith & Grami, 2017; Van de Pol et al., 2017).

Review of Practice Guideline

The CPG by Devlin et al (2018) is aimed at the prevention and management of PADIS. The PADIS CPG was chosen as it provides crucial elements to the evidenced-based management of adult ICU patients.

Appraisal of Guidelines for Research and Evaluation (AGREE II) Instrument. The AGREE II tool was first created in 1992 as a way to evaluate guidelines (Grinspun, Melnyk, & Fineout-Overholt, 2019). The AGREE II tool has six domains with 23 items that are scored on a

seven-point Likert scale. While the authors of the AGREE II tool intended that at least four appraisers would evaluate each CPG, the two DNP students evaluated the CPG to determine if it can inform the proposed project (Grinspun et al., 2019). The individual scoring can be found in Appendix I.

Domain one: Scope and purpose. Domain one determines if the overall objectives, health questions covered, and population targeted are specifically described. These objectives were met as the CPG main objective was to update and expand upon the 2013 pain, agitation, and delirium guidelines. Within the CPG, there are 37 PICO questions as well as 32 descriptive questions that include rationale with a scientific foundation. The population that this CPG is intended to target is adult ICU patients.

Domain two: Stakeholder involvement. Domain two prompts reviewers to address stakeholder involvement, target users, and developers. The panel that participated in the update included physicians, registered nurses, methodologists, and ICU survivors. The PADIS CPG was developed as a resource for any clinician working with adult ICU patients; however, the CPG does not specifically describe the role that the clinician serves when working with ICU patients.

Domain three: Rigor of development. The panel that created this CPG utilized the GRADE method to evaluate the evidence in a systematic manner. The strengths and limitations are clearly defined in the summary section. The panel supplied detailed support in how they utilized the evidence to determine the recommendations. The panel included within each section a risk-benefit of the non-pharmacologic and pharmacologic interventions using multiple methodologies to ensure that quality evidence was implemented into the guideline. The methodologists used validated software to evaluate the material to ensure that an unbiased

interpretation was used prior to publication. While the panel did not provide a clear description on the procedure for updating the guideline, they did provide a very detailed appendix that described the rationale for additions and recommendations provided within the CPG.

Domain four: Clarity of presentation. The panel developed clear PICO questions with additional questions answered in a clear and concise manner. The panel used clear subheadings to address the specific interventions and methods included within the CPG. Thirty-seven recommendations were clearly outlined by the use of italics. Formatting with italics made it clear to the reader what each section was addressing.

Domain five: Applicability. The panel failed to clearly identify facilitators and barriers for the application of this CPG. The CPG does provide a rationale for each recommendation given with quality evidence that had been evaluated by GRADE criteria. Resource implications are mentioned within each specific recommendation, but it is not its own category within the CPG. The CPG recommendations and interventions are based on each section of the PADIS guideline; thus, the monitoring and auditing criteria are embedded within the guideline's impetus.

Domain six: Editorial independence. The CPG included the active measurements taken to prevent conflicts of interest that can occur from the individuals, groups, or companies that are monetarily involved. The authors of the CPG list their employment affiliations and funding sources for various projects including and not including this CPG.

Overall guideline assessment. Devlin et al. (2018) CPG was rated at a seven out of seven by both DNP student reviewers. Both reviewers also recommend the guideline for use in practice. The PADIS CPG was created to target adult ICU patients for the treatment and management of pain, agitation/sedation, delirium, immobility, and sleep disruption, meaning it

may not be suitable for other patient populations or settings. Given that this proposal targets adult ICU patients with intentions to improve sleep as a delirium prevention strategy, it will be suitable for the situation. Utilizing this CPG will improve the caliber of the protocol being proposed.

Review of Systematic Reviews and Meta-Analysis.

Rapid Critical Appraisal Questions for Systematic Reviews and Meta-Analysis. Melnyk & Fineout-Overholt (2019) provided a framework for the reviewal of systematic reviews and meta-analysis to allow for the evaluation of each article's validity, reliability, and applicability by asking 15 questions. A complete synopsis of the individual appraisals of systematic reviews and meta-analysis used in this literature review can be found in Appendix J. A focused assessment of the strengths and limitations were summarized.

Bannon et al. (2019). Bannon et al. (2019) meta-analysis provided information on pooled data of individual interventions in the prevention of delirium. These individual interventions included physical and occupational therapy, bright light therapy, range of motion exercises, earplugs, multicomponent orientation and cognitive stimulation, multicomponent occupational therapy, multicomponent targeting risk factors for delirium, protocolized weaning and daily sedation interruption, reorientation using familiar voices and paired awakening and breathing. A limitation of this study is that it did not find any one intervention as statistically valuable. A strength of this study is the large sample size of 2,812 participants and that it found support for multicomponent interventions, but was unable to aggregate the information to create a meta-analysis of the data. The article supports the use of a bundled approach for interventions to promote sleep and reduce the incidence of delirium.

Flannery et al. (2016). The researchers of this systematic review were assessing the impact interventions had on improving sleep and delirium in the ICU. While a limitation of this study was the inability to formulate aggregate data, the authors were able to formulate suggestions for research framework for future work on improving sleep and delirium. Flannery et al. (2016) had four recommendations for future research into the connection between sleep interventions and delirium: the link between intervention and outcome must be clearly demonstrated, studies should take place in environments with guideline-recommended and consistent practices to allow for the assessment of single interventions impact on delirium, delirium should be evaluated using a validated tool, and efforts must be made to minimize selection bias and have populations that can be generalizable to a large majority of critically ill patients. These recommendations are critical to have while creating a protocol for sleep promotion in the ICU with delirium incidence as an outcome variable.

Hu et al. (2015). A strength of this systematic review/meta-analysis was the ability to create succinct categories of individual intervention effectiveness on delirium reduction. Similar to the limitations of other reviews utilized, there was a low quality of evidence to support the use of individual intervention strategies. Hu et al. (2015) analyzed a few studies and found the impact of earplugs and eye masks demonstrated a lowered incidence of delirium during ICU stay (RR 0.55, CI [0.38, 0.8], $p = .002$). The systematic review also found that sleep interventions increased the quantity of sleep participants by 2.19 hours (CI [.41,3.96], $p = .02$) in two studies.

Kang et al. (2018). In this systematic review/meta-analysis, the authors were able to find strong statistically relevant data to support the use of a non-pharmacologic approaches to preventing delirium in the ICU. Kang et al. categorized the interventions used in their included studies, with a pooled sample size of 25,283 patients, into nine categories: multicomponent,

physical environment, daily interruption of sedation, daily exercise, patient education, automatic warning system, cerebral hemodynamics improvement, family participation, and sedation reducing protocols. Kang et al. found that multicomponent and physical environments were the most widely used, accounting for over 70% of the included studies. Kang et al. found that multicomponent interventions significantly reduced the incidence of delirium (OR .48, CI [.35, .65], $p < .001$). Physical environment interventions did not have a statistical impact on delirium incidence. Similar to the other studies, a limitation of this study was the inability to find relevant studies on individual interventions. The authors stressed an importance on researchers using consistent application and development of interventions as an effective tool to use in the ICU setting.

Litton et al. (2016). The researchers of this study sought to categorize the feasibility and efficacy of using earplugs as a solo intervention for reducing delirium in the ICU. A limitation of this meta-analysis is the lack of statistically significant aggregate data. The earplug theme was present throughout the literature review. A strength of this research is that the use of earplugs is a safe intervention for patients in the ICU setting. Litton et al. found that the use of ear plugs had no significant impact on hospital mortality (RR .77, CI [.44, .78]).

Locihová et al. (2018). In this systematic review, the authors aimed to find literature to confirm if earplugs and eye masks had a positive effect on the quality of sleep in ICU patients. A limitation of the literature is that there was not one specific tool used to measure quality of sleep, which created difficulty in evaluating the impact of the particular intervention on sleep quality at a meta-analysis level. From the included studies, Locihová et al. (2018) found that the use of eye masks and ear plugs reduced sleep onset latency (71.4 minutes, ± 25.6; $p = .02$); decreased number of awakenings (15.1 ± 3.3 confer 10.5 ± 3.2, $p = .001$), and an increase in

REM sleep (9.3% ± 4.3 confer 12.9% ± 4.3, p = .005). A strength of this research is that it highlights the need to use a tool that is valid and objective, thus limiting the potential for subjectivity on assessment.

Martinez et al. (2015). The research provided in this systematic review/meta-analysis provide insight into the impact a multicomponent bundle can have in preventing delirium. A strength of this article is the researchers used randomized controlled trials to formulate aggregate data that had strong support for the bundled intervention (RR 0.73, CI [.63, .85], p = < .001). A limitation of this study was the application to the study population was done only on elderly patients. Therefore, this systematic review/meta-analysis may not be generalizable to all patients included in this proposed study.

Trogrlić et al. (2015). The authors of this study created a wealth of information on the impact that implementation has on the outcome of a research study. Trogrilic et al. found that studies that included the organizational, financial, and regulatory domains as well as the individual health care professionals had better clinical outcomes, including a reduced risk of mortality with higher number of interventions compared to low (RR .82, CI [.71, .96]). The incidence of delirium varied among the included studies. In one study that used 12 implementation strategies to apply a care bundle reduced the incidence of delirium by 13% (p = .02), whereas another study that used 12 implementation strategies to improve delirium screening found an increase in delirium incidence by 13% (p <.0001). This information will be critical for the implementation of the DP project as the focus will not only be on the health care worker but also the health system including organizational, financial, and regulatory domains.

Synthesis of Systematic Reviews and Meta-Analysis. Reviewing the evidence found within the eight included systematic reviews and meta-analysis, it is evident that multicomponent

interventions have a greater impact on delirium incidence and duration (Bannon et al., 2019; Hu et al., 2015; Litton et al., 2016; & Martinez et al., 2015). Another key piece identified was the need for a structured approach, from implementation strategies (Trogrlić et al., 2015) to assessment tool selection (Flannery et al., 2016; Kang et al., 2018; & Locihová et al., 2018). All of this evidence will be used to support this DP project.

Synthesis of the Evidence

The established literature strength of evidence, including eight level I, five level II, nine level III, and one level V per the Ackley et al. (2008) system, concludes delirium as a problem within the ICU community. The high level of evidence provides a solid foundation and validation for the implementation of a multifaceted DP strategy to decrease delirium prevalence. The research confirmed that settings were similar to that of the chosen facility's setting. Bounds et al. (2016) and Trogrlic et al. (2015) both utilized or promoted a multi-interventional bundle very similar to the standard of care on the facility's cardiovascular ICU floor before their DP interventions. The literature review does not support a single-intervention model as an effective tool to reduce delirium incidence or prevalence (Foster et al., 2013). Furthermore, the ICDSC is currently used by the facility as its validated delirium assessment tool. Multiple studies indicated the importance of using screening tools to signal delirium characteristics, and in some, the ICDSC specifically was used as the primary tool (Bounds et al., 2016; Devlin et al., 2018; Flannery et al., 2016; Rivosecchi et al., 2016; Van de Pol et al., 2017).

Theoretical Basis

Synergy Model

The ICU is an everchanging environment that requires the nurse to be flexible and possess astute instincts to patient and family needs. Characteristics that embody the patient

needing care within the ICU are complex. The more complex the patient and families are, the more nurses need to be competent in their practice. The American Association of Critical-Care Nurses (AACN) created a conceptual framework to guide patient care (AACN, 2000). To promote positive patient outcomes the synergy model incorporates eight unique patient characteristics that shape eight nursing competencies required of the nurse involved with the patient's care (AACN, 2000).

Patient characteristics include resiliency, vulnerability, stability, complexity, resource availability, participation in care, participation in decision making, and predictability (AACN, 2000). Meanwhile, nursing competencies include clinical judgment, advocacy and moral agency, caring practices, collaboration, systems thinking, response to diversity, facilitation of learning, and clinical inquiry (AACN, 2000). Delirium creates obstacles within multiple patient characteristics described by the synergy model. Delirium affects the patient's resiliency, causes the patient to be increasingly vulnerable, creates a much more complicated plan of care, decreases patient participation in their care, and impairs their ability to make decisions surrounding their care (Flannery et al., 2016).

Using the synergy model to form a sleep protocol within the ICU community at this Midwestern hospital, patient and family characteristics can allow staff to create a clear, individualized plan of care to benefit outcomes. Due to delirium's complex nature, nursing competency to manage patient and family-centered care becomes of utmost importance. Clinical judgment and patient advocacy shift to the forefront to create a culture of care that will allow the nurse to critically think and grasp the patient’s priorities. Hardin (2015) focuses on vulnerability amongst an aging population. Through the synergy model, stakeholders can collaborate to become proactive in their strategies to combat stressors that can harm patient outcomes (Hardin,

2015). With a focus solely on the vulnerability of patients within the ICU, the synergy model increases clinician awareness of the older population (Hardin, 2015). Integrating the eight patient characteristics and eight nursing competencies within the synergy model can allow clinicians to promote patient advocacy and collaboration with a multidisciplinary team. In doing so, clinicians can reach the objective of implementing an evidence-based guideline to mitigate culprits that cause delirium within the ICU patient population.

Plan for Application of the Evidence

Identification of Problem/Issue and Intervention Description

Concluding the summary of evidence performed by the DNP students, revisions were made to the original PICO question. The revised intended PICO question will be adjusted to: In adult cardiovascular ICU (CVICU) patients meeting DP Protocol Algorithm criteria (P), do patients who are treated with the bundled interventions outlined in the DP protocol (I) compared to patients without the bundled elements of the DP protocol (C) affect delirium incidence and duration as measured by the ICDSC tool (O)? The synergy model includes patient-centered values and the objectives implemented within its framework. A validated tool will be used in unison with the project objectives to measure delirium incidence and duration.

Utility/Feasibility

The involved stakeholders of the delirium project have shown their support to move forward with the project, as the interventions used in the literature review signal the importance of delirium prevention within the ICU population. This project does not require extra human resources to execute the literature-supported interventions, which include earplugs, eye masks, aromatherapy oils, disposable fans, sleep protocol magnets, and sleep menus. The feasibility of introducing these interventions are relevant to the population of interest and cite positive

indications to promote better sleep within ICU communities by using nursing-led, non-pharmacologic strategies. The feasibility and utility of these examined interventions have identified the findings, setting, sample, feasibility of implementation, benefits, risks, and resources needed to accomplish project aspirations (See Appendix K).

Resources for Intervention Implementation. The utilization of earplugs, eye masks, aromatherapy oils, disposable fans, sleep protocol magnets, and sleep menus will be essential to the project. The physical resources for the feasibility of the project have already been stocked within the facility's medical supply. Conveniently, a neurological and spine floor within the facility has already implemented a sleep protocol, a project published by Gode et al. (2020). With parts of this protocol already in place within the healthcare system, the materials and information can be easily tailored the ICU environment's sleep protocol.

Staff resources will be conducive to the success of implementing the sleep protocol. During leadership meetings, the DNP students will identify individual stakeholders to serve as project “champions”. The champions will be selected from the unit’s nurses, physicians, advanced practice registered nurses (APRNs), and nursing assistants.

Training & Education. Currently, the ICDSC tool is utilized in the electronic medical record (EMR) adopted by the facility. The DNP students will not need to introduce the tool to staff but may need to clarify charting requirements. While the tool has been validated, the DNP students are unable to provide inter-rater reliability between each staff nurse, which may be a limitation in the potential findings of this project. Unit staff performs daily patient rounding with each patient to discuss their plan of care for the day. Instruction will be needed to inform nurses, APRNs, and physicians that during these rounds, an additional piece to the discussion will occur on whether the patient is appropriate for sleep protocol implementation. ICDSC scores are a

discussed topic within these rounds; therefore, the sleep protocol eligibility criteria can easily be included in the rounds. Currently, a multidisciplinary rounding checklist is completed by the night shift to ensure pertinent topics such as a patients ICDSC are discussed prior to the morning daily rounds.

Nurses and nursing assistants will receive training on the DP protocol by the DNP students implementing the protocol. A laminated copy of the protocol will be strategically placed within each workstation on wheels desktop. A visual description of the DP protocol can be found in Appendix L. Using this protocol, nurses can discuss with their patients (if able) and families what materials they would like to use to promote quality sleep during the protocol's rest period. The DNP students will support nurses and nursing assistants by providing feedback during all shifts, keeping the sleep carts stocked with supplies, and assisting with the direction of patient care relevant to sleep promotion.

Institutional interest and infrastructure. Project implementation will take place at a top Midwestern facility. Within the hospital, there are three designated units for ICU populations: CVICU, medical/surgical ICU, and neurological ICU. The CVICU has been selected as the project site. The facility's organizational mission is to "serve communities by providing exceptional care, preventing illness, restoring health, and providing comfort" to any individual who decides to choose any of the available facilities for their care (Allina Health, 2020). The hospital recently was recognized as a Magnet facility for the third time. Accredited by the American Nurses Credentialing Center (ANCC), Magnet recognition is a rigorous process that demonstrates a facility’s dedication to international matters in nursing and healthcare and documented efforts of the utilization of evidenced-based practice delivery of care (ANCC, nd).

The healthcare system's mission corresponds with the notion of initiating practice changes with a backbone of evidence-based practice. Gode et al. (2020) published their findings on a sleep promotion program within two medical-surgical units within the same hospital as this proposed project. The results of that project demonstrated decreased delirium incidence and improved patient satisfaction (Gode et al., 2020). The facility's mission to utilize evidence-based models and incorporating multidisciplinary collaboration to improve patient outcomes are congruent with the DNP project proposed. Using methods that engulf the corporation's mission and values will create a culture of care that aspires to be at the forefront of medicine's ever-changing field.

