AMERICAN UNIVERSITY OF BEIRUT

THE FEASIBILITY OF IMPLEMENTING A TAILORED DELIRIUM PREVENTION BUNDLE FOR INTENSIVE CARE UNITS (ICU) FROM REGISTERED NURSES' PERSPECTIVE

by
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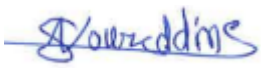

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ABSTRACT
OF THE THESIS

Hratch Hratch Moskofian for Master of science
Major: Nursing

Title: The Feasibility of Implementing a Tailored Delirium Prevention Bundle for Intensive Care Units (ICU) from Registered Nurses' Perspective

Background: Delirium is a clinical mental disturbance characterized as a transient, often reversible, alteration in consciousness, cognition, or perception. Delirium and sleep deprivation are two clinical syndromes commonly encountered in intensive care Units (ICU). Given the complexity of the shared mechanism and the interactions of the previously mentioned conditions, the relationship between these two phenomena has never been fully understood. While sleep deprivation is thought to be a risk factor for delirium, it is also likely that delirium itself contributes to sleep deprivation (Watson et al., 2012). The feasibility of implementing a non-pharmacological delirium prevention has never been studied in Lebanon.

Aim: The aim of this study was to assess the feasibility and barriers of implementing a tailored delirium prevention bundle into nurses' day-to-day practice from a nurse's perspective.

Methods: A descriptive correlational study design was used. The study was conducted at the intensive care, neuro-intensive care, coronary care and respiratory care units of the American University of Beirut Medical Center (AUBMC). The target population included all critical care nurses working at the previously mentioned units at AUBMC. The institutional review board (IRB) and AUBMC administration approvals to conduct the study were secured. An online survey was sent to the nurses, including demographic questions, and delirium knowledge questions. In addition, we asked the nurses about their perceived feasibility and barriers to implement the sleep assessment tool and our proposed delirium prevention bundle.

Analysis: Statistical analysis included descriptive statistics (means and standard deviations, and frequencies and percentages, depending on the level of measurement). Bivariate analyses included Mann Whitney and Kruskal Wallis tests to examine associations between variables.

Results: Our total sample size was 31 with a response rate of 40%. Our sample consisted more of males than females, and were aged mainly between 26-30 and 36 to 40, 60% of our nurses were ICU staff, most of our responder had a bachelor degree in nursing. As for years of experience most of the nurses had between 4 to 6 or 10 to 13

years of experience. Almost three forth of the nurses stated that they currently not using any tool to assess sleep. The total feasibility score of this sleep assessment tool was 3.82(0.13) indicating that it's somewhat feasible as perceived by the nurses. Total feasibility score for the delirium prevention bundle was 3.6 indicating its feasibility as perceived by the critical care nurses. Inadequate staffing, lack of time, and lack of resources were predominant throughout the study.

Conclusion: Delirium is a very serious and, most importantly, preventable syndrome. It has been proven to increase morbidity, mortality, and length of hospitalization. This study highlighted the possibility of implementing a delirium prevention bundle at AUBMC and provided baseline data for setting the ground for implementing the sleep-targeted delirium prevention bundle. A positive attitude of nurses toward the implementation of the bundle was noted despite some hesitancy manifested by lower perceived feasibility for some of the tested interventions. This study revealed some barriers that should be tackled before implementation to ensure our critical care nurse's proper and successful execution and positive outcome

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CHAPTER I

INTRODUCTION

Delirium is a clinical mental disturbance characterized as a transient, often reversible, alteration in consciousness, cognition, or perception (Inouye et al., 2014). Delirium was referred to as acute brain failure, ICU psychosis, encephalopathy, and many others throughout history. Currently, clinicians have agreed on the use of the word “Delirium” to refer to this clinical syndrome (Girard et al., 2008).

Physiologically, delirium is a derangement of cerebral metabolism with dysfunction caused by substance intoxication or withdrawal, or a systemic medical illness (Cavallazzi et al., 2012). On the cellular level, delirium is characterized by alterations in the secretion, synthesis, and activation of dopamine, serotonin, and acetylcholine (Figueroa-Ramos et al., 2009). It can be further divided into three subtypes: hyperactive, hypoactive, or mixed. Hypoactive delirium is manifested by withdrawal with decreased attention span, slow speech, lethargy, and increased GABA (gamma-aminobutyric acid) activity. In contrast, hyperactive delirium is characterized by hyper-alertness, loud incomprehensible speech, low GABA activity, hallucinations, restlessness, and combativeness (Suresh et al., 2017). Mixed delirium happens when these two subtypes fluctuate over time. Of the ICU delirium cases, 60% were found to have hypoactive delirium (Suresh, et al.,2017). This subtype is associated with a higher mortality rate and greater need for mechanical ventilation and hospitalization than hyperactive delirium. Therefore, early identification and management of delirium are crucial in improving patient outcomes.

Sleep deprivation has been identified as one of the potentially modifiable risk factors for delirium (Weinhouse et al., 2009). Critical care patients experience poor sleep quality with a lot of sleep fragmentation, and sleep deprivation is one of their most common complaints (Weinhouse et al., 2009). Sleep is a complex dynamic and physiologic process essential for life; it is divided into non-rapid eye movement (NREM) and rapid eye movement (REM) sleep. Various physiologic and behavioral features differentiate each one of the sleep cycles. While NREM sleep is characterized by a drop in the physiologic factors and vital signs (heart and respiratory rate, blood pressure, cardiac output, cerebral perfusion, and brain temperature), REM sleep, on the contrary, shows an increase in these previously mentioned factors and constitute only 20 to 25% of total sleep time (Figueroa-Ramos et al., 2009). At the behavioural level, leg movements, changes in posture, sleepwalking, and talking are predominately found in NREM sleep. On the other hand, muscle twitches, atonia, and pupil changes are seen in REM sleep (Figueroa-Ramos et al., 2009). NREM and REM sleep alternate; each sleep session consists of 4 to 6 cycles, shifting between these two phases of sleep (Fontana & Pittiglio, 2010).

Sleep deprivation is defined as a disturbance of the homeostasis between wakefulness and sleep (Evans et al., 2017). The physiological consequences of sleep deprivation on the body, aside from critical illness, include fatigue, decreased forced vital capacity and expiratory volume in ventilated patients, increased sensitivity to pain, decreased immune response, and increased sympathetic system activity. Meanwhile, some behavioral consequences are altered mood, inattention, and daytime sleeping (Figueroa-Ramos et al., 2009). Therefore, maintaining a regular 24-hour circadian rhythm (CR) is essential to recovery, health promotion, and maintenance of normal

body function. However, the CR is often disrupted in the ICU population, with the main contributing factor being the artificial lighting during the night (Engwall et al., 2017).