Benefits and risks. The benefits of incorporating a DP protocol within the ICU community include improved patient outcomes. The institution has already recognized delirium as a healthcare issue within the organization. Gode et al.'s (2020) work of establishing a sleep protocol to prevent delirium within the hospital's medical-surgical floors has led to the feasibility of tailoring it to the ICU. Using the available resources will save time, money, and prevent supply waste to create a protocol from the ground up. By using preventative interventions, the patient's health can progress and avert the negative consequences delirium brings. The sleep protocol interventions will not compromise or intrude on the standards of care already in place. Instead, they will aid in illness prevention and continue the patient path to restoration. Additionally, to ensure safe and ethical practice to minimize any risk to patients, the DNP students will request for institutional review board (IRB) approval in preparation for implementing the interventional sleep protocol.

Summary of Recommendations

Delirium is an identified problem for patients within the CVICU at the clinical site for this project. Reviewing Devlin et al. (2018) CPG, the DNP students have identified that a sleep intervention has not yet been implemented. The proposed bundled interventions are supported within the research, have been shown to have limited risk to patients, and are of minimal cost to the organization as many of the elements are already present. The DNP students support the implementation of the DP protocol.

Plan for Applying EBP Practice Change

EBP Implementation Model.

Iowa Model of Evidence-Based Practice. *The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care* will guide project implementation for the intended intervention. First, trigger issues were identified within the chosen environment, allowing the project to build upon an existing foundation. For this project, delirium is the foundation, and the DNP students have built a knowledge base to ground the rationale for the chosen interventions. Second, stating the relevant purpose or question associated with the issue has created a vision that will guide the project. Third, the DNP students assembled, appraised, and synthesized a body of evidence that suggested the need for a practice change. After review and synthesis of the literature, the DNP students assessed the safety, practicality, and cost-effectiveness of making a change in practice within the ICU.

The fourth stage will consist of building a team to address the issue. Developing a protocol 'champion' team that includes nurses, nurse aides, physicians, and APRNs will generate a supportive environment in the implementation stage. After identifying champions, the fifth step will include the DNP students designing a plan and pilot for the practice change. Preparation for DP protocol integration is an incredibly important step in this process. By

collecting baseline data, the authors can prepare clinicians and gather materials to arrange the necessary steps to carry out the sleep protocol. Hence, the sixth step is sustainably integrating the sleep protocol. At this point, clinicians should have the appropriate tools and resources to put the sleep protocol into practice. The team will take the data from the DP protocol implementation phase and disseminate the results on the final step. Distributing the outcomes from DP protocol integration in the ICU will potentially create a sense of empowerment among clinicians, especially if the results are promising.

The University of Iowa's Research Department has granted permission to use the revised Iowa Model to the authors of this proposal (See Appendix M). The Iowa Model delivers a natural process with multiple steps with reflection, evaluation, and necessary adjustments based upon team members (Dang et al., 2019). The Iowa Model provides numerous opportunities for feedback loops to occur (See Appendix N*)*. These feedback loops allow for constructive criticism to improve project implementation in a structured manner (Dang et al., 2019).

Clinical Context

Clinical Setting. Located within the Midwest, the hospital's corporation is a not-for-profit healthcare system that emerged in 1993. The hospital is a 686-bed facility that offers various types of healthcare services. Of the three ICUs, the CVICU, the project site, has 32 beds. Delirium is a well-known healthcare concern that creates an avenue of deterioration for patients suffering from acute and chronic health events. The CVICU is uniquely challenged to reduce delirium because of high acuity scenarios that transpire daily creating a busy and noisy environment with cares that often interrupt sleep. A unit of this nature fits the structural criteria of the project to be implemented. In 2019, the CVICU had 2,164 admissions, with an average length of stay of 3.6 days (personal communication, December 9, 2020).

Sample/Participants. Participants included in the DNP project will be patients admitted or transferred to the CVICU. While patients accepted into this unit host various comorbidities and admission diagnoses, cardiovascular disease is the primary specialty. Cardiothoracic surgery patients are admitted to the unit daily. Specific therapies utilized within this unit include: extracorporeal membrane oxygenation (ECMO), intra-aortic balloon pump (IABP) therapy, continuous renal replacement therapy (CRRT), targeted temperature management therapy (TTM), vasopressor therapy, vasodilator therapy, lumbar drains, urinary catheter care, central line care, Swan-Ganz guided treatments, various cardiac surgeries, and vascular surgeries. Given the average of 300-400 patients a quarter (personal communication, December 9, 2020), a sample size (N) of 200 patients will be chosen to conduct this project.

Inclusion criteria. All patients admitted to the CVICU will be screened to evaluate whether they are eligible for the DP protocol. Inclusion criteria are dependent on whether patients have measures that will exclude them from receiving care associated with the DP protocol. Patients will receive daily screening during multidisciplinary rounds by the primary team to assess whether the sleep protocol is appropriate to remain in their care regimen. Given the volatile nature of the CVICU patient population, there may be scenarios where a patient deemed initially as eligible for the protocol becomes ineligible due to the exclusion criteria and will be excluded from this project.

Exclusion criteria. Exclusion criteria are subject to patient acuity and therapy demands. Screening patients will play a vital role in this decision-making process. Daily screenings of all unit patients will determine if patients previously excluded have progressed to a status of health or care where they can safely be left alone for extended periods of time and can be included in the DP protocol cares. Criteria that will exclude patients from the project include the following:

length of stay in the ICU less than 24 hours, hourly neurologic checks per MD orders, an implanted temporary mechanical device for less than seven days, active titration of two or more vasoactive drips, less than 24 hours since open-heart surgery, CRRT, ECMO, or TTM therapies.

Readiness for Change

Facilitators. Before taking steps to advance the project, facilitators and barriers need identification to avoid unnecessary obstacles. The bedside clinicians ("unit champion" nurses, physicians, and APRNs; clinical nurse specialists (CNS); DNP students; ICU nurses and nursing assistants), ICDSC screening, interpreter service availability, DP protocol resources, and the predicted low cost of intervention implementation are all essential in the facilitation of integrating the DP protocol into ICU patient care.

Clinicians partaking in patient care at the bedside will be asked to incorporate the protocol to promote sleep, educating their patients and families, and being positive stewards of promoting evidence-based practices into their routine. The DNP students will be a resource for clinicians and guide clinicians in using the protocol appropriately. Currently within the critical care units, the ICDSC screening tool is a required documentation within the EMR system minimally every eight hours. Utilizing an existing tool that the staff is already familiar with will decrease education costs.

The population that the hospital hosts is culturally diverse. The organization provides a 24-hour interpreter service that can be accessed whenever necessary to communicate with patients and their families effectively. Accessibility to the sleep protocol resources lies within the hospital's supply rooms. A similar protocol is already in use in the spine and neurological medical/surgical departments within the facility; therefore, the supplies are already available in the materials department. These resources will include but are not limited to, earplugs, eye

masks, aromatherapy oils, disposable fans, sleep promotion magnets, and sleep menus, thus decreasing start-up costs.

Barriers. Identified constraints involve educating staff and their availability, staff resistance to change, patient acuity, the availability of interpreter services, cost, and the COVID-19 pandemic. The availability of staff is of concern. Due to the current union contract language, the facility must pay bedside nurses for all education completed outside their work agreement. Providing education during nursing shifts by the DNP students and discussing the project with staff can evade any extra costs for education. To address this potential obstacle, staff will have on-the-job education and reminders in the form of educational material posted in staff bathrooms, staff break rooms, and weekly unit emails. Staff who do not document the patients' ICDSC scores every eight hours as unit standards require will create holes within the data, affecting the results.

The clinical unit was initially two separate CVICU stations before October 2014, with one wing devoted to cardiac surgery patients and the other to cardiac medicine. Since the two branches have become one, the unit labels itself as two wings: a north and south wing. The south wing has patient rooms with no exterior window. Lack of natural day light is a known risk factor for delirium as it impairs patients' abilities to regulate day and night (Bounds et al., 2016). Due to the nature of the layout, this will provide a physical obstacle that may affect this project's results.

Patient acuities, or how sick patients are, may serve as a hindrance to this project as those patients may be excluded based on existing therapies. The daily screening will occur to assess whether patients will meet eligibility requirements. Once safely eligible, the DNP students will include the patients' in the sleep promotion DP protocol. Due to the variability in the facilities'

culture, in-person interpreter services are not always readily available. If an interpreter is not present in the room, resources such as printable education material available in multiple languages and telephone interpreter services will be accessed as needed. Lastly, the COVID-19 pandemic may serve as the most significant limitation. Due to current inpatient visitor restrictions in place in the healthcare system, the DNP students chose to eliminate the family involvement element from this protocol's included interventions. If an outbreak surge occurs and the health system needs to limit outside visitors and student projects, hospital management may halt the project's sleep promotion DP protocol. The proposal was presented mid-October at a CVICU leadership meeting and introduced to stakeholders. Once IRB and hospital administration approve the project, implementation will begin.

Outcome(s) Measurement Methods/Tools

Data variables. Data will need to be extracted from the EMR for comparisons in the preintervention and postintervention cohorts. Data will be extracted from the EMR for comparisons in the preintervention and postintervention cohorts. Baseline data will consist of unique patient identifiers, age, gender, primary location in the unit, ICU length of stay, and admitting diagnosis will be recorded. Outcome variables include all ICDSC scores during the patients' time in the ICU. Additionally, a nursing survey will be administered to unit nurses, comparing pre-education knowledge and comfort using the DP protocol to post-education knowledge and comfort using the DP protocol. The pre-survey results will help guide the DNP students in development of the necessary content for the education of involved staff and assess the impact of the education sessions provided.

Data measurement tools.

ICDSC. The ICDSC was founded in 2001 to promote early detection of delirium within the ICU community (Bergeron et al., 2001). The screening tool is not used for diagnostic measures. It consists of eight elements based on DSM IV criteria and delirium characteristics to flag physicians to assess the patient for delirium (Bergeron et al., 2001). The eight factors include: "Altered level of consciousness, inattention, disorientation, hallucination-delusion-psychosis, psychomotor agitation or retardation, inappropriate speech or mood, sleep/wake cycle disturbance, and symptom fluctuation" (Bergeron et al., 2001, p. 861). A detailed explanation of each of the eight elements can be found in Appendix O.

The screening elements ask for an answer of "yes" or "no" to be documented with the assessment. Responses that conclude with a "yes" allocate one point and those with "no" receive zero points. Completed screening scores can range from zero to eight. The exception to this is the patient's assessment of their level of consciousness. Level of consciousness rates as "no response," responds to "intense and repeated stimulation," responds to "mild or moderate stimulation," "normal wakefulness," and "exaggerated response to normal stimulation" (Bergeron et al., 2001, p. 861). When a patient's level of consciousness is rated as either "no response" or responds to "intense and repeated stimulation" the screening stops, as these patients are not in a state to accurately screen for delirium (Bergeron et al., 2001). However, screened as responding to mild or moderate stimulation scores a one, standard wakefulness scores zero, and exaggerated response to standard stimulation scores a one (Bergeron et al., 2001).

The reliability and validity of the ICDSC tool was published by Bergeron et al. (2001). Their study concluded that when a patient's delirium assessment scored a four or greater on the ICDSC tool, sensitivity was 99%, and specificity was 64% (Bergeron et al., 2001). The sensitivity result indicates a screening score of four or greater had a 99 percent chance of

diagnosing delirium with a neuropsychologist's consult (Bergeron et al., 2001). The specificity result suggests a 36 percent chance of incorrectly diagnosing delirium after screening positive with the ICDSC (Bergeron et al., 2001). Reliability was then measured by using Cronbach's alpha statistical analysis. The result indicated a score of .71 to .79, showing high reliability (Bergeron et al., 2001).

Later, Kose et al. (2015) screened a sample of Turkish ICU patients for delirium to test the validity and reliability of Bergeron et al. ICDSC. Kose et al. found strong correlation of the ICDSC scoring between nurses and the gold standard (Cronbach alpha [.72, .855]). The correlation between the primary nurse assessment and nurse specialist was also strong (Cronbach alpha [.728, .855]; Kose et al., 2015). Kose et al. found comparable sensitivity and specificity values to Bergeron et al. (2001). These statistics obtained by both sets of authors indicate that the ICDSC instrument contains adequate validity and reliability to implement into practice safely.

Nursing Survey. The nursing staff will be invited to complete a pre and post education intervention survey to identify unit nurses' knowledge and comfort with using the ICDSC tool. The initial survey results will guide the DNP students in designing the education needed to ensure that the nursing staff is knowledgeable and comfortable with the DP protocol and competent in the required documentation for the intervention outcome measurements. The survey will be ten questions, including a Likert scale and a competency section. See Appendix P for the survey. The staff who complete the survey will be giving consent for their answers to be used to disseminate the findings of this project as noted within the survey. The survey will be administered on an anonymous platform and will not be linked to individuals.

Intervention Summary Documentation. Each patient enrolled in the project will have a piece of paper clipped to the front of their chart that will allow staff to document which intervention was used each night. Staff will place the completed intervention summary logs in a designated folder at the central location in the unit where the DP supplies will be stored. The log can be found in Appendix Q. The log will be able to record the average number of interventions bundled each night per patient. The staff will indicate each day what interventions the patient utilized or refused. The literature review completed at this start of this project did not find one particular intervention was more effective than another, but rather that the use of three or more interventions had the greatest impact. This log will provide documentation on the average number of interventions used each night.

Primary Outcomes. The DNP students expect that the post intervention cohort will demonstrate less positive ICDSC screening scores than the baseline pre-interventional group before discharge from the ICU, resulting in lower delirium incidence. The DNP students will utilize the EMR ICDSC scores as means to assess the presence of delirium by creating a dichotomous response to the scoring of the tool. All ICDSC scorings four or greater will be labeled as "delirium." All ICDSC scores less than four will be labeled as "no delirium." Two consecutive ICDSC scores of four or greater will be considered by the DNP students as a delirium incident.

The DNP students also anticipate that the duration of delirium will be decreased with the use of the DP protocol as measured by the ICDSC scores. The DNP students will use the EMR ICDSC scores to identify periods of time when a patient is delirious. The first two consecutive ICDSC scores of four or greater will trigger the start of the period of delirium, starting from the first positive screen. The first two consecutive ICDSC scores less than four will trigger the end

of the delirious period, ending with the first negative screen. Duration of delirium will be defined in terms of hours.

Secondary outcomes. The DNP students will be evaluating the effectiveness of the education intervention within clinical nurses by comparing the pre- and post-education survey results. This information will be essential for the institution in creating future widespread education programs if the project is extended beyond the CVICU. The DNP students anticipate that the clinical nursing staff will be more comfortable in using a DP protocol to enhance patient sleep and report increased competence with measuring delirium using the ICDSC scale post intervention.

Data Collection Process

All information collected will be deidentified prior to being given to the DNP students by the CNS of the CVICU. The EMR reports will be run by the CNS to extract data on the pre and post intervention groups once at the end of the project. These reports will be given to the DNP students with patient information de-identified. The DNP students will need to access the patient's EMR records in order to record the ICDSC scores throughout each patient's stay in the CVICU in order to calculate delirium incidence and duration. The charts will be accessed under the supervision of the CNS. The students will find the medical record numbers for the corresponding unique identifiers assigned to the patients within the code book kept in a locked file cabinet within the CNS's office. A sample of the data extraction tables can be found in Appendix R. The information for Table R1 will be manually extracted from the EMR. The table for Table R2 will be extracted from EMR reports the unit CNS will run. Upon transferring out of the CVICU, the Intervention Summary log will be placed into a confidential folder at a

designated location in the unit. The CNS will remove the patient label from the log and write the unique identifier assigned to the patient prior to giving the information to the DNP students.

Data management. The CNS will have a code book that will contain a log of patient's MRN that coordinate with the unique identifier assigned to the patients. The CNS will retain all patient identifiers in a locked cabinet within a locked office. The CNS is the only individual with a key to the cabinet. All information stored on the DNP students' computers will not contain any patient identifiers and the computers will be password protected. Access to these computers will be limited to the DNP student.

Plan for Data Analysis

The ICDSC will be the only tool used to measure quantitative outcomes for data analysis. The ICDSC consists of a zero to eight scale assessing eight unique characteristics based upon the DSM IV criteria and delirium characteristics (Bergeron et al., 2001). The scores will be given a dichotomous ranking of positive (values of four or greater) or negative (values less than four). Duration will be labeled in hour increments. Assigning a quantitative value to the ICDSC tool will allow for analysis ease and convenience.

The DNP students will use means and standard deviations for continuous variables used within the demographic data, and proportions or percentages will be used for categorical variables. Fischer's exact test will be used for statistical analysis of the dichotomous outcome, delirium incidence. Continuous variables will incorporate a t-test analysis to test for statistical significance. To measure and analyze ICDSC scores across multiple variables, the integration of a *t* test will be used to evaluate for statistical significance.

The DNP students will input the assembled data into an Excel spreadsheet as shown in Appendix R. Each DNP student will be responsible for entering data separately in the

spreadsheets. Furthermore, to avoid information bias, the DNP students will compare spreadsheets for validity. The students will strictly limit data extraction to the selected demographic variables and ICDSC scores. Password protected personal computers with patient data will be safely stored and protected from being stolen or misplaced for further protection measures. Furthermore, the DNP students have consulted a statistician from Winona State University for data analysis guidance. Consultation with the statistics department will ensure proper analysis of the data and accurate results.

Resources, Proposed Budget, and Timeline

Available Resources. The DNP project intends to allocate resources only as needed to limit waste. Team collaboration will play a vital role in enabling project efficiency. The materials management department will be contacted to ensure that resources are adequately stocked for CVICU nurses to utilize among the patients' plan of care regarding the DP protocol. The DNP students will inform other disciplinary groups such as phlebotomy, radiology, and respiratory therapy to ensure they do not disrupt the timeframe dedicated to a "no wake zone." All staff will be oriented to the presence of a magnet on each protocol participant's door indicating "no wake zone." However, when clinically necessary, patient sleep will be interrupted to provide care.

The chosen hospital's setting provides an ideal environment for the DNP project to take place. The ICU environments provide a diverse patient population, increasing the generalizability potential to the ICU community. The health system's EMR already incorporates the primary tool, the ICDSC, used in the DNP project. Efficient EMR documentation of the ICDSC will reduce the need for extra education and increased resources.

Resource Deficiencies. Deficiencies may include the DNP student's inexperience in statistical analysis and the projected timeframe used to conduct the DNP project. A more extended project period may show more robust results, but given the circumstances and requirement of implementing a quality improvement project, a short five week process is planned.

Using statistician assistance from Winona State University (WSU) will be an excellent service. The DNP students have discussed the project with Dr. Christopher Malone of WSU Statistics department to aid in data compilation and analysis methods. Dr. Malone was introduced to the project to fully understand and help the DNP students in data collection and interpretation. The advisors and mentors involved in the DNP project will be invaluable for recommendations and guidance throughout each step.

Budget. The proposed budget for this project includes labor hours and costs, material costs, and the cost for implementation, see Appendix S. The estimated amount of time for education is 60 hours including the developing of literature, face-to-face meetings, attending stakeholder meetings, and rounding on the unit on all three shifts, at least three times a week to provide education for both providers and bedside nursing staff. At an estimated $50 per hour per DNP student, the total cost of education will be $3,000. The DNP students will supply this service without cost to the healthcare organization. Supplies for the flyers and literature are estimated to be $100, include paper, ink, and lamination supplies, and will come from the CVICU unit stock. The estimated cost of hospitality elements, which includes beverages and snacks to entice staff participation is $250 and will be paid by the DNP students. Materials for the delirium bundle elements are already available on the unit for patient care use and will continue to be supplied to the patients by the healthcare organization. The estimated cost of

supplies is $690. Using a salary of $50/hour per DNP student for a proposed 50 hours for manual extraction of data, the cost of hours for data extraction is estimated to be $5,000. This service will be provided without cost to the healthcare organization. The WSU Statistics department provides a service for graduate students to analyze data outcomes. The average hourly rate for a statistician is $50 per hour. The assumed work, including initial meeting, data extraction, and analysis, will take an estimated 40-50 hours. The estimated cost listed reflects what hiring an outside statistician could be. The cost for statistician services through WSU will be provided at no cost to the hospital. Material expenses are estimated on this proposal as the hospital system may secure these at different rates than public consumers. The work expected of providers to order said protocol and staff nurses to carry out the mission will not significantly impact their daily expectations of job roles, so it is not listed as a cost.

Project Timeline. The DNP project timeline starts in August 2020 and will conclude in May 2021 (See Appendix T). The DNP students submitted the first draft of the proposal in early-October 2020. Revisions and recommendations for change have been made by the DNP student's clinical and faculty advisor. After the DNP students received suggestions for proposed changes, the second draft proposal was submitted in November 2020, followed by the final project proposal meeting scheduled in the beginning of December 2020. After approval for the DNP project, the authors will submit for the university and institution IRB approval for authorization to move ahead with the project. Once IRB approves the project, the DNP students will undertake the pre-implementation steps outlined previously. Revisiting and finalizing plans will ensure a concrete agenda is put into effect to avoid obstacles. Following the DNP project's completion and the DNP students' data extraction, a statistician will be used to assist in data

analysis. Simultaneously, clinical and faculty advisors will make an evaluation and recommendations to improve the DNP project as a whole.

When the DNP project has become one cohesive product with complete detail of the process and practice change results, dissemination will begin. Data extraction, analysis, and evaluation will start in February 2021. The DNP students plan to disseminate the findings to WSU per DNP guidelines, the project unit staff and leadership, the critical care department leadership, and hospital administration. The DNP students also plan to submit the findings in a manuscript to an appropriate peer-reviewed journal and present a poster at a regional conference. The projected DNP project completion will be in May 2021.

Cost Analysis. Many of the anticipated costs of this project are elements that are already in place at the institution. The organization of elements is not concise enough to create a meaningful change in patient outcomes. Lee and Kim (2014) did a cost analysis of delirium treatment in liver transplant patients and found a greater than $5,000 savings with the prevention protocol they implemented. As healthcare costs are rising and Medicare reimbursement rates are dropping, treatment measures need to improve to prevent iatrogenic delirium. The DNP students have provided an overview of the anticipated budget for the DP protocol in Appendix S. Many of the elements that will cost the institution regularly (eye masks, earplugs, personal fans, and essential oils) are already being used in the ICU and will not be an additional long-term expense. The non-recurring components, such as staff training, door magnets, EMR build for order, and laminated protocol cards, are of minimal costs.

Summary Plan for Implementation

Pre-project education. The project's implementation will start with meetings with the physicians and APRNs who primarily serve as attending providers in the CVICU. These

meetings will primary consist of education and discussion of the project. The DNP students will keep a log of all providers who have been educated to ensure a saturation of the team. Ideally, the DNP students will speak to each provider at least twice, once before implementation and once during. Education will consist of attending team meetings to present the project, emails to providers to outline parameters and expectations of the providers during the project, and face-to-face discussions with providers while DNP students are rounding on the unit during the pre-project implementation period. Particular focus will be on the APRNs, as most of the orders entered during daily rounds fall under their purview. It is essential that the providers have education on the project as a key component of the project is a provider order for the sleep promotion time period. For nurses to incorporate the DP protocol into patient care, an order will have to be placed in the EMR by a provider.

The second step of implementation will be the education of clinical staff. The staff will complete a pre-education survey which will identify any knowledge gaps in scoring with the ICDSC tool. After reviewing the results, targeted education will be given to staff including sending weekly informational unit emails, weekly literature posted in various places throughout the unit staff restrooms, and educational rounding by the DNP students on all shifts. This targeted education will include any deficiencies on the ICDSC and educate on the DP protocol. The DNP students anticipate rounding three times per week, once per shift, various days of the week. As with the providers, the DNP students will obtain a staff list from the unit manager and log when each staff member was given face-to-face opportunities to ask questions. One institutional education barrier for clinical nurses is there can be no mandatory meetings to discuss the benefits of the DP protocol; therefore, the DNP students will need to meet face-to-face during scheduled work hours with as many staff members as possible. The DNP students

intend to round in the early morning hours with nightshift staff, late in the evening with the evening staff, and midday with dayshift staff. In addition to the same education provided to all clinicians, there will also be intentional education directed at charge and resource nurses within the CVICU community, as they will serve as the project's informal champions. The DNP students will also enlist the CNS and care coordinators who attend the daily multidisciplinary rounds to help the attending providers who are assigned to identify which patients meet the DP protocol criteria.

Material gathering. While staff education is occurring, collecting supplies into a central location will also need to be accomplished. As described earlier, the layout of the CVICU has a north and south wing. Each side has a central nursing station that will be the ideal location for supply storage. There will be a basket containing earplugs, eye masks, essential oils, magnets, and a sleep menu. The personal fans are stored in a different supply room between the north and south wings and will not be moved from their designated place but will remain accessible. Routine rounding three times per week will be done by the DNP students during the implementation period to ensure adequate supply storage is present and provide instructions on the basket on how to obtain more supplies should it be empty.

Project implementation. During the implementation timeframe, the DNP students will continue to round three times a week, to ensure that the project is being executed efficiently. The DNP students anticipate there will be questions that arise once the project has been initiated. Being present on the unit during the three different shifts will ensure that staff have an opportunity to ask any questions or clarify protocol bundle elements as needed. The DNP students will make themselves available to staff, either by phone, email, or face-to-face, for any questions during the planning and implementation periods. The DNP students will post their

contact information at each unit wing's central station for staff to utilize if it is needed. Finally, they will disseminate the information obtained from the results of this project to the project's staff and stakeholders.

Anticipated Barriers. After assessing the training needs of the staff on the ICDSC tool, an obstacle that may arise is each RN's subjective assessment on scoring the ICDSC, causing inter-rater reliability issues. Educational material regarding proper ICDSC assessment will be discussed during daily unit morning huddle sessions and posted in various CVICU unit locations to avoid this potential obstacle. The DNP students will round on the units frequently to assess questions or concerns regarding the project protocol. Also, the selected unit 'champion' RN's, physicians, and APRNs will serve as educators on the DP protocol and proper ICDSC use.

Another barrier to note is the timing of project implementation. With the COVID-19 pandemic occurring and the anticipated arrival of the influenza, patient acuity may increase, causing ineligibility factors inhibiting the DP protocol's use within patient' care plans. The DNP students goal sample size will be a minimum of 100 patients for each phase of the project, concluding a goal N size of at least 200 CVICU patients. The DNP students will retrospectively collect data from five weeks preceding the implementation period to gather the pre-intervention cohort and the five weeks after project implementation as the post-intervention cohort. The DNP students' goal is to obtain enough patients to meet the ideal sample size. However, given the ever-changing nature of the project and the time limits, it may not be feasible to obtain the goal sample size.

Conclusion

Delirium is a devastating condition for patients, their families, and the staff who provide care. Using simple but effective non-pharmacological evidenced-based interventions can

provide benefits such as improved sleep quality, and early identification of patients at risk for delirium through regular screening. Implementing a DP protocol will give much needed restorative sleep to patients and be a factor in preventing delirium in an already critically ill population. Serving communities by providing exceptional care, preventing illness, restoring health, and providing comfort to all aligns the organization's mission goals and project. By creating an environment of integrity, respect, trust, and compassion, this project provides patient-centered care that leads to successful patient outcomes and experiences. Ultimately, the prevention of patient adverse effects associated with delirium is a commonality that will form strength and cohesion within the care team.

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Table of Contents for Appendices

Appendix A

Delirium Risk Factors

Predisposing factors	Precipitating factors	Delirium-inducing medications
Comorbidities Alcoholism Chronic pain History of baseline lung, liver, kidney, heart, or brain disease Terminal illness *Demographic factors* Age older than 65 years Male sex *Geriatric syndromes* Dementia Depression Elder abuse Falls History of delirium Malnutrition Polypharmacy Pressure ulcers Sensory impairment *Premorbid state* Inactivity Poor functional status Social isolation	*Acute insults* Dehydration Fracture Hypoxia Infection Ischemia (e.g., cerebral, cardiac) Medications Metabolic derangement Poor nutrition Severe illness Shock Surgery Uncontrolled pain Urinary or stool retention *Environmental exposures* Intensive care unit setting Sleep deprivation Tethers	*High risk* Anticholinergics (e.g., antihistamines, muscle relaxants, antipsychotics) Benzodiazepines Dopamine agonists Meperidine (Demerol) *Moderate to low risk* Antibiotics (e.g., quinolones, antimalarials, isoniazid, linezolid [Zyvox], macrolides) Anticonvulsants Antidizziness agents Antiemetics Antihypertensives (e.g., beta blockers, clonidine [Catapres]) Antivirals (e.g., acyclovir [Zovirax], interferon) Corticosteroids Low-potency antihistamines (e.g., histamine H2 blockers, urinary and gastrointestinal antispasmodics) Metoclopramide (Reglan) Narcotics other than meperidine Nonsteroidal anti-inflammatory drugs Sedatives/hypnotics Tricyclic antidepressants

Note. European Delirium Association and American Delirium Society (2014). The DSM-5 criteria, level of arousal and delirium diagnosis: Inclusiveness is safer. *BMC Medicine, 12.* https://doi.org/10.1186/s12916-014-0141-2; Kalish, V. B., Consortium, N. C., & Belvoir, F. (2014). *Delirium in Older Persons: Evaluation and Management*. *90*(3), 9.

Appendix B
DSM-5 Delirium Criteria

A. A disturbance in attention (i.e., reduced ability to direct, focus, sustain, and shift attention) and awareness (reduced orientation to the environment).
B. The disturbance develops over a short period of time (usually hours to a few days), represents a change from baseline attention and awareness, and tends to fluctuate in severity during the course of a day.
C. An additional disturbance in cognition (e.g., memory deficit, disorientation, language, visuospatial ability, or perception).
D. The disturbances in Criteria A and C are not explained by another preexisting, established, or evolving neurocognitive disorder and do not occur in the context of a severely reduced level of arousal, such as coma.
E. There is evidence from the history, physical examination, or laboratory findings that the disturbance is a direct physiological consequence of another medical condition, substance intoxication or withdrawal (i.e., due to a drug of abuse or to a medication), or exposure to a toxin, or is due to multiple etiologies.

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Appendix C
Databases Searched and Data Abstraction

Date of Search	Keyword Used	Database/Source Used *(CINAHL, OVID, ProQuest, Google Scholar, etc.)*	# of Hits	
			Listed	Reviewed
3/06/20	Sleep and delirium, sleep promotion, delirium, sleep protocol, delirium prevention, ICU syndrome, non-pharmacologic interventions	CINAHL	37	6
3/06/20	Intensive Care Unit, Critically Ill, ICU, Quiet Time, sleep promotion, delirium prevention	PubMed	13	5
3/10/12	nursing interventions, sleep hygiene interventions, delirium prevention, adult ICU patients	PubMed	24	8
3/11/12	nursing interventions, sleep hygiene interventions, delirium prevention, adult ICU patients	Cochrane Database	35	4
3/16/2020	Delirium AND Prevention	EBSCO MegaFile	1355	43
3/16/2020	Delirium AND prevention	Ovid	24	6
3/16/2020	delirium	Ovid	621	40
3/16/2020	Sleep AND ICU	Ovid		
3/16/2020	Delirium prevention	Cochrane Library	1008	65
3/17/2020	Delirium prevention	EBSCO		
3/24/2020	ICDSC AND delirium	Proquest	198	12
8/31/2020	ICDSC OR Intensive care delirium screening checklist	CINAHL Complete	78	15
8/31/2020	Delirium prevention sleep protocol	CINAHL Complete		
9/15/2020	Iowa model of evidence-based practice	CINAHL Complete	108	20
9/15/2020	Synergy nursing model AND patient care	CINAHL Complete	67	15
9/22/2020	delirium or acute confusion or confusion or disorientation AND critical care OR Adult Intensive Care Unit	CINAHL Complete	5795	57
9/22/2020	delirium or acute confusion or confusion or disorientation or ICU psychosis AND critical care OR Adult Intensive Care Unit OR Cardiac Intensive Care Unit	CINAHL Complete	3721	32
9/24	Delirium AND sleep protocol OR sleep promotion AND ICU	PubMed	353	16

Appendix D

PICO Search Terms

P	Patient, Population, Predicament or Problem	Adult Intensive Care Unit OR Critically Ill OR ICU OR Adult Cardiovascular Intensive Care Unit OR Adult CVICU
I	Intervention, Issue, exposure, test, or agent	Sleep and delirium OR sleep promotion OR delirium OR sleep protocol and delirium prevention OR ICU syndrome OR non-pharmacologic sleep interventions OR sleep hygiene interventions OR ICU psychosis
C	Comparison	N/A
O	Outcome, effect	Decreased delirium OR delirium prevention OR delirium duration OR delirium incidence OR delirium reduction

Appendix E
Literature Review

Citation / Search Engine Used	**Purpose / Objectives**	**Study Population / Sample / Setting**	**Study Design / Methods / Major Variables / Instruments & Measures**	**Result(s) / Main Findings**	**Implications / Critique**	**Comments / Themes**	**Level of Evidence**
Bannon, L., McGaughey, J., Clarke, M., McAuley, D. F., & Blackwood, B. (2018). Designing a nurse-delivered delirium bundle: What intensive care unit staff, survivors, and their families think? *Australian Critical Care, 31*. 174-179. doi: https://doi.org/10.1016/j.aucc/2018.02.007 PubMed	To elicit the perspectives of ICU staff, survivors, and families about the barriers and facilitators to delivering and receiving this delirium bundle that would inform design, delivery, and implementation.	*Staff interviews*: 12 NHS adult general ICUs in England, Scotland, Wales, and Northern Ireland, range of experience from less than 1 year to greater than 10 years. ICU size ranged from seven beds to 52 beds with various specialties including medical, surgical, trauma, and burns. n=68 *Survivor interviews:* ICU steps group meetings in England and Northern Ireland and online with each participant in their own home. Survivors had to have had an ICU stay of more than 48h	*Study Design:* Qualitative *Instruments:* Braun and Clarke thematic analysis framework	Staff felt - families were underutilized -Communication training & availability of tools would be useful to meet needs. - patient safety concerns were a barrier to bundle Survivors felt - re-establishing normality was a facilitator to bundle delivery - flexible visiting for relatives facilitated communication - low staff numbers were a barrier - staff lacked awareness & understanding of patient experiences under sedation & unaware that patients heard staff conversations	Important to adapt protocols to suit specific units (i.e. not every ICU included had the availability of pharmacy to attend MDRs or PT to increase mobility)	Referenced bundle included education and family participation, sedation minimization and pain, agitation, and delirium protocol, early mobilization, and environmental interventions	Level IV

Citation / Search Engine Used	**Purpose / Objectives**	**Study Population / Sample / Setting**	**Study Design / Methods / Major Variables / Instruments & Measures**	**Result(s) / Main Findings**	**Implications / Critique**	**Comments / Themes**	**Level of Evidence**
Bannon, L., McGaughey, J., Verghis, R., Clarke, M., McAuley, D. F., & Blackwood, B. (2019). The effectiveness of non-pharmacological interventions in reducing the incidence and duration of delirium in critically ill patients: A systematic review and meta-analysis. *Intensive Care Medicine*, *45*(1), 1–12. https://doi.org/10.1007/s00134-018-5452-x ProQuest	To evaluate the effect of non-pharmacological interventions versus standard care on incidence and duration of delirium in critically ill patients.	*Studies Included:* 15 randomized control trials *Sample:* 2812 participants *Setting:* Studies were conducted in the USA, Japan, Italy, Canada, Belgium, Netherlands, Chile, UK, Turkey, Thailand and Korea	*Study Design:* Meta-analysis, with Systematic Review *Instruments Used:* CAM-ICU, ICDSC, CAM, and NEECHAM, GRADE format used for quality of evidence assessment *Statistical Analysis* CI, RR, *p* values, chi square test, and I^2	-Multicomponent PT (2 trials) showed no significant effect on duration of delirium [*n* = 404 participants, MD (days) – 0.65, 99% CI – 2.73 to 1.44, *P* = .42, low quality of evidence] - Insufficient evidence to support single or multicomponent non-pharmacological interventions -Beneficial patient outcomes reported for four non-pharmacological interventions including improved sleep quality (earplugs and bright light therapy), physical health at 6 months (standard rehab) and hospital mortality (multicomponent intervention)	*Strengths:* -high quality systematic review -large sample size -study adequately uses evidence evaluation *Limitations:* -large amount of heterogeneity included - duration of delirium reported in multiple ways -many RCTs were single-center studies -large variations in interventions	-Low quality of evidence according to GRADE evaluation, more studies need to be performed to validate interventions that showed some positive effects on secondary outcomes *Interventions used* earplugs, bright light therapy, PT/OT, cognitive stimulation, protocolized sedation, multicomponent targeting risk factors, structured mirrors, family voice reorientation	Level I