Several factors negatively alter the sleep-wake cycle of ICU patients. The ICU environment is noisy and disruptive due to monitors and equipment alarms, disturbing lights, and frequent patient manipulation (Engwall et al., 2015). In fact, light, noise, frequent patient manipulation, high ventilator settings, benzodiazepines, opioids, nutritional insufficiency, and altered immune system could lead to sleep deprivation and delirium in ICU patients (Korompeli et al., 2017).

Delirium and sleep deprivation are two clinical syndromes commonly encountered in intensive care Units (ICU). Given the complexity of the shared mechanism and the interactions of the previously mentioned conditions, the relationship between these two phenomena has never been fully understood. While sleep deprivation is thought to be a risk factor for delirium, it is also likely that delirium itself contributes to sleep deprivation (Watson et al., 2012).

The aim of this study was to assess the feasibility of implementing a tailored delirium prevention bundle into nurses' day-to-day practice from a nurse's perspective. We hypothesized that the American University of Beirut Medical Center (AUBMC) critical care nurses will report that the implementation of a tailored delirium prevention bundle for non-intubated patients is feasible.

CHAPTER II

LITERATURE REVIEW

Given the impact that delirium pauses worldwide, and its high number incidence in the critical care units, many studies developed assessment tools and bundles in order to prevent and treat delirium.

A. Risk Factors and Outcomes of Delirium

Delirium is one of the six preventable medical conditions for patients older than 65 years (Claudia et al., 2017). Studies have shown that delirium occurs in nearly 60% to 80% of intubated ICU patients and 20% to 50% of patients who are not receiving mechanical ventilation. Despite its prevalence, delirium is still under-diagnosed and maltreated in 66 to 84% of ICU patients (Bounds et al., 2016; Claudia et al., 2017). Each day of delirium has been linked to a 20% increase in the length of stay, a 10% increase in mortality, and an approximate increase of 9,000$ in hospitalization cost per patient in USA hospitals (Claudia et al., 2017). Also, people who develop ICU delirium might have residual cognitive impairment that lasts up to one year after discharge (Hata & Han, 2014).

Several factors have been identified as predisposing factors to delirium such as hypocalcemia, hyponatremia, metabolic acidosis, hyperbilirubinemia, hypertension, and benzodiazepine use (Hatta et al., 2014). Another risk factor for delirium is the alteration in the secretion of melatonin; patients who developed delirium in the ICU were found to have significantly lower and more irregular secretions of melatonin compared to non-

delirious patients (Artemiou et al., 2015). Moreover, the use of restraints is another risk factor that increases the incidence of delirium by 2.82 times (Claudia et al., 2017).

Several studies tackled the relationship between sleep deprivation and delirium (Engwall et al., 2015; Sakamuri et al., 2014). Nevertheless, the evidence is inconclusive. The studies that showed sleep deprivation as a risk factor for delirium remain inconsistent; the same is found in relation to sleep deprivation resulting from delirium. This discrepancy is mainly related to the methodological difficulties in defining the exact relationship between the two phenomena mentioned (Flannery, Oyler, & Weinhouse, 2016).

Many studies showed similarities in the clinical and physiologic presentation of patients with sleep deprivation and delirium (Mograss et al., 2009; Weinhouse et al., 2009). Delirium and sleep deprivation share these common characteristics: cognitive disfunction, inattention, and fluctuating mental status (Weinhouse et al., 2009). A review of literature by Weinhouse et al. in 2009 investigated the relationship between delirium and sleep deprivation. The authors concluded that for a more robust conclusion, a 24 hours polysomnography (PSG) is needed to study the effect of sleep deprivation on delirium development (Weinhouse et al., 2009). Regardless of which of the two is a risk factor for another, the disturbance in the level of melatonin in delirious patients supports this association between sleep deprivation and delirium (Mograss et al., 2009; Weinhouse et al., 2009).

Many medications such as vasoactive drugs, sedation, and analgesia have profound effects on sleep; sleeping patterns also change when these medications are weaned. Moreover, encephalopathy is very common in ICU patients, and it can cause

changes in the sleep wave seen by PSG (Mograss et al., 2009). Admission to ICU, mechanical ventilation, pain, benzodiazepines, and stress are also risk factors for developing both sleep deprivation and delirium (Weinhouse et al., 2009).

To sum up, delirium might be caused by various insults to the peripheral, systemic, and central nervous system, leading to the shared and common pathway with sleep deprivation. In this context, sleep deprivation might be a risk factor for developing delirium even in the absence of absolute evidence defining sleep deprivation as an independent risk factor of delirium (Mograss et al., 2009; Weinhouse et al., 2009). The significance of the association between sleep deprivation and delirium lies in its potential to identify intervention targets for delirium prevention. Figure 1 below shows the physiologic, pathological, and environmental factors contributing to delirium and sleep deprivation.

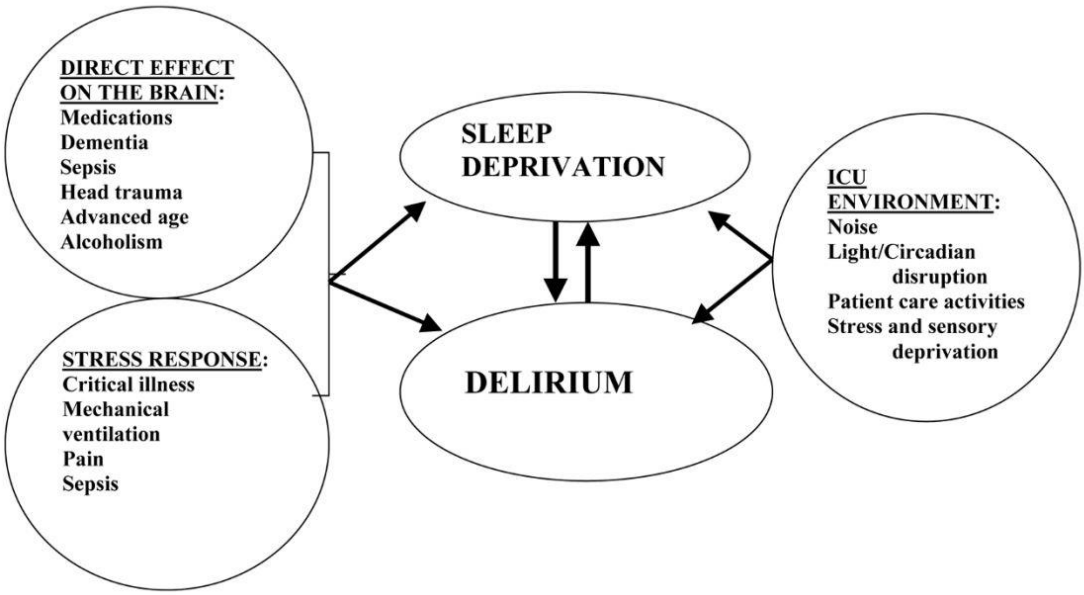


Figure 1: A Possible Relationship Between Delirium and Some of Its Associated Risk Factors, Including Sleep Deprivation**.**

B. Sleep Targeted Interventions and Delirium

Few research studies explored the outcome of sleep-targeted interventions on delirium. These studies mostly tested one intervention at a time, often targeting one contributing factor. However, since the factors that contribute to sleep deprivation are multiple, interventions targeting more than one factor are needed. At the same time, the need to measure the effects of sleep deprivation on delirium is also essential.

A pilot study that measured the effect of cycled lighting in the ICU on circadian rhythm (CR) (proxy outcome measures: heart rate, mean arterial pressure, temperature, and activity level) failed to show a significant difference between patients placed in the regular hospital room and those placed in a cycled lighting room on the above-mentioned dependent variables (CR). The small sample size (n=60) could have contributed to these findings and the fact that the control group had windows in their room that allowed the sun to enter, a significant confounding variable (Engwall et al., 2017). In addition to the sun and natural daylight interference, this study only collected the CR proxy measures on the last day of ICU stay; there was no information about the CR throughout the ICU stay. In comparison, another study with ICU patients who had disturbed CR showed that their CR tends to improve over time as their health improves (Telias & Wilcox, 2019).

Simons et al., (2016) conducted a randomized controlled trial to measure the effect of dynamic light application therapy to reduce the incidence and duration of delirium in the ICU. They enrolled 734 patients, then randomly assigned them to intervention (dynamic lighting) or control group according to a computer-generated schedule. The dynamic light was a bluish-white light administered through ceiling-mounted fluorescent tubes. These lights were turned on between 9:00 am and 4:00 pm

with an intensity of 1700 lux and were dimmed to 300 lux at night (Simons et al.,2016). Delirium happened in 38% of the intervention group, compared to 33% of the control group (odds ratio 1·24, 95% CI 0·92–1·68, p=0·16). Consequently, the authors concluded that dynamic light control alone does not reduce the cumulative occurrence of delirium; they suggested that it should be a part of multicomponent strategy (Simons et al.,2016).

The administration of pharmacological intervention such as melatonin 5 mg at bedtime or Ramelteon 8 mg at bedtime in an RCT showed a 12% to 43% reduction in ICU delirium recurrence rate (Artemiou et al., 2015; Hatta et al., 2014), compared to a pre/post study that found 16 to 20% reduction in non-pharmacological sleep intervention targeted studies (Guo et al., 2016).

Moreover, an RCT conducted in 2012 by Van Rompaey on ICU patients using only earplugs as an intervention showed a mild change in ICU delirium score. The intervention group scored a median of 26 compared to 24 for the control group with a p-value of 0.04. Patients who used earplugs reported a better quality of sleep, and the earplugs showed to be most beneficial in the first 48 hours (Van Rompaey, Elseviers, Van Drom, Fromont, & Jorens, 2012). Furthermore, Van Rompey et al. conducted another randomized controlled trial on 136 ICU patients using earplugs to promote sleep in 2012. The use of earplugs at night lowered the incidence of delirium by 50% (Van Rompaey et al., 2012). Similarly, Litton et al., 2016 conducted a systematic review and meta-analysis to examine the efficacy of earplugs as a sleep hygiene strategy for reducing delirium in the ICU. The analysis included nine studies between 2009 and 2019. Five studies comprising 832 participants reported incident delirium were reviewed. Earplug placement was associated with a relative risk of delirium of 0.59

(95% CI, 0.44–0.78) (Litton et al., 2016). Consequently, earplugs placement in ICU patients is associated with a significant decrease in the risk of delirium (Litton et al., 2016).

A meta-analysis of 13 research studies, including eight RCTs that targeted sleep interventions to improve sleep in the ICU showed that sleep targeted interventions (pharmacological and non-pharmacological) improved sleep (pooled standardized mean difference [SMD], 0.37; 95% confidence interval [CI], 0.05-0.69; P = .02) and led to a reduction in sleep fragmentation (SMD, -0.31; 95% CI, -0.60 to -0.01; P = .04) (Poongkunran et al., 2015). It is worth mentioning that these studies measured the effect of sleep interventions on sleep quantity and quality. However, they did not focus on the effect of sleep deprivation on delirium as an outcome (Poongkunran et al., 2015).

C. Assessment Tools and Intervention Bundles

The Society of Critical Care Medicine published in 2013 a list of evidence-based recommendations for the accurate assessment, detection, and prevention of delirium (Marino et al., 2015). These recommendations focused on developing protocols or bundles of care and teaching the staff about them while using a multidisciplinary approach (Marino et al., 2015). The authors also recommended the use of accurate tools to screen and detect delirium, in addition to the use of early mobility, light sedation for ventilated patients, and sleep promotion (Marino et al., 2015).

The Confusion Assessment Method – ICU (CAM-ICU) is one of the most commonly used tools to diagnose ICU delirium. This tool consists of four domains: acute onset of mental status changes, inattention, disorganized thinking, and altered level of consciousness. The CAM-ICU has been tested in large ICU populations was

found to be highly reliable with Cohen κ, 0.96, a sensitivity of 93-100%, and specificity of 89-100%. It requires two minutes to be completed by health care providers, who are often nurses (Ely et al., 2001). Moreover, critical care nurses at AUBMC are currently using this tool to diagnose delirium.

Additionally, several delirium prevention bundles showed effectiveness in reducing its incidence. Prevention is the most effective approach for reducing mortality, morbidity, and the financial burden caused by this syndrome (Thom et al., 2019). Given that delirium is multifactorial, the most effective strategy is to address it with a bundle of interventions that target various predisposing factors. The Yale Delirium Prevention Trial is a randomized controlled trial that showed that a bundle of non-pharmacological interventions was feasible with an 87% adherence rate and effective with a reduction of delirium incidence from 15% to 9% (Thom et al., 2019). The bundle used includes orientation, early mobilization, medication reconciliation, sleep-wake cycle preservation, sensory impairment, and hydration (Thom et al., 2019).

A systematic review by Collinsworth et al. (2014) to examine the implementation and effectiveness of multifaceted delirium prevention bundles showed that delirium prevention bundles were associated with lower incidence and duration of delirium, lower coma and ventilator days, improvements in functional status, and lower hospital length of stay and mortality. The review included 14 randomized controlled trials and comparative studies with delirium as their outcome (Collinsworth et al., 2014). The implementation approach for the reviewed articles included quality improvement projects, training and education, multidisciplinary team, and electronic reporting systems. Cost-effectiveness analysis was also performed and showed an average 1,000$ decrease in hospital cost per patient treated with a multifaceted approach compared to

standard care (Collinsworth et al., 2014). The authors concluded that multifaceted care approaches might decrease delirium incidence and improve patient outcomes; however, better outcomes might be reached by incorporating awakening and breathing trials into the comprehensive prevention bundle (Collinsworth et al., 2014).

Bounds et al. implemented the ABCDE (Awakening, Breathing, Coordination, Delirium monitoring/management, and Early mobility) delirium prevention bundle on 159 patients (80 chart review and 90 patients in the intervention group) in 2016. After implementing the bundle, the delirium prevalence decreased significantly from 38% to 23%, with a p-value of 0.01 (Bounds et al., 2016).