Citation / Search Engine Used	**Purpose / Objectives**	**Study Population / Sample / Setting**	**Study Design / Methods / Major Variables / Instruments & Measures**	**Result(s) / Main Findings**	**Implications / Critique**	**Comments / Themes**	**Level of Evidence**
Bounds, M., Kram, S., Speroni, K. G., Brice, K., Luschinski, M. A., Harte, S., & Daniel, M. G. (2016). Effect of the ABCDE bundle implementation on prevalence of delirium in intensive care unit patients. *American Journal of Critical Care, 25*(6). 535-544. DoiL http://dx.doi.org/10/4037/ajcc2016209 CINAHL	To quantify delirium's prevalence and duration before and after the implementation of the ABCDE bundle.	*Study Population:* Inclusion: 18 years or older, ICU stay >24 hours. Exclusion: intracranial pressure increased more than 50% since ICU admission, quadriplegia, GSC <8 on no sedatives, comfort measures only/palliative care, cardiopulmonary arrest resulting in death *Sample:* 159 total, 80 pre and 79 post *Setting:* Rural hospital system in Maryland, USA. General medical/surgical ICU	*Study Design:* Pre/post implementation, Quasi experimental *Instruments Used:* ICDSC, GSC, RASS, ABCDE bundle *Statistical Analysis:* Means and frequencies, chi square, 2-sample *t* tests, multivariable linear and logistic regression models.	Number of days delirium was less post-implementation (3.8 v 1.72, $p <$ .001 Number of patients with delirium was less post (30 v 18, $p = .01$) Mechanically ventilated patients with delirium was less post (22 v 10, $p > .001$) No change for non-mechanically ventilated patients (8 v 8, $p = .71$)	*Strengths:* Study found that implementing the whole ABCDE bundle had a positive impact on the incidence and prevalence of delirium in mechanically ventilated patients. *Limitations:* -Was not able to show an effect on ICU patients who are not intubated. Did not decipher which part of the bundle was most effective -Design limits ability to randomly assign intervention and control group. -Setting limits ability to generalize to all ICU patients.	Utilized ABCDE bundle and ICDSC scales, similar to what is in place at clinical site	Level III

Citation / Search Engine Used	**Purpose / Objectives**	**Study Population / Sample / Setting**	**Study Design / Methods / Major Variables / Instruments & Measures**	**Result(s) / Main Findings**	**Implications / Critique**	**Comments / Themes**	**Level of Evidence**
Demoule, A., Carreira, S., Lavault, S., Pallanca, O., Morawiec, E., Mayaux, J., … & Similowski, T. (2017). Impact of earplugs and eye mask on sleep in critically ill patients: a prospective randomized study. *Critical Care, 21*(1). 1-9. doi: 10.1186/s13054-017-1865-0 PubMed	To evaluate the impact of earplugs and eye masks on sleep architecture in ICU patients.	*Study Population:* - Inclusion: no sedation for >24 hours, score <3 on the Ramsay Sedation Scale, remain in ICU for >48 hours, minimal morphine and levophed infusion -Exclusion: history of sleep disorders, psychiatric illness requiring chronic medications, known neurological conditions, liver disease, sepsis, hearing impairment or blindness *Sample:* 64 total patients, 32 control and 32 intervention *Setting:* 16-bed adult general ICU in Paris, France.	*Study Design:* Randomized controlled *Instruments:* poly somnography, visual analog scale, CAM-ICU, sound and light recording *Statistical Analysis:* Mann-Whitney U, Chi-square test	Prolonged awakenings during nighttime, >1m (*n*): Control= 31, intervention= 21, $p = .02$ Delirium rate at day 90 follow up, *n* (%): Control= 2 (6%), intervention= 2(7%), $p = 1$	*Strengths:* Found evidence of decreased prolonged awakenings with intervention. *Limitation:* - No evidenced of improved delirium rates - No reported differences in self-reported sleep quality	Measured quality of sleep by diagnostic testing as well as with patient survey.	Level II

Citation / Search Engine Used	**Purpose / Objectives**	**Study Population / Sample / Setting**	**Study Design / Methods / Major Variables / Instruments & Measures**	**Result(s) / Main Findings**	**Implications / Critique**	**Comments / Themes**	**Level of Evidence**
Devlin, J. W., Skrobik, Y., Gélinas, C., Needham, D. M., Slooter, A. J. C., Pandharipande, P. P., … Alhazzani, W. (2018). Clinical Practice Guidelines for the Prevention and Management of Pain, Agitation/Sedation, Delirium, Immobility, and Sleep Disruption in Adult Patients in the ICU: *Critical Care Medicine*, *46*(9), e825–e873. https://doi.org/10.1097/CCM.0000000000003299 PubMed	To update and expand the 2013 Clinical Practice Guidelines for the Management of Pain, Agitation, and Delirium in Adult Patients in the ICU.	Clinical Practice Guideline created by content experts, methodologists, and ICU survivors	Clinical Practice Guideline	- The panel issued: 37 recommendations (three strong and 34 conditional); two good practice statements; 32 ungraded, nonactionable statements; three questions from patient-centered prioritized question list remained without recommendation. - Immobility and Sleep included in the new 2018 Pain, Agitation, Delirium, Impobility, and Sleep (PADIS) updated guideline compared to the 2013 Pain Agitation Delirium guideline	*Strengths:* - Immobility and Sleep disruptions are now indicated in the CPG. - Able to use this literature for change of practice strategy implementation *Limitations:* - There were potential diagnostic confounders and practice misalignments - Guidelines do not ensure its use.	Clinical practice guideline for adult ICU patients using multifaceted strategies	Level I

Citation / Search Engine Used	**Purpose / Objectives**	**Study Population / Sample / Setting**	**Study Design / Methods / Major Variables / Instruments & Measures**	**Result(s) / Main Findings**	**Implications / Critique**	**Comments / Themes**	**Level of Evidence**
Flannery, A. H., Oyler, D. R., & Weinhouse, G. L. (2016). The impact of interventions to improve sleep on delirium in the ICU: a systematic review and research framework. *Neurologic Critical Care, 44*(12), 2231-2240. doi: 10.1097/CCM.0000000000001952 PubMed	To assess whether interventions targeted at improving sleep in the ICU were associated with reductions in ICU delirium. Secondary outcomes included ICU length of stay and duration of delirium.	*Studies Included:* Investigations of sleep interventions and the impact on ICU delirium, daily assessments of delirium, use of validated tool, enrolled both delirious and non-delirious patients. *Sample:* 10 studies included, enrolling 1,639 patients *Setting:* Elderly patients in medical and surgical ICUs. Six of the studies were randomized controlled trials, four were pre/post cohort studies.	*Study Design:* Systematic Review *Instruments:* CAM-ICU, DSM-IV, NEECHAM	- Two of five studies showed decreased ICU length of stay. - Three of four studies evaluating duration of delirium demonstrated a reduction with sleep interventions.	*Strengths:* Systematic approach utilized to review available data to evaluate the complex link between sleep interventions and delirium. *Limitations:* - Varied delirium screening practices forced authors to eliminate 46 studies. - Only one of the ten included articles measured sedative exposure as a risk factor for delirium	Four proposals for future research in this category: - Clearly and objectively demonstrate link between sleep intervention, improved sleep and outcome. - Use guidelines and consistent practices to prevent and treat delirium to allow testing of single intervention on impact of delirium. - Use a validated screening tool - Minimize selection bias and use populations that can be generalized	Level I

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Foster, J., & Kelly, M. (2013). A Pilot Study to Test the Feasibility of a Nonpharmacologic Intervention for the Prevention of Delirium in the Medical Intensive Care Unit: *Clinical Nurse Specialist*, *27*(5), 231–238. https://doi.org/10.1097/NUR.0b013e3182a0b9f9 Cochrane Library	- To determine the feasibility of and test a multicomponent, nonpharmacologic, nurse-driven intervention for prevention of delirium	*Study Population:* Patients 18 and older *Sample:* 32 patients *Setting:* 12-bed Medical ICU at a Magnet recognized facility in Southwest United States.	*Study Design:* Prospective, cohort *Instruments:* -5-item nonpharmacologic intervention (daily sedation cessation, promotion of sleep-wake cycles, promotion of meaningful sensory stimulation, patient mobility, & preferred music listening.) -CAM-ICU *Statistical Analysis:* OR, CI and *p* values	-None of the predictors of delirium status including sedation cessation, hours of sleep, number of sleep interruptions, use of visual aids, and noise were statistically significant. - Little to no difference in delirium proportion before and after the intervention (28% vs 31%).	*Strengths*: -successful noise reduction in the unit -family support of sleep promotion -including clinicians on the research team *Limitations*: -sleep promotion -mobility protocol adherence -lack of support from other disciplines -patient/family consent process -documentation deficiencies	-More research needs to be completed due to the complications that arose from the study. -Missing documentation potentially contributed to results being inconclusive and non-significant	Level III

Citation / Search Engine Used	**Purpose / Objectives**	**Study Population / Sample / Setting**	**Study Design / Methods / Major Variables / Instruments & Measures**	**Result(s) / Main Findings**	**Implications / Critique**	**Comments / Themes**	**Level of Evidence**
Hu, R.-F., Jiang, X.-Y., Chen, J., Zeng, Z., Chen, X. Y., Li, Y., Huining, X., Evans, D. J., & Wang, S. (2015). Non-pharmacological interventions for sleep promotion in the intensive care unit. *Cochrane Database of Systematic Reviews*. https://doi.org/10.1002/14651858.CD008808.pub2 Cochrane Library	- To assess the efficacy of a non-pharmacological interventions for sleep promotion and whether they are safe for adult ICU patients. - To establish whether non-pharmacological interventions are cost effective.	*Studies Included:* All randomized controlled trials (RCT) and quasi-randomized-RCT that evaluated the effects of non-pharmacological interventions for sleep promotion in critically ill adults (18 years or older) during admission to critical care units. *Sample:* 30 RCT and Quasi-RCT, 1569 patients *Inclusion Criteria:* ventilator mode or type, earplugs or eye masks or both, massage, relaxation interventions, foot baths, music interventions, nursing interventions, valerian acupressure, aromatherapy, and sound masking	*Study Design:* Systematic Review *Statistical Analysis:* risk ratio, 95% confidence interval, and p-values were used	Only three trials, all of earplugs or eye masks or both, provided data suitable for two separate meta-analyses. These meta-analyses, each of two studies, showed a lower incidence of delirium during ICU stay [RR 0.55, CI (0.38, 0.80), p =.002, two studies, 177 participants) and a positive effect of earplugs or eye masks or both on total sleep time (mean difference 2.19 hours, CI (0.41, 3.96), p = .02, two studies, 116 participants)	*Strengths:* - Large pooled sample size *Limitations:* - Only able to complete two meta-analyses due to different outcomes across studies - High risk for performance bias due to subjective outcomes - Potential for publication bias	- The quality of evidence within this review was low to very low - Studies on these interventions need to continue to create stronger quality of evidence	Level II

Citation / Search Engine Used	**Purpose / Objectives**	**Study Population / Sample / Setting**	**Study Design / Methods / Major Variables / Instruments & Measures**	**Result(s) / Main Findings**	**Implications / Critique**	**Comments / Themes**	**Level of Evidence**
Johnson, K., Fleury, J., & McClain, D. (2018). Music intervention to prevent delirium among older patients admitted to a trauma intensive care unit and a trauma orthopaedic unit. *Intensive and Critical Care Nursing*, *47*, 7–14. https://doi.org/10.1016/j.iccn.2018.03.007 OVID	To evaluate the effects of a music listening (ML) intervention in preventing delirium through decreasing physiologic variables; SBP, HR, and RR among older patients.	*Study Population:* Inclusion: patients 55 and older *Sample:* 40 patients *Setting:* Trauma ICU (TICU) and a Trauma Orthopedic Unit (TOU) at a 266 bed Level One Trauma Hospital in Phoenix, Arizona over three days.	*Study Design:* Randomized Control Trial *Instruments Used:* - CAM-ICU - Measurement of physiologic signs of delirium: SBP, HR and RR *Statistical Analysis:* Chi Square Test, Pearson Product Correlation, ANOVA, paired sample t-test, t-test, and post hoc analysis	- Significant for pre and post HR, ($F(4, 134) = 4.75$, $p=.001$) - Statistically significant differences ($p<.003$) in SBP pre and post ML	*Strengths*: -Conducted in an understudied environment -Focused on physiological factors associated with delirium *Limitations;* -Excluded mechanically ventilated patients which introduces possible bias -Study was non-blinded introducing possible observer bias	-Focus was on nursing intervention of music therapy twice a day for 60 minutes at a time.	Level II

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Kamdar, B. B., King, L. M., Collop, N. A., Sakamuri, S., Colantuoni, E., Neufeld, K. J., … & Needham, D. M. (2013). The effect of a quality improvement intervention on perceived sleep quality and cognition in a medical ICU. *Critical Care Medicine*, *41*(3), 800–809. https://doi.org/10.1097/CCM.0b013e3182746442 ProQuest	-To evaluate the effect of a multi-faceted intervention to improve sleep and delirium/cognition in a medical ICU	*Study Population:* Inclusion: greater than 1 full night in ICU, able to complete survey tools *Sample:* 285 total patients, 110 baseline & 175 intervention *Setting:* 16 bed MICU in the USA	*Study Design:* Observational pre-post design (Quasi-Experimental) *Instruments:* Richard-Campbell Sleep Questionnaire (RCSQ), Sleep in the ICU Questionnaire, CAM-ICU, RASS *Statistical Analysis:* Wilcoxon Rank-Sum, chi-square, OR, CI Fisher's exact, median and interquartile range	- Improvements in daily noise ratings (mean ± standard deviation: 65.9 ± 26.6 vs. 60.5 ± 26.3, *P* = .001) - Decrease incidence of delirium/coma [OR: 0.46; CI (0.23, 0.89) *P* = .02] - Decrease in daily delirium/coma-free status [OR: 1.64, CI (1.04, 2.58), *P* = .03] - No significant reduction in length of stay [ICU: OR: -1.12, CI (-2.33, 0.08), *p* = .60; Hospital: OR -1.60, CI (-5.15,1.94), *p* = .74] - No significant difference in mortality [ICU: OR 1.14, CI (0.53,2.45), *p* = .74; Hospital: OR 0.87, CI (0.45, 1.66), *p* = .67)	*Strengths:* - Large sample size - Highlights the importance of implementing a multifaceted intervention *Limitations:* - Unable to attribute improvements in delirium/ coma specifically to sleep - Study design does not control for baseline differences - RCSQ created subjective data instead of objective - No objective measure of noise - Single-site study	RCSQ is left open for subjectivity due to individual nurse experience	Level III

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Kang, J., Lee, M., Ko, H., Kim, S., Yun, S., Jeong, Y., & Cho, Y. (2018). Effect of nonpharmacological interventions for the prevention of delirium in the intensive care unit: A systematic review and meta-analysis. *Journal of Critical Care*, *48*, 372–384. https://doi.org/10.1016/j.jcrc.2018.09.032 ProQuest	To systematically review nonpharmacological interventions for the prevention of delirium in ICU patients in order to classify them and their efficacy.	*Study population:* *Sample:* Pooled sample size of 25,283 patients *Setting:* Patients admitted to various Surgical ICU, Medical ICU, and Trauma ICU units.	*Study Design:* Systematic review and meta-analysis *Tools:* CAM-ICU, ICDSC, NEECHAM, Delirium Detection Score, DSM-MD IV, and Delirium Observational screening scale *Statistical Analysis:* OR, CI, *p*-values, I^2, and funnel plot	-The effect size of preventive non-drug interventions for delirium occurrence [OR of 0.66, CI (0.50, 0.86) $p = .002$] delirium duration [OR 0.31, CI (0.10,0.94), $p = .039$] -The effect sizes for length of ICU stay (OR = 0.85, 95% CI: 0.67–1.09, p = .194) and ICU mortality (OR = 0.92, 95% CI: 0.83–1.01, p = .138) were not statistically significant -The effect size of multicomponent on delirium incidence [OR 0.48, CI (0.35,0.65), $p < .001$] was statistically 72ignifycant, but not significant on delirium duration [OR 0.20, CI (0.04,1.14), $p = .071$	*Strengths*: -Promotes the importance of continuing research on nonpharmacological interventions to battle delirium -Large pooled sample size -Shorter duration of delirium associates with better long-term outcomes *Limitations* -Effect sizes difficult to compare amongst nonpharmacological interventions -There were multiple delirium assessment tools	Intervention Categories: multicomponent, physical environment, daily interruption of sedation, exercise, or patient education, and automatic warning system, cerebral hemodynamics improvement, family participation, and sedation reducing protocol	Level I

Citation / Search Engine Used	**Purpose / Objectives**	**Study Population / Sample / Setting**	**Study Design / Methods / Major Variables / Instruments & Measures**	**Result(s) / Main Findings**	**Implications / Critique**	**Comments / Themes**	**Level of Evidence**
Lee, E., & Kim, J. (2016). Cost-benefit analysis of a delirium prevention strategy in the intensive care unit: Cost-benefit analysis of a delirium prevention strategy in the ICU. *Nursing in Critical Care*, *21*(6), 367–373. https://doi.org/10.1111/nicc.12124 CINAHL	To evaluate the effect of a delirium prevention strategy.	*Study population:* Patients receiving liver transplants *Sample:* 130 patients *Setting:* Admitted to ICU at Seoul National University Hospital	*Study Design:* Quasi-Experimental Study *Instruments:* Multi-component delirium prevention strategy (See comments) *Statistical analysis:* chi square tests, t-tests, and - values.	-Patients with delirium-associated complications in the prevention-care group was 14.7%, compared to 30·6% in the usual-care group ($\chi 2$=4.754, p < .05) -No statistically significant differences between the groups for delirium prevalence rate, treatment cost, and length of stay -Net benefit was $5539·6 with a benefit ratio of 145·3	*Strengths*: -Low cost intervention because of already implemented strategies in place. -Good sample size to increase power to study *Weaknesses*: -Patients not randomly selected putting study at potential risk for selection bias. -Did not discuss possible study limitations	-Delirium prevention strategy did not include nursing Delirium screening tools, instead was initiated by neuropsychiatric consult. - Study somewhat confusing with monetary savings due to prevention strategies. <u>Strategies included:</u> - neuropsychiatric consultation - as needed medications - avoidance of medication during nighttime -light regulation during nighttime, reorientation more than 3 times per day - mental status evaluation more than 3 times per day.	Level III

Citation / Search Engine Used	**Purpose / Objectives**	**Study Population / Sample / Setting**	**Study Design / Methods / Major Variables / Instruments & Measures**	**Result(s) / Main Findings**	**Implications / Critique**	**Comments / Themes**	**Level of Evidence**
Litton, E., Carnegie, V., Elliott, R., & Webb, S. A. R. (2016). The Efficacy of Earplugs as a Sleep Hygiene Strategy for Reducing Delirium in the ICU: A Systematic Review and Meta-Analysis*. *Critical Care Medicine*, *44*(5), 992–999. https://doi.org/10.1097/CCM.0000000000001557 Cochrane Library	-To assess the efficacy of earplugs as an ICU strategy for reducing delirium	*Study population:* Included studies were interventional (randomized and nonrandomized) that assessed the efficacy of earplugs, included more than healthy volunteers *Sample:* 1455 participants *Setting:* Studies published between 2009 and 2015	*Study Design:* Meta-Analysis with Systematic Review when applicable *Studies included:* Nine RCT and Non-RCT chosen *Statistical Analysis:* RR, CI, *p* values, I^2, funnel plot	-Earplugs in patients either in isolation or as part of a bundle of sleep hygiene improvement, is associated with a significant reduction in risk of delirium (RR 0.59; CI (0.44,0.78)] -Ear plugs had no significant effect on hospital mortality rates [RR 0.77, CI (0.54, 1.11)]	*Strengths*: -Expands on the existing reviews, providing a quantified, pooled estimate of treatment effect on clinically important endpoints including delirium and mortality -Pooled sample size allows for potential generalizability *Limitations*: -Inclusion material involved single-center studies with high risk of bias -Unable to accomplish association between delirium risk reduction and improved patient-centered outcomes	-Ear plugs are an inexpensive intervention that have potential benefits to improve sleep quality in ICU patients.	Level I

Citation / Search Engine Used	**Purpose / Objectives**	**Study Population / Sample / Setting**	**Study Design / Methods / Major Variables / Instruments & Measures**	**Result(s) / Main Findings**	**Implications / Critique**	**Comments / Themes**	**Level of Evidence**
Locihová, H., Axmann, K., Padyšáková, H., & Fejfar, J. (2018). Effect of the use of earplugs and eye mask on the quality of sleep in intensive care patients: A systematic review. *Journal of Sleep Research*, *27*(3), e12607. https://doi.org/10.1111/jsr.12607 CINAHL	To evaluate the effectiveness of ear plugs and eye masks on patient quality of sleep	*Study population:* 19 chosen ICU RCT's and experimental studies for systematic review. *Sample:* Pooled sample size of 1379 participants *Setting:*	*Study Design:* Systematic Review *Tools Used:* Pittsburgh Sleep Quality Index, Verran and Snyder–Halpern Sleep Scale, NEECHAM, RCSQ, CAM-ICU; RASS Scale; sleep quality scale, and the Spiegel score. *Statistical Analysis:* standard deviation, CI, OR, *p* values	- Analysis of identified studies suggests that the observed non-pharmacological interventions (earplugs and eye mask) may have a positive effect on the subjective sleep quality of patients in an ICU	*Strengths*: -Large pooled sample size, increases study power and generalizability. *Limitations:* -There were multiple sleep evaluation methods used that could cause objective comparisons -Major variability in study designs	Hard to determine which study would be better indicated to follow due to variability of evaluation methods used	Level I

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Martínez,F., Donoso, A. M., & Marquez, C. (2017). Implementing a multicomponent intervention to prevent delirium among critically ill patients. *Critical Care Nurse*, *37*(6), 36–47. PubMed	-To assess the efficacy and describe the implementation strategy of a multicomponent intervention to prevent delirium in an intensive care unit	-A sample size of 287 ICU patients at Unidad de Cuidados Intensivos Generales, Hospital Naval Almirante Nef	*Study Design:* Randomized Control Trial *Tools Used;* CAM-ICU, 10-Intervention strategy: *Statistical Analysis:* Fishers exact test, Mann-Whitney test, students t-test, CI, and *p* values	-Significant reduction of delirium development even after adjusting for confounding factors (from 38% to 24%; relative risk, 0.62; 95% CI, 0.40-0.94; *P* = .02) -The mean (SD) delirium duration was 5.6 (6.8) days in observation phase, in contrast with the mean (SD) duration of 3.5 (2.9) days in the interventional stage.	*Strengths*: -Before and after trial -Intensive care environment is also ideally suited to minimize biases due to attrition *Limitations*: -Lack of randomization -Design does not allow us to draw conclusions in terms of other relevant end points, such as long-term survival, cognitive outcomes, functionality, and quality of life	- 50.9% patients were mechanically ventilated 10-point Intervention Strategy: PT and early mobilization, daily reorientation, prevention of sensory deprivation, avoidance of drugs with the potential to trigger delirium, pain control, sleep hygiene, environmental stimulation, monitoring of urinary and rectal function, minimization of physical restraints, and family participation in care	Level II

Citation / Search Engine Used	**Purpose / Objectives**	**Study Population / Sample / Setting**	**Study Design / Methods / Major Variables / Instruments & Measures**	**Result(s) / Main Findings**	**Implications / Critique**	**Comments / Themes**	**Level of Evidence**
Martinez, F., Tobar, Cl., & Hill, N. (2015). Preventing delirium: should non-pharmacological, multicomponent interventions be used? A systematic review and meta-analysis of the literature. *Age and Aging, 44*. 196-204. doi: 10.1093/ageing/afu173 PubMed	To assess the efficacy of multicomponent interventions (MI) in preventing incident delirium in the elderly	*Study Population/ Inclusion Criteria:* Randomized trials with Mis compared to usual care in preventing delirium *Sample:* 7 studies included, with 1,691 participants total *Setting:* 3 orthopedic wards, two acute medical wards, 1 coronary care, and 1 intensive care unit	*Study Design:* Systematic review, with meta-analysis as possible. *Interventions:* Confusion Assessment Method *Statistical Analysis:* Cochrane's Q and I^2,	- Incident delirium of all patients [RR 0.75, CI (0.63, 0.85) *n* = 1,619] - Decrease in Hospital length of stay [WMD -1.22 days, CI (-2.63,.020), *P* = .09; *n* = 1,643] - Decrease in accidental falls [RR 0.39 CI (0.21, 0.72) *P = .03*, *n* = 486]	- Using Mis had a relative reduction of 30% in delirium rates, regardless of setting or cognitive decline	Intervention strategies (% of trials included): - PT (70%) - daily reorientation (60%) - family involvement (60%) - staff/family education (40%)	Level I

Citation / Search Engine Used	**Purpose / Objectives**	**Study Population / Sample / Setting**	**Study Design / Methods / Major Variables / Instruments & Measures**	**Result(s) / Main Findings**	**Implications / Critique**	**Comments / Themes**	**Level of Evidence**
Patel, J., Baldwin, J., Bunting, P., & Laha, S. (2014). The effect of a multicomponent multidisciplinary bundle of interventions on sleep and delirium in medical and surgical intensive care patients. *Anaesthesia*, *69*(6), 540–549. https://doi.org/10.1111/anae.12638 CINAHL	To reduce the incidence of sleep deprivation and delirium by collectively addressing these risk factors through a novel, entirely non-pharmacological bundle of interventions	*Study Population:* Exclusion criteria: Preexisting cognitive dysfunction, sleep pathologies, active delirium, previous ICU admissions within same hospital stay, neurosurgical patients, received sedatives within 24 hours preceding enrollment *Sample:* 338 patients, 167 control & 171 intervention *Setting:* Mixed medical/surgical ICU in 24 bed adult unit in the UK	*Study Design:* Pre- and Post-design interventional study, Quasi-experimental *Instruments:* CAM-ICU, 24-hour light/sound monitoring, Richard Campbell Sleep Questionnaire, Sleep in Intensive Care Questionnaire, Multi-component interventional bundle *Statistical Analysis:* Independent t-tests, chi square tests, Fishers exact test, Mann-U Whitney test, OR, and *p* values	- Reduced incidence of delirium (55/167 (33%) before vs 24/171 (14%) after, $p < .001$), and less time spent in delirium (3.4 (1.4) days before vs 1.2 (0.9) days after, $p = .021$) - Increased mean (SD) sleep efficiency index [60.8 (3.5) before vs 75.9 (2.2) after, $p = .031$] - Increases in sleep efficiency index were associated with a lower odds ratio of developing delirium [OR 0.90, CI (0.84, 0.97)]	*Strengths*: - Use of evidence-based tools - There was a strong percentage of compliance with the bundle of interventions *Limitations*: - Single-center design leaving out potential other outer facility patient populations - Non-randomized cohort causing risk for selection bias	- Multi-component bundle that was implemented by the bedside nurses - Difficult to generalize due to study design	Level III

Citation / Search Engine Used	**Purpose / Objectives**	**Study Population / Sample / Setting**	**Study Design / Methods / Major Variables / Instruments & Measures**	**Result(s) / Main Findings**	**Implications / Critique**	**Comments / Themes**	**Level of Evidence**
Rivosecchi, R. M., Kane-Gill, S. L., Svec, S., Campbell, S., & Smithburger, P. L. (2016). The implementation of a nonpharmacologic protocol to prevent intensive care delirium. *Journal of Critical Care*, *31*(1), 206–211. https://doi.org/10.1016/j.jcrc.2015.09.031 CINAHL	To determine if implementation of an evidence-based nonpharmacologic protocol reduced the percentage of time patients spent delirious in a medical intensive care unit (MICU) that already uses a sedation and mobility protocol.	*Study Population:* All patients admitted to the trial unit who did not spend time in any other ICU prior before MICU admission, no history of cognitive impairment, MICU stay greater than 24 hours, non-delirious on arrival, and recorded ICDSC scores. *Sample:* 503 patients total, 250 baseline & 253 intervention *Setting:* University of Pittsburgh Medical Center, Presbyterian Hospital, 24-bed MICU	*Study Design:* Pre-post prospective observational study, Quasi-Experimental *Instruments:* Evidence-based interventions (see comments column), sedation algorithm, mobilization protocol, and ICDSC *Statistical Analysis:* Descriptive statistics, Mann-Whitney U, $\chi 2$, student t tests, Logistic regression, and *p*-values	- There was a 50.6% reduction (16.1% vs 9.6%, $P < .001$) in time spent delirious in the MICU - Incidence of delirium developed was decreased (15.7% vs 9.4%, $P = .04$) - The protocol reduced the odds of developing delirium by 57% (OR 0.43; $P = .005$) after controlling for age, Acute Physiology and Chronic Health Evaluation II, mechanical ventilation, and dementia.	*Strengths:* - Utilized systematic literature for protocol development - Using a protocol based on a systematic literature review prevented neglect of potential prevention strategies. *Limitations:* - Did not track nursing adherence to the protocol. - Delirium screening frequency was not equal between phases - Evaluated MICU patients, may not be generalizable to other ICUs - Delirium inducing medications were not tracked.	Non-pharmacologic interventions used by nurses included music, opening and closing blinds, reorientation and cognitive stimulation, and ear/eye care.	Level III

Citation / Search Engine Used	**Purpose / Objectives**	**Study Population / Sample / Setting**	**Study Design / Methods / Major Variables / Instruments & Measures**	**Result(s) / Main Findings**	**Implications / Critique**	**Comments / Themes**	**Level of Evidence**
Smith, C. D. & Grami, P. (2017). Feasibility and Effectiveness of a Delirium Prevention Bundle in Critically Ill Patients. *American Journal of Critical Care*, *26*(1), 19–27. https://doi.org/10.4037/ajcc2017374 EBSCO	To evaluate the effect of a delirium prevention bundle in decreasing delirium incidence	*Study Population:* Inclusion: admitted to one of two similar medical/surgical ICUs in one hospital. Exclusion: Delirium on admission, resided in ICU for longer than 4 months, or laterally transferred between control and intervention ICU *Sample:* 447 patients, 298 control and 149 intervention *Setting:* Large Texas medical center involving two medical-surgical ICU's.	*Study Design:* Controlled intervention, cohort design *Instruments:* CAM-ICU, RASS, Delirium Prevention Bundle (DPB), sound level meter *Statistical Analysis:* phi coefficient, t-tests, Chi-square, and multivariate logistical regression to obtain OR	- Patients in the intervention group experienced highly significant reductions (78%) in the relative risk for delirium [OR 0.22; CI (0.08, 0.56) $p = .001$]	*Strengths*: - Large sample size - Patients were randomized by group (ICU) rather than individual to prevent cross over between intervention and control *Limitations*: - Randomizing study by unit rather than individuals - There was a lack of a nurse led daily sedation cessation protocol for patients receiving mechanical ventilation - Clinical needs of the critically ill patients	- Community hospitals need to be used for delirium research; educational hospitals acquire the bulk of delirium research - Research need to be performed that includes that assistance of other health professionals such as nurse aids. - Unbale to determine the individual impact of each element of the bundle	Level III

Citation / Search Engine Used	**Purpose / Objectives**	**Study Population / Sample / Setting**	**Study Design / Methods / Major Variables / Instruments & Measures**	**Result(s) / Main Findings**	**Implications / Critique**	**Comments / Themes**	**Level of Evidence**
Trogrlić, Z., van der Jagt, M., Bakker, J., Balas, M. C., Ely, E. W., van der Voort, P. H., & Ista, E. (2015). A systematic review of implementation strategies for assessment, prevention, and management of ICU delirium and their effect on clinical outcomes. *Critical Care*, *19*(1), 157. https://doi.org/10.1186/s13054-015-0886-9 CINAHL	To summarize what types of implementation strategies have been tested to improve ICU clinicians' ability to effectively assess, prevent and treat delirium -To evaluate the effect of these strategies on clinical outcomes	*Studies Included:* 21 total studies utilized: 20 before and after studies and one RCT. *Inclusion process:* - Published between January 2000 and April 2014. - Aimed at implementation of delirium screening, prevention / management in adult ICU setting	*Study Design:* Systematic Review *Instruments:* CAM-ICU, PAD guidelines, ABCDE bundle	-Using implementation strategies with health care professional, organizational, and financial regulatory domains is associated with better delirium outcomes -Using a higher number of implementation strategies (six or more) alongside PAD guidelines or the ABCDE care bundle, are associated with positive effects on delirium incidence.	*Strengths*: -Large pooled sample size of studies creates generalizability and increased power *Limitations*: -Majority of studies were not randomized creating potential for selection bias -Study design showed variable heterogeneity	-Large selection of studies, however, variability made it difficult to pinpoint which strategy would be best outcome for delirium prevention.	Level I

Citation / Search Engine Used	**Purpose / Objectives**	**Study Population / Sample / Setting**	**Study Design / Methods / Major Variables / Instruments & Measures**	**Result(s) / Main Findings**	**Implications / Critique**	**Comments / Themes**	**Level of Evidence**
Van de Pol, I., van Iterson, M., & Maaskant, J. (2017). Effect of nocturnal sound reduction on the incidence of delirium in intensive care patients: an interrupted time series analysis. *Inten sive and Critical Care Nursing*, *41*. 18-25. doi: http://dx.doi.org/10.1016/j.iccn.2017.01.008 PubMed	To evaluate the effect of a nocturnal sound-reduction protocol on the incidence of delirium and the quality of sleep experience by critically ill patients in an intensive care unit	*Study Population:* no delirium at time of admission, able to speak Dutch and hear, and ICU length of stay >24 hours. *Sample:* Pre-implementation: 211 patients post-implementation: 210 patients. *Setting:* 3 level ICU of St. Antonius Hospital in Niewegein, the Netherlands, with 24 beds between three units.	*Study Design:* Pre-post analysis, quasi-experimental *Instruments:* RASS, ICDSC, RCSQ, sound level meter *Statistical Analysis:* Chi-sqaure, Fisher's Exact tests, means and standard deviations, medians and interquartile ranges (IQR)	- Observed trend of the incidence of delirium between pre- and post-groups (difference in slope: -3.70%, $p = .02$) - Utilization of sleep-inducing medications decreased between pre- and post-groups ($p < .001$) - Perceived nocturnal noise was less for post-group [pre- median score: 70 (IQR 60, 80) vs post- median score: 65 (IQR 50, 80) $p = .01$]	*Strengths:* - Demonstrated a decrease in incidence of delirium in post-implementation group. *Limitations:* - Quality of sleep did not improve after implementation of protocol - RSCQ was translated to Dutch and was not validated in this language - Inter-rater reliability of ICDSC and RSCQ was not measured	Nocturnal sound-reduction reduced the incidence of delirium but did not improve reported sleep quality.	Level III