Similarly, a controlled interventional design study with 447 delirium-negative critically ill patients applied a non-pharmacological delirium prevention bundle, showing promising results(Claudia et al., 2017). The bundle consisted of sedation vacation, pain management, sensory stimulation, and sleep promotion. The study showed that patients who received this intervention bundle had 78% less incidence of delirium (odds ratio, 0.22; P = .001) (Claudia et al., 2017).

A mixed-method pilot study explored the implementation of the prevention of delirium system of care in five hospitals in England. They had six months of preparation, followed by six months of implementation. First, they trained the staff on delirium preventive practices; they observed the existing practices, established systems, and documentation processes to successfully implement the delirium prevention bundle. After implementation, they concluded that delirium prevention was feasible but the site's readiness was also necessary for successful implementation (Young et al., 2021).

A metanalysis of 14 interventional studies to examine the relation between performing multi-component non-pharmacological delirium interventions and five outcomes: rate of discharge falls, change in functional /cognitive status, lengths of stay, and delirium incidence, showed that (Hshieh et al., 2015) the rate of delirium decreased by 44%, the rate of fall decreased by 64%, the rate of institutionalization decreased by around 5 to 6%, and length of stay also decreased. Hence, based on this review of around one million cases of delirium, many delirium cases could have been prevented by using those multi-component nonpharmacological interventions, resulting in cost-saving of around 10,000 billion dollars per year (Hshieh et al., 2015).

Anand et al. (2021) conducted a recent randomized parallel-group trial to examine the efficacy of a new delirium prevention bundle in mechanically ventilated critically ill patients. This study included 50 patients in a tertiary care ICU in New Delhi. Patients were randomized to receive either the new bundle or the standard care. They assessed daily CAM-ICU for up to 28 days and measured ICU and hospital length of stay and other parameters. The bundle included daily sedation vacation, no benzodiazepines, allowing family visitation and engagement with the patient, providing earplugs and eye masks, early mobility, and switching the lights off at night (Anand et al., 2021). They found a 20% difference in the incidence of delirium between the experimental and control groups (36 vs. 56%); however, this difference was statistically non-significant ($p = 0.156$) (Anand et al., 2021). Hospital and ICU length of stay were similar in both groups, with a p-value of more than 0.05. These results contradict many similar studies previously done in the ICU (Holt et al., 2013; Avendaño et al., 2016; Bounds et al., 2016). This study has many limitations mainly a small sample size of 60. The authors required a larger sample to show statistical significance in delirium incidence (Anand et

al., 2021). Moreover, it only included mechanically ventilated patients; these patients were already critically ill with high Acute Physiology and Chronic Health Evaluation (APACHE II) and Sequential Organ Failure Assessment (SOFA) scores, so reaching a statistically significant decrease in delirium incidence or hospital length of stay was more challenging (Anand et al., 2021).

D. The Family's Role in Delirium

Since 2014, the Society of Critical Care Medicine has updated the ABCDE bundle to include the letter F for Family engagement and empowerment (Negro et al., 2021). Munro et al. did a randomized controlled trial in 2016 to study the effect of automated reorientation on the prevalence of delirium. They divided the patients into three groups: the first group received a family-recorded reorientation message, the second group received the same message recorded by a non-family member, and the last group was a control group. The group receiving a family recorded message had significantly less delirium than the control group ($p= 0.0437$) (Munro et al., 2017).

Martinez et al, 2012 did a randomized controlled trial on 287 hospitalized patients, randomly assigning them to standard management and intervention groups, which contained 144 patients in each. The primary outcome of that study was the occurrence of delirium throughout hospitalization using the CAM ICU tool. A family member performed the non-pharmacological interventions; these interventions included the provision of a clock and a calendar, avoidance of sensory deprivation (eyeglasses, hearing aids), provision of a familiar object in the room (pictures, blanket), reorientation of patients, and extended visitation to five hours daily (Martinez et al., 2012). Delirium occurred in 5.6 % of the patients in the intervention group compared to 13.3% in the

control group. This finding was statistically significant, with a p-value of 0.027. This decrease of 18% reduction of delirium supports the effectiveness of non-pharmacological prevention of delirium provided by a family member (Martinez et al., 2012).

Another study examined the feasibility of family participation in a nurse-supported intervention program for delirium prevention in older hospitalized adults (Rosenbloom-Brunton et al., 2010). The interventions included frequent reorientation, bringing home items, visual and hearing aids, active and passive range of motion exercises, and early mobilization. The feasibility study included 15 patients with their families. Most interventions completed were orientation (83.5%), followed by vision protocol (81.5%). The program was deemed feasible for implementation in a clinical setting (Rosenbloom-Brunton et al., 2010).

A recent study evaluated the feasibility of implementing a family Hospital Elder Life Program (HELP) protocol. This study aimed to determine if bedside critical care nurses support the incorporation of the family in their patients' care to prevent delirium. The set of interventions that the family members were asked to participate in was to help in orientation and awareness, help in sleep promotion, encourage early mobility, help in case of visual or hearing impairment, and provide proper hydration (McClay, 2021). This study's critical care nurses showed a high perception of family members as partners in care and a high intention to implement this protocol in their practice (McClay, 2021).

E. Nurses' Role in Delirium Prevention

Recently there has been an increase in the awareness of critical care nurses regarding delirium (Kang et al., 2017). Nurses play a crucial role in the assessment,

management, treatment, and, most importantly, prevention of delirium (Kang et al., 2017). Nursing education is vital in delirium prevention and management. Furthermore, several studies have highlighted the importance of nurses' education to improve delirium management in critical care units. Given the proper education, nurses could use the CAM-ICU tool to diagnose delirium and inform other health care providers about it (Kang et al., 2017).

Skilled ICU nurses are able to include the patient and the family in a care plan in order to create a healing environment for critically ill patients despite all aggravating environmental factors (Kang et al., 2017). Delirium management poses serious challenges for nurses, and failure to manage it, in turn, causes stress and creates a negative, stressful work environment (Kang et al., 2017). Nurses' knowledge deficit and negative attitudes are the primary two factors contributing to poor management of delirium (Kang et al., 2017).

F. Nurse-Led Projects and the Role of the Clinical Nurse Specialist

A Parallel-group double-blind, randomized clinical trial pilot study was conducted by Avendano et al. in 2016 to evaluate the effect of a multicomponent nonpharmacological nurse-led intervention using a delirium prevention bundle on the incidence, duration, and severity of delirium in an acute setting geriatric unit in Spain. Fifty participants were selected and randomly assigned to intervention (n=21) and control group (n=29). The bundle included frequent patient orientation, sensorial deficit assessment, sleep targeted interventions, mobilization, pain, hydration, elimination, oxygenation, nutrition, and drug chart review (Avendaño et al., 2016). Delirium prevalence was 49.3% in the control group compared to 33.3% in the interventional group; delirium incidence decreased to 41.3% in the control group and 14.3% in the

intervention group, with a p-value of 0.03. Moreover, total delirium severity was also lower in the intervention group than in the control group (35.0 vs. 65.0; p = 0.040); however, mortality remained unchanged between the two groups (Avendaño et al., 2016). The nurse-led bundle was perceived to be feasible and effective in delirium prevention and management.