Citation / Search Engine Used	**Purpose / Objectives**	**Study Population / Sample / Setting**	**Study Design / Methods / Major Variables / Instruments & Measures**	**Result(s) / Main Findings**	**Implications / Critique**	**Comments / Themes**	**Level of Evidence**
Van Rompaey, B., Elseviers, M. M., Drom, W. V., Fromont, F., & Jorens, P. G. (2012). The effect of earplugs during the night on the onset of delirium and sleep perception: a randomized controlled trial in intensive care patients. *Critical Care, 16,* R73. doi: http://ccforum.com/content/16/3/R73 PubMed	To evaluate the effect of ear plugs at night on delirium and confusion onset and quality of sleep.	*Study population:* Adult, Dutch or English-Speaking patients, with ICU stays >24 hours, Glascow Coma Scale >10, no known history of hearing impairment, dementia, confusion or delirium *Sample:* 136 patients: 69 intervention, 67 control *Setting:* Antwerp University Hospital, 45 bed ICU department including medical, surgical, and cardiac patients.	*Study Design:* Randomized Controlled *Instruments:* NEECHAM, Sleep perception questionnaire, *Statistical Analysis:* Student's t-test, Mann-Whitney U, Pearson's Chi-square, Wilcoxon log rank.	- Intervention group median NEECHAM: 26, vs control median NEECHAM: 24 (Mann-Whitney U, P =.04) - Use of ear plugs reduced the risk of delirium or confusion by 53% (HR 0.47, CI 0.27, 0.82) - Sleeping with earplugs showed better sleep (P = .042).	*Strengths:* - Demonstrated that patient's reported better sleep with ear plugs. *Limitations:* - incidence of delirium was not different for intervention group. - Study sample was limited to a subsection of patients, cannot generalize to all	Earplugs are a cheap and easy tool to improve the patient's comfort and prevent confusion.	Level II

Citation / Search Engine Used	**Purpose / Objectives**	**Study Population / Sample / Setting**	**Study Design / Methods / Major Variables / Instruments & Measures**	**Result(s) / Main Findings**	**Implications / Critique**	**Comments / Themes**	**Level of Evidence**
Zhang, W., Sun, Y., Liu, Y., Qiu, W., Ye, X., Zhang, G. & Zhang, L.(2017). A nursing protocol targeting risk factors for reducing postoperative delirium in patients following coronary artery bypass grafting: Results of a prospective before-after study. *International Journal of Nursing Science, 4*. 81-87. doi: http://dx.doi.org/10.1016/j.ijnss.2017.02.002	To determine whether a nursing intervention targeting risk factors could decrease the incidence of postoperative delirium (POD) among patients who had coronary artery bypass grafting (CABG) in China	*Study population:* Patients who underwent CABG between November 2014 to April 2015. Inclusion criteria: Age 18 and older, no mental disease or delirium at time of admission, awake within 24 hours from surgery, and could understand Mandarin. *Sample:* *N* = 278 Control: 137 Intervention: 141 *Setting:* Cardiac intensive care in Changhai Hospital in China	*Study Design:* Before/After study, Quasi experimental *Instruments:* CAM-ICU, RASS *Statistical analysis:* Pearson chi-square test, Fisher's exact test, standard deviations, medians and interquartile ranges (IQR), *p* values	- Incidence of delirium significantly less in intervention group (13.48% v 29.93%, $p = .001$) - Onset of POD occurred between 3rd and 6th postoperative day for intervention v postoperative days 1-3 for control ($P < .05$) - Intervention group had shorter length of ICU stay ($P < .001$)	*Strengths:* - Protocol was developed using patients' interviews, nursing staff ideas, and expert review - Protocol instructed staff to limit unnecessary interruptions between 2300 and 0500. *Limitations:* - relatively short period of observation, may be difficult to make long-term assessments - Study only evaluated CABG patients, may not be generalizable to other types of patients.	Intervention consisted of screening for delirium risk factors. Targeted risk factor modification: - pain control - early catheter removal - patient orientation - increased family visits - minimizing care-related interruptions	Level III

Appendix F
Level of Evidence Grading Criteria

Level of evidence	**Description**	**Number of Articles**
I	Evidence from a systematic review or meta- analysis of all relevant RCTs (randomized controlled trial) or evidence- based clinical practice guidelines based on systematic reviews of RCTs or three or more RCTs of good quality that have similar results.	8
II	Evidence obtained from at least one well-designed RCT (e.g. large multi-site RCT).	5
III	Evidence obtained from well-designed controlled trials without randomization (i.e. quasi-experimental).	9
IV	Evidence from well-designed case-control or cohort studies.	0
V	Evidence from systematic reviews of descriptive and qualitative studies (meta-synthesis)	1
VI	Evidence from a single descriptive or qualitative study	0
VII	Evidence from the opinion of authorities and/or reports of expert committees	0

Note. Level of effectiveness ratings from: Ackley, B. J., Swan, B., A., Ladwig, G., Tucker, S. (2008). *Evidence-based nursing care guidelines: Medical-surgical interventions.* (p. 7). St. Louis, MO: Mosby Elsevier

Appendix G
Summary of Effectiveness

Intervention/Activity of Interest	References	Level of Effectiveness for Implementation / Activity
Bundle: ABCDE guideline	Bounds et al. (2016)	Possible Effective
Eye masks and Ear plugs on sleep architecture	Demoule et al. (2017)	Effective
Bundle: daily sedation cessation, promotion of sleep/wake cycles, sensory stimulation, mobility, and music therapy	Foster et al. (2013)	Not Effective
Music Therapy effective on delirium triggers / risk factors	Johnson et al. (2018)	Possible Effective
Bundle: Minimize nighttime stimulation, promote normal circadian rhythm, earplugs, eye masks, soothing music, predetermined pharmacologic interventions	Kamdar et al. (2013)	Possibly Effective
Bundle: reorientation, improve environment for sleep promotion	Lee et al. (2016)	Possibly Effective
Bundle: mobility, reorientation, cognitive stimulation, drug reviews, avoidance of sensory deprivation, pain control, family participation	Martinez et al. (2017)	Effective
Bundle: noise and light reduction, ear plugs and eye masks, minimal nighttime interruptions, pain control and mobilization	Patel et al. (2014)	Possibly Effective
Bundle: music, opening/closing blinds, reorientation/cognitive stimulation, and ear/eye care	Rivosecchi et al. (2016)	Possible Effective
Bundle: sedation cessation, pain control, early mobility, sleep promotion	Smith & Grami (2017)	Possibly Effective
Nighttime sound reduction	Van de Pol et al. (2017)	Possibly Effective
Ear plugs	Van Rompaey et al. (2012)	Not Effective
Bundle: pain control, early catheter removal, reorientation, family participation, cluster cares at night	Zhang et al. (2017)	Possibly Effective

Note. Reference from: Ackley, B. J., Swan, B. A., Ladwig, G., & Tucker, S. (2008). Evidence-based nursing care guidelines: Medical surgical interventions. St. Louis, MO: Mosby Elsevier.
Effective: Research validates the effectiveness of the nursing activity or intervention, preferably with Level 1 or with Level 2 evidence.
Possibly Effective: There are some research studies that validate the effectiveness of the nursing activity or intervention, but with insufficient strength to recommend that nurses institute the activity or intervention at this time. Generally, more research is needed.
Not Effective: Research has shown that the nursing activity or intervention is not effective and generally should not be used.
Possibly Harmful: There are some studies that show harm to clients when using the nursing activity or intervention, and the nurse should evaluate carefully whether the activity is ever appropriate.

Appendix H
Theme Matrix

Item	Background Themes			Intervention Theme							Concluding Themes		
	Incidence of Delirium	Duration of Delirium	Screening Tool	Ear Plugs & Eye Masks	Noise Reduction	Clustering Cares	Minimal Interruptions Timeframe	Reducing Lights	Therapeutic Cares	Family Participation	Delirium Incidence Reduction	Delirium Duration Reduction	No Change in Delirium / Not addressed
Demoule et al. (2017)	X		CAM-ICU	X				X					X
Devlin et al. (2018)	X		CAM-ICU ICDSC	X	X	X			X		X		
Flannery et al. (2016)	X	X	CAM-ICU ICDSC DSM-IV								X	X	
Foster et al. (2013)	X		CAM-ICU			X	X	X					X
Hu et al. (2015)	X		NEECHAM	X	X				X		X		
Johnson et al. (2018)	X		CAM-ICU						X				X
Kamdar et al. (2013)	X		CAM-ICU		X	X		X			X		
Litton et al. (2016)	X										X		
Locihova et al. (2018)			NEECHAM CAM-ICU	X	X								X
Martinez et al. (2017)	X		CAM-ICU		X	X				X	X		
Patel et al. (2014)	X		CAM-ICU	X	X	X	X	X			X	X	
Rivosecchi et al. (2016)	X	X	ICDSC	X	X			X	X		X	X	
Smith et al. (2017)	X		CAM-ICU	X	X	X	X	X			X		
Trogrlic et al. (2015)	X	X	CAM-ICU	X	X	X	X	X	X	X	X		
Van de Pol et al. (2017)	X		ICDSC	X	X	X	X	X			X		
Van Rompaey et al. (2012)	X		NEECHAM	X									X
Zhang et al. (2017)	X		CAM-ICU			X	X			X	X		

Appendix I
Clinical Practice Guideline Appraisal using the AGREE II Tool

Citation:
Devlin, J. W., Skrobik, Y., Gélinas, C., Needham, D. M., Slooter, A. J. C., Pandharipande, P. P., … Alhazzani, W. (2018). Clinical Practice Guidelines for the Prevention and Management of Pain, Agitation/Sedation, Delirium, Immobility, and Sleep Disruption in Adult Patients in the ICU: *Critical Care Medicine*, *46*(9), e825–e873. https://doi.org/10.1097/CCM.0000000000003299

Domain	**Item**	**AGREE II Rating**						
		1 *Strongly Disagree*	**2**	**3**	**4**	**5**	**6**	**7** *Strongly Agree*
1. Scope and purpose	**1. The overall objective(s) of the guideline is (are) specifically described.**							AK JK
	Comments: *Overall objective stated within the abstract stating to update and expand on the 2013 Pain, Agitation, and Delirium guidelines.*							
	2. The health question(s) covered by the guideline is (are) specifically described.							AK JK
	Comments: *Within the guideline there are 37 PICO questions and 32 descriptive questions that include rationale with a scientific foundation for purpose.*							
	3. The population (patients, public, etc.) to whom the guideline is meant to apply is specifically described.							AK JK
	Comment: *Population that the guideline is applied to is discussed and meant to be applied to the Adult ICU population*							
2. Stakeholder involvement	**4. The guideline development group includes individuals from all the relevant professional groups.**							AK JK
	Comment: *The guideline is meant for any clinical professional taking care of Adult ICU patients. The panel that aided in the update of the 2013 PAD guideline included experts (both MDs and RNs), methodologists, and ICU survivors to develop the new guideline.*							
	5. The views and preferences of the target population (patients, public, etc.) have been sought.							AK JK
	Comment: *The guideline is meant for any clinical professional taking care of Adult ICU patients. The panel that aided in the update of the 2013 PAD guideline included experts (both MDs and RNs), methodologists, and ICU survivors to develop the new guideline.*							
	6. The target users of the guideline are clearly defined.		AK	JK				
	Comment: *It does not clearly identify specific individuals, as in RNs or MDs, but rather readers who are clinicians within the ICU community.*							
3. Rigor of development	**7. Systematic methods were used to search for evidence.**							AK JK
	Comment: *The panel used multiple database searches and utilized the GRADE method to evaluate evidence applied in a systematic manner.*							

Domain	Item	AGREE II Rating						
		1 *Strongly Disagree*	2	3	4	5	6	7 *Strongly Agree*
	8. The criteria for selecting the evidence are clearly described.							AK JK
	Comment: *The guideline used a system to categorize the recommendations given as such: Guideline used the GRADE evaluation method.*							
	9. The strengths and limitations of the body of evidence are clearly described.							AK JK
	Comment: *Strengths and limitations are identified in Summary section.*							
	10. The methods for formulating the recommendations are clearly described.							AK JK
	Comment: *Within Appendix I there is a detailed systematic approach to choosing evidence applied to recommendations.*							
	11. The health benefits, side effects and risks have been considered in formulating the recommendations.							AK JK
	Comment: *Each section discussed the risks/benefits of non-pharmacologic/pharmacologic interventions with multiple methodologies to ensure quality evidence was implemented.*							
	12. There is an explicit link between the recommendations and the supporting evidence.							AK JK
	Comment: *The panel involved with developing questions and rationale systematically used evidence-based evaluation methods to be included in the recommendations for patient care.*							
	13. The guideline has been externally reviewed by experts prior to its publication.							AK JK
	Comment: *Methodologists used GDT software to evaluate material to ensure unbiased interpretation prior to publication.*							
	14. A procedure for updating the guideline is provided.					AK JK		
	Comment: *A clear description is not give, but there is a very detailed appendix (1) that describes rationale for additions and recommendations provided in the updated guideline.*							
4. Clarity of presentation	**15. The recommendations are specific and unambiguous.**							AK JK
	Comment: *The 37 PICO questions were developed with approval from multiple personnel. The 32 additional questions were developed in a descriptive manner to address the body of knowledge.*							
	16. The different options for management of the condition or health issue are clearly presented.							AK JK
	Comment: *There are clear subheadings that address specific interventions and methods to treat Pain, Agitation, Delirium, Immobility, and Sleep disruption.*							
	17. Key recommendations are easily identifiable.						AK	JK
	Comment: *Recommendations were easily identified by use of italicizing a recommended subheading.*							

Domain	Item	AGREE II Rating						
		1 *Strongly Disagree*	**2**	**3**	**4**	**5**	**6**	**7** *Strongly Agree*
5. Applicability	**18. The guideline describes facilitators and barriers to its application.**		AK JK					
	Comment: *Facilitators and barriers were not clearly described.*							
	19. The guideline provides advice and/or tools on how the recommendations can be put into practice.							AK JK
	Comment: *The recommendations given are accompanied by a rationale statement which is developed by quality evidence evaluated by GRADE criteria.*							
	20. The potential resource implications of applying the recommendations have been considered.							AK JK
	Comment: *Resource supply is taken into considerable account amongst recommendations.*							
	21. The guideline presents monitoring and/ or auditing criteria.						AK JK	
	Comment: *The interventions/ recommendations are based off assessment findings that are related to each section of the PADIS guideline which help direct patient care.*							
6. Editorial independence	**22. The views of the funding body have not influenced the content of the guideline.**							AK JK
	Comment: *Within Appendix 1 descriptions included active measurement taken to prevent conflicts of interest from occurring that can develop from individuals, groups, or companies that are monetarily involved.*							
	23. Competing interests of guideline development group members have been recorded and addressed.							AK JK
	Comment: *Within Appendix 1 descriptions included active measurement taken to prevent conflicts of interest from occurring that can develop from individuals, groups, or companies.*							
Overall Guideline Assessment	**1. Rate the overall quality of this guideline.**	**1** *Lowest possible quality*	**2**	**3**	**4**	**5**	**6**	**7** *Highest possible quality* AK, JK
	2. I would recommend this guideline for use. **Notes:**	*Yes* AK JK		*Yes, with modifications*			*No*	

Note. The AGREE Research Trust. (2013). *Appraisal of Guidelines for Research & Evaluation II (AGREE II).* Canada: Author. Retrieved from http://www.agreetrust.org

Appendix J

Rapid Critical Appraisal Questions for Systematic Reviews and Meta-Analysis

Citation: Bannon, L., McGaughey, J., Verghis, R., Clarke, M., McAuley, D. F., & Blackwood, B. (2019). The effectiveness of non-pharmacological interventions in reducing the incidence and duration of delirium in critically ill patients: A systematic review and meta-analysis. *Intensive Care Medicine*, *45*(1), 1–12. https://doi.org/10.1007/s00134-018-5452-x			
Validity			
1. Are the results of the review valid?			
a. Are the studies continued in the review randomized controlled trials (RCTS)?	**Yes**	No	Unknown
b. If not, were all relevant studies included in the review?	Yes	No	Unknown
c. Does the review include a detailed description of the search strategy to find all relevant studies?	**Yes**	No	Unknown
d. Does the review describe how validity of the individual studies was assessed (e.g., methodological quality, including the use of random assignment to the study groups and complete follow-up of the participants)?	**Yes**	No	Unknown
e. Were the results consistent across studies?	**Yes**	No	Unknown
f. Were individual patient data or aggregate data used in the analysis?	Individual		Aggregate
g. Does the review include a description of how studies were compared using statistical analysis?	**Yes**	No	Unknown
Reliability			
2. What were the Results?			
a. How large is the intervention or treatment effect (OR, RR, effect size)	Bright light therapy: RR 0.45 Therapy proportion: 57% vs 33%, *p*.003		
b. How precise is the intervention or treatment (CI)?	Bright light therapy: CI (0.1,2.13)		
Applicability			
3. Will the results assist me in caring for my patients?			
a. Are my patients similar to the ones included in the review?	**Yes**	No	Unknown
b. Is it feasible to implement the findings in my practice setting?	**Yes**	No	Unknown
c. Do the pooled or combined results of the studies support the hospital's values and goalsof the service delivery? (i.e., Is it feasible to implement the findings into my practice setting?)	**Yes**	No	Unknown
d. Were all clinically important outcomes considered, including risks and benefits of the treatment?	**Yes**	No	Unknown
e. What is my clinical assessment of the patient and are there any contraindications or circumstances that would inhibit me from implementing the treatment?	Yes	**No**	Unknown
f. What are my patient's and his or her family's preferences and values about the treatment that is under consideration?	Yes	No	**Unknown**
Would you use the study results in your practice to make a difference in patient outcomes? If yes, how?, If yes, how? If no, why not? *Yes, I plan to use this data in my practice. The SR found that individual interventions had no effect on delirium outcomes, but rather comprehensive protocols had an impact. Given that different studies used different interventions, it was difficult to pool the response to create statistically meaningful meta-analysis*			
Additional Comments/Reflections: *n/a*			
Recommendation for article use within a body of evidence: *Take note that individual interventions are not shown to make an impact on reduction of delirium incidence.*			

Citation: Flannery, A. H., Oyler, D. R., & Weinhouse, G. L. (2016). The impact of interventions to improve sleep on delirium in the ICU: a systematic review and research framework. *Neurologic Critical Care, 44*(12), 2231-2240. doi: 10.1097/CCM.0000000000001952			
Validity			
1. Are the results of the review valid?			
a. Are the studies continued in the review randomized controlled trials (RCTS)?	Yes	**No**	Unknown
b. If not, were all relevant studies included in the review?	**Yes**	No	Unknown
c. Does the review include a detailed description of the search strategy to find all relevant studies?	**Yes**	No	Unknown
d. Does the review describe how validity of the individual studies was assessed (e.g., methodological quality, including the use of random assignment to the study groups and complete follow-up of the participants)?	**Yes**	No	Unknown
e. Were the results consistent across studies?	**Yes**	No	Unknown
f. Were individual patient data or aggregate data used in the analysis?	**Individual**		Aggregate
g. Does the review include a description of how studies were compared using statistical analysis?	**Yes**	No	Unknown
Reliability			
2. What were the Results?			
a. How large is the intervention or treatment effect (OR, RR, effect size)	SR, no pooled effect data		
b. How precise is the intervention or treatment (CI)?	SR, no pooled data		
Applicability			
3. Will the results assist me in caring for my patients?			
a. Are my patients similar to the ones included in the review?	**Yes**	No	Unknown
b. Is it feasible to implement the findings in my practice setting?	**Yes**	No	Unknown
c. Do the pooled or combined results of the studies support the hospital's values and goalsof the service delivery? (i.e., Is it feasible to implement the findings into my practice setting?)	Yes	No	**Unknown**
d. Were all clinically important outcomes considered, including risks and benefits of the treatment?	**Yes**	No	Unknown
e. What is my clinical assessment of the patient and are there any contraindications or circumstances that would inhibit me from implementing the treatment?	Yes	**No**	Unknown
f. What are my patient's and his or her family's preferences and values about the treatment that is under consideration?	Yes	No	**Unknown**
Would you use the study results in your practice to make a difference in patient outcomes? If yes, how?, If yes, how? If no, why not? *Flannery et al. (2016) made recommendations for future research in the area of sleep and delirium. The key elements provided within this framework were utilized to create the proposal for this project. 1) Clearly define the link between sleep, intervention, and delirium outcome. 2) Environment of study must be a place of consistent practice, therefore the proposal will clearly define the unit of intervention. 3) Must use a validated screening tool. 4) Minimize selection bias.*			
Additional Comments/Reflections: *No statistical data supplied as it is a SR, but does provide a framework that is crucial for development of future research into the link between sleep and delirium.*			
Recommendation for article use within a body of evidence: *This SR provides a needed framework for our project.*			
Citation: Hu, R.-F., Jiang, X.-Y., Chen, J., Zeng, Z., Chen, X. Y., Li, Y., Huining, X., Evans, D. J., & Wang, S. (2015). Non-pharmacological interventions for sleep promotion in the intensive care unit. *Cochrane Database of Systematic Reviews*. https://doi.org/10.1002/14651858.CD008808.pub2			
Validity			

1. Are the results of the review valid?			
a. Are the studies continued in the review randomized controlled trials (RCTS)?	**Yes**	No	Unknown
b. If not, were all relevant studies included in the review?	Yes	No	Unknown
c. Does the review include a detailed description of the search strategy to find all relevant studies?	**Yes**	No	Unknown
d. Does the review describe how validity of the individual studies was assessed (e.g., methodological quality, including the use of random assignment to the study groups and complete follow-up of the participants)?	**Yes**	No	Unknown
e. Were the results consistent across studies?	**Yes**	No	Unknown
f. Were individual patient data or aggregate data used in the analysis?	Individual		**Aggregate**
g. Does the review include a description of how studies were compared using statistical analysis?	**Yes**	No	Unknown
Reliability			
2. What were the Results?			
a. How large is the intervention or treatment effect (OR, RR, effect size)	RR 0.55		
b. How precise is the intervention or treatment (CI)?	CI 0.38,0.80 *P* .002		
Applicability			
3. Will the results assist me in caring for my patients?			
a. Are my patients similar to the ones included in the review?	**Yes**	No	Unknown
b. Is it feasible to implement the findings in my practice setting?	**Yes**	No	Unknown
c. Do the pooled or combined results of the studies support the hospital's values and goalsof the service delivery? (i.e., Is it feasible to implement the findings into my practice setting?)	**Yes**	No	Unknown
d. Were all clinically important outcomes considered, including risks and benefits of the treatment?	**Yes**	No	Unknown
e. What is my clinical assessment of the patient and are there any contraindications or circumstances that would inhibit me from implementing the treatment?	Yes	**No**	Unknown
f. What are my patient's and his or her family's preferences and values about the treatment that is under consideration?	Yes	No	**Unknown**
Would you use the study results in your practice to make a difference in patient outcomes? If yes, how?, If yes, how? If no, why not? *Hu et al. (2015) SR/MA in the Cochrane review provides a very clear and concise recommendation for non-pharmacologic sleep recommendations in the ICU. While the quality of evidence was determined as low, they were able to compile 2 different studies to create RR, assumed risk with a intervention reduced risk drop(489 per 1000 to 269 per 1000, CI [186,391]) which was unique to this review.*			
Additional Comments/Reflections: *Provides statistical evidence that is essential for moving this project forward.*			
Recommendation for article use within a body of evidence: *Gave information from the pooled evidence on various non-pharmacologic interventions that could be of use when selecting the interventions to be used in the developing protocol.*			
Citation: Kang, J., Lee, M., Ko, H., Kim, S., Yun, S., Jeong, Y., & Cho, Y. (2018). Effect of nonpharmacological interventions for the prevention of delirium in the intensive care unit: A systematic review and meta-analysis. *Journal of Critical Care*, *48*, 372–384. https://doi.org/10.1016/j.jcrc.2018.09.032			
Validity			
1. Are the results of the review valid?			
a. Are the studies continued in the review randomized controlled trials (RCTS)?	Yes	**No**	Unknown
b. If not, were all relevant studies included in the review?	**Yes**	No	Unknown
c. Does the review include a detailed description of the search strategy to find all relevant studies?	**Yes**	No	Unknown
d. Does the review describe how validity of the individual studies was assessed (e.g., methodological quality, including the use of random assignment to the study groups and complete follow-up of the participants)?	Yes	No	Unknown
e. Were the results consistent across studies?	Yes	No	Unknown

f. Were individual patient data or aggregate data used in the analysis?	Individual		Aggregate
g. Does the review include a description of how studies were compared using statistical analysis?	Yes	No	Unknown
Reliability			
2. What were the Results?			
a. How large is the intervention or treatment effect (OR, RR, effect size)	RR 0.66 (delirium occurrence) RR 0.31 (delirium duration)		
b. How precise is the intervention or treatment (CI)?	CI (0.5, 0.86) & CI (.1, .94)		
Applicability			
3. Will the results assist me in caring for my patients?			
a. Are my patients similar to the ones included in the review?	**Yes**	No	Unknown
b. Is it feasible to implement the findings in my practice setting?	**Yes**	No	Unknown
c. Do the pooled or combined results of the studies support the hospital's values and goals of the service delivery? (i.e., Is it feasible to implement the findings into my practice setting?)	**Yes**	No	Unknown
d. Were all clinically important outcomes considered, including risks and benefits of the treatment?	**Yes**	No	Unknown
e. What is my clinical assessment of the patient and are there any contraindications or circumstances that would inhibit me from implementing the treatment?	Yes	**No**	Unknown
f. What are my patient's and his or her family's preferences and values about the treatment that is under consideration?	Yes	No	**Unknown**
Would you use the study results in your practice to make a difference in patient outcomes? If yes, how?, If yes, how? If no, why not? *This SR/MA found that non-pharmacologic interventions were effective at reducing the duration and occurrence of delirium in the ICU setting.*			
Additional Comments/Reflections: *n/a*			
Recommendation for article use within a body of evidence: *Provided more evidence that non-pharmacologic interventions are effective for delirium mitigation.*			
Citation: Litton, E., Carnegie, V., Elliott, R., & Webb, S. A. R. (2016). The Efficacy of Earplugs as a Sleep Hygiene Strategy for Reducing Delirium in the ICU: A Systematic Review and Meta-Analysis*. *Critical Care Medicine*, *44*(5), 992–999. https://doi.org/10.1097/CCM.0000000000001557			
Validity			
1. Are the results of the review valid?			
a. Are the studies continued in the review randomized controlled trials (RCTS)?	Yes	**No**	Unknown
b. If not, were all relevant studies included in the review?	**Yes**	No	Unknown
c. Does the review include a detailed description of the search strategy to find all relevant studies?	**Yes**	No	Unknown
d. Does the review describe how validity of the individual studies was assessed (e.g., methodological quality, including the use of random assignment to the study groups and complete follow-up of the participants)?	**Yes**	No	Unknown
e. Were the results consistent across studies?	**Yes**	No	Unknown
f. Were individual patient data or aggregate data used in the analysis?	Individual		**Aggregate**
g. Does the review include a description of how studies were compared using statistical analysis?	**Yes**	No	Unknown
Reliability			
2. What were the Results?			
a. How large is the intervention or treatment effect (OR, RR, effect size)	RR 0.59		
b. How precise is the intervention or treatment (CI)?	CI (0.44-0.78)		
Applicability			

3. Will the results assist me in caring for my patients?			
a. Are my patients similar to the ones included in the review?	**Yes**	No	Unknown
b. Is it feasible to implement the findings in my practice setting?	**Yes**	No	Unknown
c. Do the pooled or combined results of the studies support the hospital's values and goals of the service delivery? (i.e., Is it feasible to implement the findings into my practice setting?)	**Yes**	No	Unknown
d. Were all clinically important outcomes considered, including risks and benefits of the treatment?	Yes	No	**Unknown**
e. What is my clinical assessment of the patient and are there any contraindications or circumstances that would inhibit me from implementing the treatment?	Yes	**No**	Unknown
f. What are my patient's and his or her family's preferences and values about the treatment that is under consideration?	Yes	No	**Unknown**
Would you use the study results in your practice to make a difference in patient outcomes? If yes, how?, If yes, how? If no, why not? *As a stand-alone SR/MA, this data is not sufficient to implement a practice change of earplugs for the prevention of delirium. What this data informs readers is that the use of earplugs in the ICU is a safe intervention.*			
Additional Comments/Reflections: *Does not support the use of ear plugs as an individual intervention.*			
Recommendation for article use within a body of evidence: *In conjunction with other studies, earplug use can be used as a part of the whole intervention bundle.*			
Citation: Locihová, H., Axmann, K., Padyšáková, H., & Fejfar, J. (2018). Effect of the use of earplugs and eye mask on the quality of sleep in intensive care patients: A systematic review. *Journal of Sleep Research*, *27*(3), e12607. https://doi.org/10.1111/jsr.12607			
Validity			
1. Are the results of the review valid?			
a. Are the studies continued in the review randomized controlled trials (RCTS)?	Yes	**No**	Unknown
b. If not, were all relevant studies included in the review?	**Yes**	No	Unknown
c. Does the review include a detailed description of the search strategy to find all relevant studies?	**Yes**	No	Unknown
d. Does the review describe how validity of the individual studies was assessed (e.g., methodological quality, including the use of random assignment to the study groups and complete follow-up of the participants)?	Yes	**No**	Unknown
e. Were the results consistent across studies?	**Yes**	No	Unknown
f. Were individual patient data or aggregate data used in the analysis?	**Individual**		Aggregate
g. Does the review include a description of how studies were compared using statistical analysis?	**Yes**	No	Unknown
Reliability			
2. What were the Results?			
a. How large is the intervention or treatment effect (OR, RR, effect size)	SR, no pooled data		
b. How precise is the intervention or treatment (CI)?	SR, no pooled data		
Applicability			
3. Will the results assist me in caring for my patients?			
a. Are my patients similar to the ones included in the review?	**Yes**	No	Unknown
b. Is it feasible to implement the findings in my practice setting?	**Yes**	No	Unknown
c. Do the pooled or combined results of the studies support the hospital's values and goals of the service delivery? (i.e., Is it feasible to implement the findings into my practice setting?)	**Yes**	No	Unknown
d. Were all clinically important outcomes considered, including risks and benefits of the treatment?	**Yes**	No	Unknown
e. What is my clinical assessment of the patient and are there any contraindications or circumstances that would inhibit me from implementing the treatment?	Yes	**No**	Unknown

f. What are my patient's and his or her family's preferences and values about the treatment that is under consideration?	Yes	No	**Unknown**
Would you use the study results in your practice to make a difference in patient outcomes? If yes, how?, If yes, how? If no, why not? *The researchers provided implications for practice that will be useful when establishing a sleep protocol for the prevention of delirium in the adult ICU clinical site.*			
Additional Comments/Reflections: *n/a*			
Recommendation for article use within a body of evidence: *Great information from other research on how to use ear plugs and eye masks for sleep improvement.*			
Citation: Martinez, F., Tobar, Cl., & Hill, N. (2015). Preventing delirium: should non-pharmacological, multicomponent interventions be used? A systematic review and meta-analysis of the literature. *Age and Aging, 44*. 196-204. doi: 10.1093/ageing/afu173			
Validity			
1. Are the results of the review valid?			
a. Are the studies continued in the review randomized controlled trials (RCTS)?	**Yes**	No	Unknown
b. If not, were all relevant studies included in the review?	Yes	No	Unknown
c. Does the review include a detailed description of the search strategy to find all relevant studies?	**Yes**	No	Unknown
d. Does the review describe how validity of the individual studies was assessed (e.g., methodological quality, including the use of random assignment to the study groups and complete follow-up of the participants)?	**Yes**	No	Unknown
e. Were the results consistent across studies?	**Yes**	No	Unknown
f. Were individual patient data or aggregate data used in the analysis?	Individual		**Aggregate**
g. Does the review include a description of how studies were compared using statistical analysis?	**Yes**	No	Unknown
Reliability			
2. What were the Results?			
a. How large is the intervention or treatment effect (OR, RR, effect size)	RR 0.73, *P <.001*		
b. How precise is the intervention or treatment (CI)?	CI (0.63, 0.85)		
Applicability			
3. Will the results assist me in caring for my patients?			
a. Are my patients similar to the ones included in the review?	**Yes**	No	Unknown
b. Is it feasible to implement the findings in my practice setting?	**Yes**	No	Unknown
c. Do the pooled or combined results of the studies support the hospital's values and goals of the service delivery? (i.e., Is it feasible to implement the findings into my practice setting?)	**Yes**	No	Unknown
d. Were all clinically important outcomes considered, including risks and benefits of the treatment?	**Yes**	No	Unknown
e. What is my clinical assessment of the patient and are there any contraindications or circumstances that would inhibit me from implementing the treatment?	Yes	**No**	Unknown
f. What are my patient's and his or her family's preferences and values about the treatment that is under consideration?	Yes	No	**Unknown**
Would you use the study results in your practice to make a difference in patient outcomes? If yes, how?, If yes, how? If no, why not? *This SR/MA provides data to support the use of a multicomponent intervention bundle to prevent delirium in the adult patient population. While this study was aimed at elderly patients, the information is still useful as the clinical site includes all patients older than 18 years.*			
Additional Comments/Reflections: *May not be reproduceable in a wider range of patient ages.*			
Recommendation for article use within a body of evidence: *Provides evidence on the benefit of a multicomponent bundle.*			

Citation: Trogrlić, Z., van der Jagt, M., Bakker, J., Balas, M. C., Ely, E. W., van der Voort, P. H., & Ista, E. (2015). A systematic review of implementation strategies for assessment, prevention, and management of ICU delirium and their effect on clinical outcomes. *Critical Care*, *19*(1), 157. https://doi.org/10.1186/s13054-015-0886-9			
Validity			
1. Are the results of the review valid?			
a. Are the studies continued in the review randomized controlled trials (RCTS)?	Yes	**No**	Unknown
b. If not, were all relevant studies included in the review?	**Yes**	No	Unknown
c. Does the review include a detailed description of the search strategy to find all relevant studies?	**Yes**	No	Unknown
d. Does the review describe how validity of the individual studies was assessed (e.g., methodological quality, including the use of random assignment to the study groups and complete follow-up of the participants)?	**Yes**	No	Unknown
e. Were the results consistent across studies?	**Yes**	No	Unknown
f. Were individual patient data or aggregate data used in the analysis?	**Individual**		Aggregate
g. Does the review include a description of how studies were compared using statistical analysis?	**Yes**	No	Unknown
Reliability			
2. What were the Results?			
a. How large is the intervention or treatment effect (OR, RR, effect size)	SR, no pooled data		
b. How precise is the intervention or treatment (CI)?	SR, no pooled data		
Applicability			
3. Will the results assist me in caring for my patients?			
a. Are my patients similar to the ones included in the review?	**Yes**	No	Unknown
b. Is it feasible to implement the findings in my practice setting?	**Yes**	No	Unknown
c. Do the pooled or combined results of the studies support the hospital's values and goals of the service delivery? (i.e., Is it feasible to implement the findings into my practice setting?)	**Yes**	No	Unknown
d. Were all clinically important outcomes considered, including risks and benefits of the treatment?	Yes	No	**Unknown**
e. What is my clinical assessment of the patient and are there any contraindications or circumstances that would inhibit me from implementing the treatment?	Yes	**No**	Unknown
f. What are my patient's and his or her family's preferences and values about the treatment that is under consideration?	Yes	No	**Unknown**
Would you use the study results in your practice to make a difference in patient outcomes? If yes, how?, If yes, how? If no, why not? *This SR evaluated the effectiveness of different implementation strategies. This will be necessary information for the purpose of this proposal as the protocol will need to be disseminated and implemented somehow. The authors didn't find statistical data on the effect on the implementation strategy on the overall anticipated outcome of a study but rather the compliance with the interventions being utilized. The authors found that utilizing strategies that target the health care professional as well as the organizational, financial, and regulatory domains were associated with better clinical outcomes.*			
Additional Comments/Reflections: *n/a*			
Recommendation for article use within a body of evidence: *Provides information on how delirium reduction strategies were implemented successfully, but not on the actual strategies themselves.*			