Similarly, a before and after study by Holt et al. in three elderly care wards in a general hospital in the UK examined the effect of multicomponent nurse-led interventions on the incidences of delirium (Holt et al., 2013). The researchers performed educational training for the nurses and applied non-pharmacological interventions to the patients in the "after" group; however, the bundle details were not described. A total of 436 patients were included in this study (249 enrolled and were included in the before group, and 187 in the after group). Delirium incidences statistically decreased (13.3% to 4.6%; P = 0.006) (Holt et al., 2013). Delirium severity and duration were also lower in the "after" group; however, mortality and length of stay remained unchanged (Holt et al., 2013).

Ladak (2020) evaluated in a pre-post intervention study the effectiveness of a nurse-led delirium prevention bundle on the incidence of delirium. The project was divided into two phases: first, they gave educational sessions to the nurses on delirium, assessment, delirium prevention bundle, and management. Then, they implemented the bundle in a 26 -geriatric bed unit in a community medical center. The delirium prevention bundle was based on the previously discussed HELP protocol. This project effectively reduced the incidence of delirium from 16% to 14% (p=0.001) (Ladak, 2020).

Reimers & Miller, 2014 explored the role of the clinical nurse specialist as a change agent in the implementation of the ABCDE delirium prevention program for ventilated patients in a community hospital in the US. The authors discussed that the role CNSs play in collaboration, communication, and education is crucial for the successful implementation of any project. The CNS used Kurt Lewin's 3-step model of change, including unfreezing, changing, and refreezing (Reimers & Miller, 2014). At first, the CNS used a survey to assess staff readiness to adopt such a bundle into their practice; 68% of staff were capable of using the daily awakening tool; only 23% reported using the tool daily; 86% stated collaboration with physicians regarding sedation; 48% did not know how to assess delirium; 22.5% reported they did not believe that length of sedation time and the number of ventilator days were associated with delirium; and 32% of nurses did not know that delirium was associated with increased mortality (Reimers & Miller, 2014). After analyzing these findings, the CNS started with the process of implementing each section of the bundle alone. The CNS was able to successfully implement the ABCDE bundle to improve the assessment, prevention, and management of ICU ventilated patients (Reimers & Miller, 2014).

G. Feasibility, Facilitators, and Barriers

Implementation of delirium prevention bundle is like the implementation of any evidence-based practice. So, the literature of implementing evidence-based practice in the clinical setting was reviewed to investigate barriers that may apply to the topic of this study. Feasibility studies help determine whether a specific intervention can be implemented (Bowen, Bronsert, Henderson, Valuck, & Hosokawa, 2008). Moreover, evidence-based practice (EBP) applies both clinical expertise and the latest evidence in health care management (Shayan et al., 2019). The evidence can be gained from clinical

trials, meta-analyses, and systematic reviews. In addition, the evidence builds on the knowledge of the studied disease pathways and pathophysiology. In low- and middle-income countries, the use of EBP has been embraced, but with various barriers. Information seeking from health care workers have been reported to be poor and lack the use of the latest evidence (Shayan et al., 2019).

Shayan et al. published a systematic review in 2019 about the barriers to implementing EBP in the middle to low-income countries. The barriers were categorized into three categories. The first is related to institutional barriers: lack of resources, lack of access to information, inadequate staffing, and lack of organizational support, such as not providing incentives or help to health care providers to continue their education (Shayan et al., 2019).

The second category is interdisciplinary barriers. Interdisciplinary barriers include discrepancies between nursing theory and practice, lack of teamwork, and discrimination against nurses that has been seen in the healthcare field throughout time (Shayan et al., 2019).

The third main category is perceived to be nurse–related barriers. Under this umbrella, the barriers can be segregated into four sections. First, the nurses' scope of practice creates a limitation for them as an independent profession. The second barrier is time: lack of time to be involved in EBP research, read about the latest EBP, or implement it into their practice. The third barrier is lack of knowledge about EBP and inability to translate it into practice, lack of understanding of some nursing research terminologies, and lack of previous nursing research and EBP (Shayan et al., 2019). The fourth and last category in nurse-related barriers is individual-related barriers. This

category emerged from the inability to use the technology, language barrier, unwillingness to change, and lack of interest (Shayan et al., 2019).

Yevchak et al., (2014) conducted one of the first qualitative and quantitative studies to explore the barriers and facilitators to help implement nursing delirium rounds. This study was completed in three different clinical sites, including a trauma center, medical center, and academic medical center. The quantitative part showed that being busy in the unit was the most frequently mentioned barrier, mainly in the trauma center. On the other hand, having a nurse on the unit who was familiar with performing delirium rounds was a facilitator to both the academic and trauma centers compared to the rest of the medical center units (Yevchak et al., 2014). Moreover, the qualitative part showed three major barriers: being busy, not having enough awareness about the nursing rounds, as well as lack of responsibility and role regarding delirium (Yevchak et al., 2014). Concerning the facilitators, there were also three themes. The first one had an "interdisciplinary nature"; the nurses enjoyed meeting different team members and sharing their knowledge and skills during the round (Yevchak et al., 2014). The second was already having connections with prior research studies done by the team. The third was related to motivation and interest in using these intervention materials (Yevchak et al., 2014).

Trogrlic et al. (2016) administered an online survey to 360 ICU nurses to design ICU delirium management implementation strategies. This survey unveiled many barriers that might affect the implementation of a delirium guideline. This was mainly because of decreased perception of the effect of delirium and the importance of its management in clinical practice. Those barriers were summarized into: having a low screening rate for delirium, not trusting the reliability of delirium tools, not believing

that delirium can be prevented, not being satisfied with the delirium management proposed by the physicians, disbelief that these guidelines will help the patient receive optimal care, a deficit in their knowledge and unfamiliarity with delirium guidelines, feeling that it is an inconvenient addition to their daily practice, reluctance in changing their current practice, not having good collaboration between them and the physicians, and lack of enough time to practice those guidelines (Trogrlić et al., 2017).

Negro et al. did a survey-based study to describe the facilitators and barriers to implementing the ABCDE (Awakening, Breathing, Coordination, Delirium monitoring/management, and Early mobility) bundle from the nurses' and physicians' perspectives. They assessed the staff's knowledge of this bundle, teamwork perception, and resource availability (Negro et al., 2021). Most of the participants showed having reasonable knowledge regarding delirium and its management using the ABCDE bundle, and lack of coordination between health care providers was perceived as the main barrier (Negro et al., 2021). The authors concluded that interdisciplinary rounds are vital for the successful implementation of the bundle (Negro et al., 2021).

In conclusion, the literature revealed that non-pharmacological delirium prevention bundles showed efficiency in decreasing the incidences of delirium in the ICU; however, none of the previously mentioned studies was done in Lebanon. A number of facilitators and barriers to the implementation of such bundles were identified, mostly related to the knowledge and attitudes of health professionals. This highlights the importance of assessing the feasibility of using multiple multifaceted interventions to improve sleep quality and decrease the incidence of delirium efficiently

from the perspective of professional caregivers. The list of interventions derived from all the studies and used in our survey are shown in appendix I.

CHAPTER III

THEORETICAL FRAMEWORK

This study is based on the "Promoting Action on Research Implementation in Health Services" (PARIHS) Theoretical framework. The PARIHS Framework is a commonly used conceptual framework that postulates Successful Implementation of evidence (SI) as a function (f) of the nature and type of Evidence (E) (including research, clinical experience, patient experience, and local information), the qualities of the Context (C) of implementation (including culture, leadership, and evaluation), and the way the implementation process is Facilitated (F) (internal and/or external person acting as a facilitator to enable the process of implementation); SI = f(E,C,F) (Bergström et al., 2020; Rycroft-malone et al., 2013). The framework was derived from Rogers' Diffusion of Innovation theory and various theories to help get the evidence implemented into practice (Rycroft-malone et al., 2013). The researchers who developed the PARIHS framework suggest that each sub-element has to be evaluated toward high in order for an implementation to be successful (Kristensen et al., 2012). The PARIHS framework was initially published in 1998 and updated based on a conceptual analysis in 2002 and 2015 (Bergström et al., 2020). Figure 2 below shows the PARIHS framework, with its three interactive elements: Evidence, Facilitation, and Context.

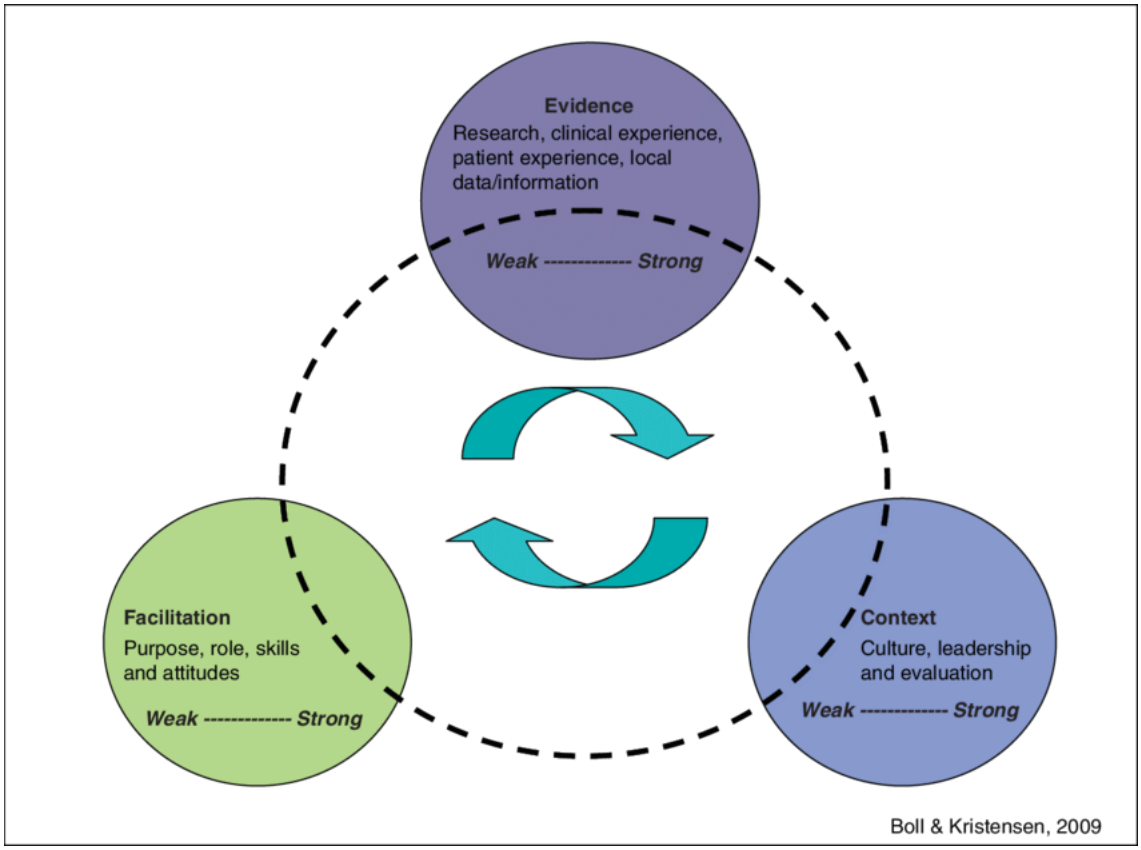


Figure 2: PHARIS Theoretical Framework Variables

This study focuses on the Evidence and Facilitation domains of this theoretical framework. As discussed earlier, delirium prevention bundles were found to be feasible and safe for implementation in critical care units. However, the successful implementation of this bundle must be based on accurate consideration of relevant factors. This study focuses on assessing critical care nurses' perceived feasibility and barriers to implementing such a bundle of care in the critical care areas at the American University of Beirut Medical Center. In this study we assessed “facilitation” and “Evidence,” addressing two out of three domains in this theory. As for the context domain, we know the ICU leadership values their patients and showed interest in delirium prevention as they introduced the CAM-ICU into their daily practice.

The primary study outcome is the perceived feasibility of implementing a delirium prevention bundle in critical care units. Figure 3 below represents the study's conceptual model.

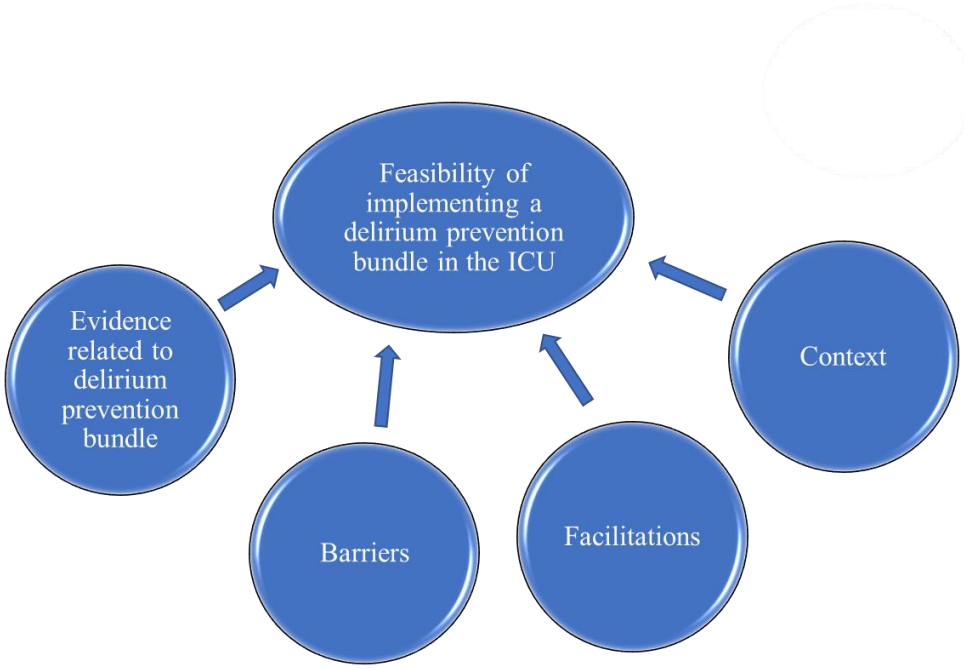


Figure 3: the conceptual model of the factors that affect the successful implementation of the delirium prevention bundle