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Appendix K
Utility and Feasibility

Intervention	Citation(s)	Finding(s)	Fit with Setting	Fit with Sample	Feasibility of Implementation	Benefits	Risks	Resources Needed
Updated Clinical Practice Guidelines for the Management of Pain, Agitation, and Delirium in Adult Patients in the ICU.	Devlin et al. (2018)	The Pain, Agitation, and Delirium (PAD) Clinical Practice Guideline (2013) has been updated in 2018 to include Immobility and Sleep disruptions (PADIS) as quality indicators to improve patient outcomes.	Hospital setting	Clinicians providing care to ICU patients	Guideline gives rationale followed by literary evidence for introducing interventions to ICU patients on an individual basis so care can be patient centered.	Decreasing delirium rates have a positive impact on patient outcomes, financial burdens, family/ caregiver burdens, and patient quality of life.	No Risks Identified	Trained clinicians to care for ICU patients, ear plugs, eye masks

Intervention	Citation(s)	Finding(s)	Fit with Setting	Fit with Sample	Feasibility of Implementation	Benefits	Risks	Resources Needed
The use of non-pharmacological interventions to combat the incidence of duration within the ICU. Interventions were broken into 9 categories: multicomponent, physical environment, daily interruption of sedation, exercise, or patient education, and automatic warning system, cerebral hemodynamics improvement, family participation, and sedation reducing protocol	Kang et al. (2018)	Non-pharmacological interventions decrease the incidence and duration of delirium; however, they do not have an effect on hospital length of stay and mortality rates.	Hospital setting	Clinicians providing care to ICU patients	Combined evidence indicating that utilizing interventions can have a positive impact on delirium prevention allowing patients to progress out of the ICU.	Decreasing delirium rates have a positive impact on patient outcomes, financial burdens, family/ caregiver burdens, and patient quality of life. Incorporating interventions requires minimal education amongst staff and is a cost effective method to combating delirium.	No Risks Identified	Trained clinicians to care for ICU patients, ear plugs, eye masks, delirium education material, computer access for assessment documentation

Intervention	Citation(s)	Finding(s)	Fit with Setting	Fit with Sample	Feasibility of Implementation	Benefits	Risks	Resources Needed
A 10-point intervention strategy was used to prevent delirium within the ICU. Strategies included PT and early mobilization, daily reorientation, prevention of sensory deprivation, avoidance of drugs with the potential to trigger delirium, pain control, sleep hygiene, environmental stimulation, monitoring of urinary and rectal function, minimization of physical restraints, and family participation in care.	Martinez et al. (2017)	Incorporating the 10-point strategy reduced the incidence and duration of delirium with patients staying in the ICU.	Hospital setting	Clinicians providing care to ICU patients	A multifaceted strategy that provides patient centered care anchoring the priority to combat delirium from occurring or decreasing the duration of delirium while patients in the ICU.	Decreasing delirium rates have a positive impact on patient outcomes, financial burdens, family/ caregiver burdens, and patient quality of life.	No Risks Identified	Trained clinicians to care for ICU patients, ear plugs, eye masks, delirium education material, computer access for assessment documentation

Intervention	Citation(s)	Finding(s)	Fit with Setting	Fit with Sample	Feasibility of Implementation	Benefits	Risks	Resources Needed
Nurses Incorporated the use of a multifaceted bundle to promote sleep within the ICU environment.	Patel et al. (2014)	The use of the sleep promotion bundle decreased the incidence and duration of delirium, increased sleep quality, and decreased risk of developing delirium.	Hospital setting	Clinicians providing care to ICU patients	A nurse-driven bundle that allows nurses at the bedside to implement interventions that can create positive outcomes for patients and families.	Decreasing delirium rates have a positive impact on patient outcomes, financial burdens, family/ caregiver burdens, and patient quality of life.	No Risks Identified	Trained nurses to care for ICU patients, ear plugs, eye masks, computer access for assessment documentation
The non-pharmacologic interventions music, opening and closing blinds, reorientation and cognitive stimulation, and ear/eye care were used by nurses to reduce delirium incidence and duration.	Rivosecchi, et al. (2016)	The use of the interventions reduced delirium incidence, delirium duration, and odds of acquiring delirium for patients during their stay in the ICU.	Hospital Setting	Clinicians providing care to ICU patients	Nurse-driven non-pharmacological interventions that could easily be accommodated into patient care to prevent delirium incidence and duration.	Decreasing delirium rates have a positive impact on patient outcomes, financial burdens, family/ caregiver burdens, and patient quality of life.	No Risks Identified	Trained nurses to care for ICU patients, ear plugs, eye masks, delirium education material, computer access for assessment documentation

Appendix L
Delirium Prevention Protocol

Delirium Prevention QI Project

Exclusion Criteria

- Length of stay in ICU <24 hours
- Hourly Neuro checks per MD orders
- Temporary mechanical device <7 days
- CRRT, ECMO, <24 hrs since Open Heart surgery, Targeted Temperature Managment
- Active titration of 2 or more vasoactive gtts

Delirium Prevention

Cart Supplies

- Eye masks
- Disposable Fans
- Ear Plugs
- Aromatherapy oil
- Sleep Protocol Magnet for door
- Sleep Menu

Remember to Chart

- ICDSC Score on admission and every 8 hours at minimum
- RASS Score every 8 hours at minimum
- Delirium interventions utilized on Intervention Summary Form

Step 1: Does patient meet any of the exclusion criteria?

No *Yes* → Stop here, Continue current cares

Step 2: Address during AM rounds patient's eligibility for *Sleep Promotion (No Wake Zone)* protocol. Will attending order the protocol?

Yes *No* → Stop here, Continue current cares

Step 3: Enter *Sleep Promotion (No Wake Zone)* order with time modification to reflect 0030 – 0400.

Step 4: EVENING SHIFT - Prepare the patient for *Sleep Promotion (No Wake Zone)* protocol by gathering supplies necessary for Protocol Cart.

Step 5: NIGHT SHIFT – Complete midnight assessment, administer all needed cares, and give patient uninterrupted rest starting at 0030.

Step 6: Continue to monitor vital signs, administer scheduled medications as ordered, and monitor patient as able. ***If at any time patient decompensates, intervene as necessary***.

Step 7: At 0400, enter patient's room to complete 0400 assessment, draw lab work, xrays, and any other needed cares to prepare patient for morning. Keep sleep protocol items utilized for the next night!

Appendix M
Iowa Model Permission

From: Kimberly Jordan - University of Iowa Hospitals and Clinics <noreply@qemailserver.com>
Sent: Wednesday, September 16, 2020 11:48 AM
To: Klein, Aaron M <Aaron.Klein@go.winona.edu>
Subject: Permission to Use The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care

You have permission, as requested today, to review and/or reproduce *The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care*. Click the link below to open.

The Iowa Model Revised (2015)

Citation: Iowa Model Collaborative. (2017). Iowa model of evidence-based practice: Revisions and validation. ***Worldviews on Evidence-Based Nursing, 14(3), 175-182. doi:10.1111/wvn.12223***

In written material, please add the following statement:

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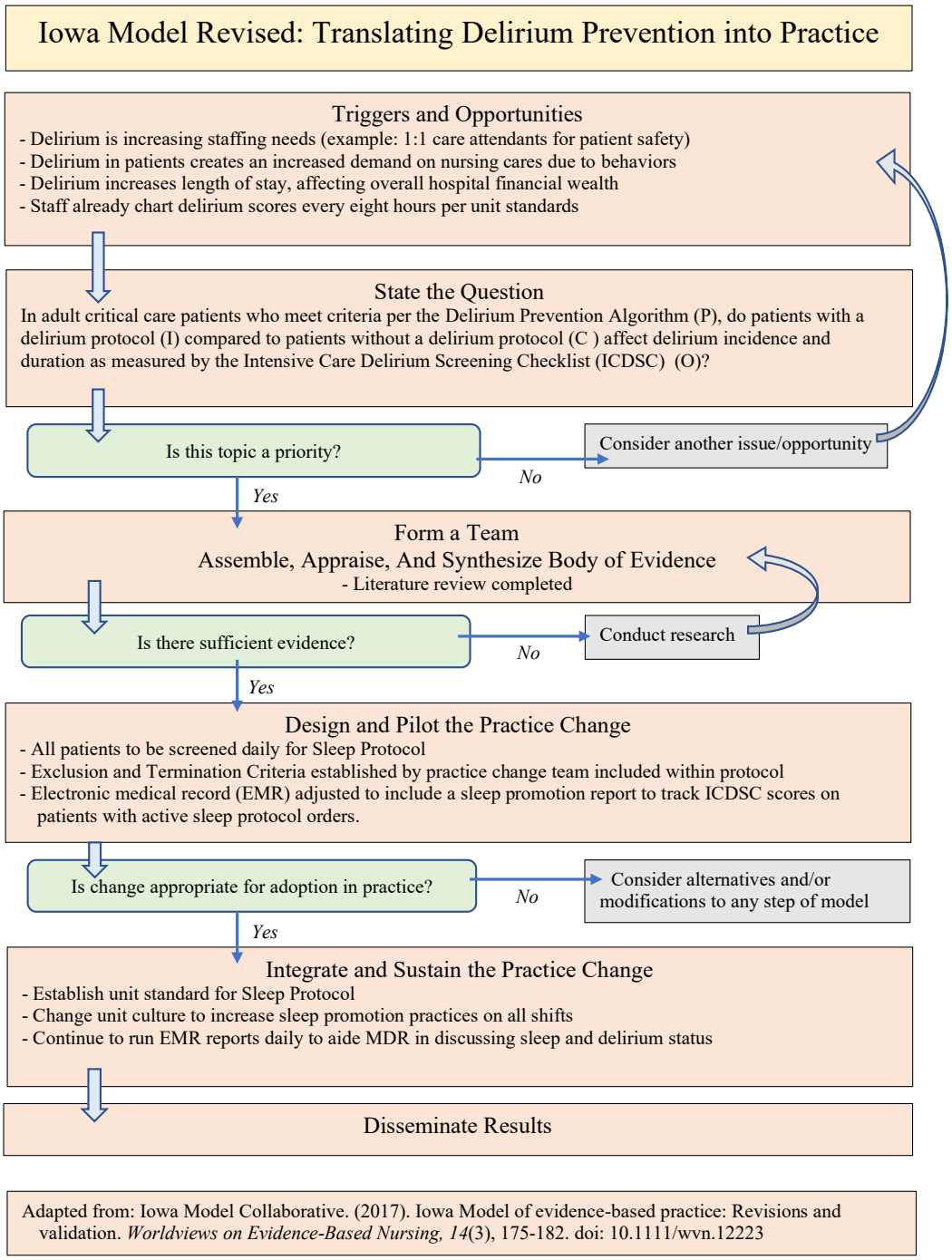
Please contact UIHCNursingResearchandEBP@uiowa.edu or 319-384-9098 with questions.

/

Appendix N
Iowa Model EBP Flowchart



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Please contact UIHCNursingResearchandEBP@uiowa.edu or 319-384-9098 with questions.

Appendix O
ICDSC Screening Tool

1. Altered level of consciousness: A) No response or B) the need for vigorous stimulation in order to obtain any response signified a severe alteration in the level of consciousness precluding evaluation. If there is coma (A) or stupor (B) most of the time period then a dash (-) is entered and there is no further evaluation during that period. C) Drowsiness or requirement of a mild to moderate stimulation for a response implies an altered level of consciousness and scores 1 point. D) Wakefulness or sleeping state that could easily be aroused is considered normal and scores no point. E) Hypervigilance is rated as an abnormal level of consciousness and scores 1 point.
2. Inattention: Difficulty in following a conversation or instructions. Easily distracted by external stimuli. Difficulty in shifting focuses. Any of these scores 1 point.
3. Disorientation: Any obvious mistake in time, place or person scores 1 point.
4. Hallucination, delusion or psychosis: The unequivocal clinical manifestation of hallucination or of behavior probably due to hallucination (e.g., trying to catch a non-existent object) or delusion. Gross impairment in reality testing. Any of these scores 1 point.
5. Psychomotor agitation or retardation: Hyperactivity requiring the use of additional sedative drugs or restraints in order to control potential danger to oneself or others (e.g., pulling out iv lines, hitting staff). Hypoactivity or clinically noticeable psychomotor slowing. Any of these scores 1 point.
6. Inappropriate speech or mood: Inappropriate, disorganized or incoherent speech. Inappropriate display of emotion related to events or situation. Any of these scores 1 point.
7. Sleep/wake cycle disturbance: Sleeping less than 4 h or waking frequently at night (do not consider wakefulness initiated by medical staff or loud environment). Sleeping during most of the day. Any of these scores 1 point.
8. Symptom fluctuation: Fluctuation of the manifestation of any item or symptom over 24 h (e.g., from one shift to another) scores 1 point.

Note. Retrieved from Bergeron, N., Dubois, M. J., Dumont, M., Dial, S., & Skrobik, Y. (2001). Intensive care delirium screening checklist: evalution of a new screening tool. Intensive Care Medicine, 27. 859-864. doi: 10.1007/s001340100909

Appendix P
Nursing Survey

Please answer the following ten questions to the best of your knowledge. The purpose of this survey is to assess staff knowledge of the risks and consequences of delirium and staff comfortability with using the ICDSC screening tool to assess patient risk of delirium. All submissions will remain anonymous. By completing this survey, the participant consents to having his/her responses used for statistical data in a DNP project.

1) How comfortable are you offering non-pharmacologic agents to promote sleep?				
a) Very comfortable	b) Comfortable	c) Neutral	d) Uncomfortable	e) Very uncomfortable
2) How comfortable are you allowing patients to have 4 hours of uninterrupted rest at night?				
a) Very comfortable	b) Comfortable	c) Neutral	d) Uncomfortable	e) Very uncomfortable
3) How comfortable are you following a protocol that promotes sleep?				
a) Very comfortable	b) Comfortable	c) Neutral	d) Uncomfortable	e) Very uncomfortable
4) How comfortable are you educating patients/families on delirium prevention?				
a) Very comfortable	b) Comfortable	c) Neutral	d) Uncomfortable	e) Very uncomfortable
5) How comfortable are you advocating a delirium protocol for your patient to providers?				
a) Very comfortable	b) Comfortable	c) Neutral	d) Uncomfortable	e) Very uncomfortable
6) At a minimum, how often do you need to document the ICDSC?				
a) Every 2 hours	b) Every 4 hours	C) Every 8 hours	D) Every 24 hours	E) As needed
7) What score on the ICDSC indicates a positive screen for delirium?				
a) Any number greater than 0	b) Any number greater than 2	c) Any number greater than 4	d) Any number greater than 6	e) Any number greater than 8
8) What are the negative consequences of delirium?				
a) Disorientation	b) Increased health care cost	c) Change in cognitive status	d) Increased mortality and morbidity	e) All of the above
9) What are some positive patient outcomes for delirium prevention?				
a) Decreased duration of delirium	b) Increased patient satisfaction	c) Decreased healthcare resource usage	d) Decreased stress	e) All of the above
10) Who is at risk for developing delirium?				
a) Open heart, POD #2	b) Intubated/sedated pneumonia patient	c) Leave-in Swan, CHF patient	d) Post STEMI, pre-open heart patient	e) All of the above

Appendix Q
Intervention Summary

Record of Patient Interventions for Delirium Reduction Project

Please indicate which options the patient utilized each night to enhance sleep with an "X"

Indicate with an "R" if patient/family refused intervention.

The first line is filled in as an example.

Date	Uninterrupted Sleep: 0030-0400	Eye Mask	Ear Plugs	Fan	Essential Oils	Lights Off	Door Closed	Music
12/01	*X*	*X*	*R*	*X*	*R*	*X*	*X*	*X*

PATIENT LABEL HERE

Appendix R
Data Extraction Tables

Table R1

Data extraction form for EMR

Unique Identifier	ICU Day	Time	ICDSC Score

Table R2

Tabulated data table for statistical analysis

Unique Identifier	Age (Yrs)	Gender (M/F/U)	Race	Admitting ICU Diagnosis	Primary location within ICU (N/S)	Incidence of delirium (Y/N)	Duration of Delirium (Hrs)	Cohort (Pre/Post)	Length of stay in ICU (HRS)	Average number of bundle elements used

Appendix S
Project Budget

Phase of Project	Item	Description	Cost	Cost incurred to Site
Preparation	Face to face Education	The cost of the DNP students's time to educate staff, APRNs, and MDs on the various aspects of project	$3,000	$0
	Education Materials	Office Supplies used to create flyers, handouts, and other materials	$100	$100
	Hospitality	Cost of food, drink, etc., used to engage staff for participation	$250	$0
Implementation	Protocol Materials	Ear Plugs – 3M classic 30ct $16 x 3	$50	$50
		Eye Masks – 40ct $8 x2	$16	$16
		Magnet – VistaPrint pack of 25	$14	$14
		Sleep Menu – SmartWorks pk of 50	$10	$10
		Aromatherapy -$5/bottle x 20	$200	$200
		Personal Fan -$8/fan x 50	$400	$400
Data Collection	Manual Extraction	Cost of DNP students evaluating patient charts and pulling data to be used for evaluation	$5,000	$0
	Statistical Analysis	Statistician time to run analysis on data reports	$4,000	$0
Total:			$13,040	$790

Appendix T
Gantt Chart

	September	October	November	December	January	February	March	April	May	June
Proposal Paper Submitted										
IRB Approval										
Project Proposal Meeting										
Retrospective Pre-Cohort Data Extraction										
Intervention Implemented on Post-Cohort										
Data Entry and Analysis										
Evaluation										
Recommendations										
Dissemination										
DNP project completion										