Before initiating the delirium prevention bundle, it is crucial to assess if nurses have sufficient knowledge about delirium and the gravity of seriousness it poses on the patients, families, and health care providers. If a knowledge deficit is detected, training becomes necessary to implement the delirium prevention bundle successfully. Moreover, it is important to assess the barriers that might impede the successful implementation from the nurses' perspective, as they are the main party involved in direct patient care. Barriers need to be addressed before implementing this bundle in order to ensure its successful implementation and continuity in the ICUs.

The successful implementation of the delirium prevention bundle depends on solid evidence regarding non-pharmacological intervention to treat delirium, the support from the leadership, and the nurses' perception that treating delirium is essential. All these factors will facilitate the process of implementation. The main concepts of the study are defined below.

A. Conceptual definitions

Delirium is an acute mental condition characterized by alterations in dopamine, serotonin, and acetylcholine secretion, synthesis, and activation (Figueroa-Ramos et al., 2009). It can be further divided into three subtypes: hyperactive, hypoactive, or mixed. Hypoactive delirium is manifested by withdrawal with decreased attention span, slow speech, lethargy, and increased GABA (gamma-aminobutyric acid) activity. In contrast, hyperactive delirium is characterized by hyper-alertness, loud incomprehensible speech, low GABA activity, hallucinations, restlessness, and combativeness (Suresh et al., 2017). Mixed delirium happens when these two subtypes fluctuate over time.

Sleep is a complex dynamic and physiologic process essential for life; it is divided into non-rapid eye movement (NREM) and rapid eye movement (REM) sleep. NREM sleep is characterized by a drop in the physiologic factors and vital signs (heart and respiratory rate, blood pressure, cardiac output, cerebral perfusion, and brain temperature); REM sleep, on the contrary, shows an increase in the factors mentioned previously and constitute only 20 to 25% of total sleep time (Figueroa-Ramos et al., 2009).

Sleep deprivation is defined as a disturbance of the homeostasis between wakefulness and sleep (Evans et al., 2017).

B. Research Questions

Based on the above framework, the following research questions arose:

1. What is the perceived feasibility of delirium prevention among critical care nurses? Do critical care nurses think it is feasible to integrate the delirium bundle into their day-to-day practice, to decrease the incidences of delirium?
2. What are the facilitators to the implementation of a delirium prevention bundle as perceived by nurses in critical care units?
3. What are the barriers to the implementation of a delirium prevention bundle as perceived by nurses in critical care units?
    - **Dependent variable:** perceived feasibility of implementing a delirium bundle
    - **Independent variables:** perceived nurse related facilitators such as age, education, and years of experience; perceived nurse related barriers such as staffing ratio, workload, and lack of time

CHAPTER IV

METHODS

A. Design and Setting

This study used a descriptive correlational design. It was conducted at the American University of Beirut Medical Centre (AUBMC), including the intensive care, neuro-intensive care, coronary care, and respiratory care units. The cardiothoracic surgery unit was excluded since their patients often do not remain for a long enough period to warrant concern about delirium; they are usually transferred to the medical-surgical unit within 24 hours to 48 hours.

B. Sample

This survey targeted all critical care nurses working in the designated units for more than six months. The total number of critical care nurses invited to participate in this research was around 80 nurses. The eligible critical care nurses were identified by the Human Research Protective Program and Institutional Review Board (HRPP/IRB) and invited to participate in the study via an email from the research study investigator.

1. Inclusion criteria:

- Critical care nurses working in ICU, NCU, CCU, and RCU for at least six months

2. Exclusion criteria:

- Critical care nurses with less than six months of experience in a critical care area

- Nurse managers, clinical care coordinators, clinical nurse specialists, and clinical educators as they do not provide direct patient care

C. Procedure and Data Collection

The institutional review board (IRB) of the American University of Beirut Medical Centre approval was granted (Appendix II). We created an online survey to answer our research questions and sent it to the critical care nurses. The email addresses were provided by the HRPP/IRB, who acted as an intermediary with the Nursing Services Department at AUBMC to secure the list of email addresses provided to the information technology department (IT ACAD). The IT then uploaded the provided email list on the AUB Lime Survey.

We used an online survey (Lime Survey, Appendix III) to assess the perceived feasibility of AUBMC critical care nurses to implement the delirium bundle in their daily workflow. This design yielded preliminary data to set up a standard protocol for the nurses to follow.

Survey-based research is widely used in nursing research. Many studies used survey-based research to study different aspects of nursing behavior, stress, and feasibility. The commonly collected data included the nurses' demographics such as gender, age, educational level, and years of experience (Bogossian et al., 2017; Ma et al., 2016). Consequently, we used these demographics in our survey to explore if nurses' demographics were associated with the perceived feasibility of the clinical implementation of this bundle.

The primary outcome of this study was the feasibility of implementing the delirium bundle. The survey consisted of several sections. The first section included

questions tackling nurses' demographics such as gender, age range, and educational level. The next section asked the critical care nurses about their current familiarity with delirium, CAM-ICU, and perceived delirium treatment regimens. Nurses were asked about their confidence in using the CAM – ICU tool. Details about CAM-ICU are found in Appendix IV.

The next section of the survey tackled sleep. The nurses were asked about current practices in sleep management, as well as perceived feasibility and barriers to the implementation of a sleep assessment tool. Previous studies found that polysomnography is the golden standard for sleep measurement. However, applying it in the ICU is time and money consuming and not feasible given the various equipment that ICU patients already have in a single room. Observations have been used to measure sleep, but these might be prone to subjectivity. A self-report questionnaire to evaluate sleep perception was suggested as an alternative measure of sleep. It consists of five dichotomous (Yes/No) questions listed below that measure sleep quality (Van Pompaey et al. 2012). We explored the perceived feasibility of administering this questionnaire.

1. Did you sleep well?
2. Did you sleep better than you were expecting?
3. Did you sleep better than your sleeping quality at home?
4. Were you awake for a long time before sleeping?
5. Do you feel rested?

We have also collected the most common barriers identified in the literature to assess the nurses' perceived barriers regarding sleep measurement, like inadequate staffing, inadequate time, or lack of interest.

The Lime survey was divided into three sections related to the delirium prevention bundle. The first section was related to cognitive assessment and orientation, in which nurses were asked about their perceived feasibility in assessing delirium using the CAM – ICU tool, providing orientation to time and place, reminding patients about reasons for admission, applying verbal and non-verbal communication, and informing patients about every task before performing it. Each of the questions was rated on a scale of 1 to 5, in which 1 is not feasible, and 5 is very feasible. The same set of barriers previously mentioned was asked to the nurses to identify the barriers hindering them from performing cognitive assessment and orientation.

The second section tackled early therapeutic interventions. Another set of questions focused on the feasibility of assessing pain every four hours, providing adequate oxygenation, providing nutrition and hydration, detecting infections as early as possible, removing unnecessary catheters, encouraging early mobility, and careful use of sleeping pills and opiates. After this set of questions, the nurses were asked again about their perceived barriers to implementing these daily practice interventions.

Finally, the last section of the survey focused on assessing the perceived nurses' feasibility of performing environmental interventions. We asked about the ability to provide earplugs and eye masks, turn off the lights at night, put soft music, put clocks inside patients' rooms, combine interventions to decrease stimulation, allow family pictures and blankets from home, and assess for visual and hearing impairment. Finally, the survey asked the nurses about the perceived barriers to implementing these environmental interventions.

The survey comprised several question formats and measurement level of the items (yes/no, nominal, ordinal, and Likert scales), with some open-ended questions.

D. Data Analysis

Descriptive statistics of the demographic characteristics, perceived beliefs, barriers, feasibility, and knowledge questions are presented as means and standard deviations, or frequencies and percentages, according to the level of measurement, to answer the research questions.

- Bivariate analyses included Kruskal-Wallis and Mann-Whitney and Spearman R tests, non-parametric test, were used given the limited sample size.
- We set the statistical significance at 5%; as for the feasibility, any value above 3 was considered feasible, similarly to the approach taken by Negro et al., 2021.

CHAPTER V

RESULTS

A. Response Rate and Respondents

A total of 80 surveys were sent and received by potential participant nurses, and 31 were returned, 4 emails bounced back indicating that these nurses left the hospital. This yielded a response rate of 40.78%. All the questionnaires were analyzed because none of the questionnaires had more than 50% of missing data. Table 1 shows the sample characteristics.

Our sample consisted of 38.71% males, 25.81% females, and 35.48% of the participants chose not to answer this question. The majority of the participants were 26-30 years (32.26%) and 36-40 years (29.03%). Most of the participant nurses work in the ICU (58%). The distribution of the other participants is as follows: CCU (16%), RCU, and NCU (12.90%) each. The Majority of the nurses are holders of a bachelor's degree in Nursing (61.29%), and the rest of the nurses are master’s degree holders (38%). As for the years of experience, more than half the nurses belonged to the following two categories 4 to 6 years (32.26%) and 10 to 13 years of experience (29%).

Table 1 Sample Characteristics (N=31)

Demographic	Options	Frequency	Percentage
Gender	Male	12	38.71%
	Female	8	25.81%
	Not answered	11	35.48%
Age	Below 20	1	3.23%
	20-25	4	12.90%
	26-30	10	32.26%
	31-35	6	19.35%
	36-40	9	29.03%
	41-45	1	3.23%
Unit	ICU	18	58.06%
	CCU	5	16.13%
	NCU	4	12.90%
	RCU	4	12.90%
Degree	Bachelor of Science in Nursing	19	61.29%
	Master of Science in Nursing	10	32.26%
	Master's degree not in Nursing	2	6.45%
Years of experience	1 to 3	5	16.13%
	4 to 6	10	32.26%
	7 to 9	6	19.35%
	10 to 13	9	29.03%
	14 or more	1	3.23%

B. Perceived Delirium Knowledge and Practice

The nurses predominately reported that they knew about delirium (96.77%), most of them received an educational session about delirium (90.32%), and they felt confident about using CAM-ICU to diagnose a delirium patient (93.55%). When asked about the treatment, 12.90% of the nurses were not sure about delirium treatment, 41.94% reported that the best way to treat delirium is by following a non-pharmacological approach, and 32.26% chose pharmacological therapy. Table 2 summarizes the findings regarding delirium knowledge among the critical care nurses. As for the pharmacological treatments, only two nurses chose Haldol as the drug of choice to treat delirium. The rest of the nurses wrote that as part of pharmacological

interventions, they are trying to decrease the use of midazolam as much as possible and trying to keep the patient within the targeted sedation level as much as possible. As for non-pharmacological treatments, nurses stated that the primary interventions to treat or prevent delirium are to discharge the patient from ICU as soon as possible, keep the family with the patient whenever possible, and orient the patient to time and place. Other interventions included the imitation of a light cycle in the ICU, provision of supportive care, and placement of televisions inside patients' rooms. Half the nurses reported that they are currently implementing interventions for delirium, such as providing orientation, using the benzodiazepine as the last choice for sedation, and family companionship.

Table 2 Perceived Delirium Knowledge

	Answer	**Count**	**Percentage**
CAM-ICU knowledge	YES	30	96.77%
	NO	1	3.23%
Education CAM-ICU	YES	28	90.32%
	NO	3	9.68%
Confidence in Usage of CAM-ICU	YES	29	93.55%
	NO	2	6.45%
What kind of treatment are you currently using to treat delirium	Not sure	4	12.90%
	Pharmacological	10	32.26%
	Not Answered	4	12.90%
	Nonpharmacological	13	41.94%
Are you currently implementing any intervention to prevent delirium in your unit	Yes	15	48.39%
	Not sure	5	16.13%
	No	8	25.81%
	Not Answered	3	9.68%

1. Questionnaire's Internal Consistency: Reliability

We measured the internal consistency of our questionnaire to see how related the questions were. Results are in Table 3.

The correlation between variables was very good on the feasibility of implementing a sleep quality assessment tool with a Cronbach alpha of 0.875. The correlation between variables was good on the feasibility to implement cognitive assessment and orientation tools with a Cronbach alpha of 0.709. Although this reliability score was the lowest, it is still considered a good correlation. The Cronbach alpha of the feasibility to implement early therapeutic interventions 0.846, this indicates a very good correlation between the items. Similarly, the feasibility to implement environmental interventions had a Cronbach alpha of 0.847, this also indicates a very good correlation between its items.

Table 3 Internal Consistency of the Questionnaire

Questionnaire Questions	**Cronbach alpha**	**Correlation between variables**
Feasibility to implement: Sleep Quality Assessment Tool	0.875	Very good
Feasibility to implement: Cognitive Assessment and orientation	0.709	Good
Feasibility to implement: Early therapeutic interventions	0.846	Very good
Feasibility to implement: Environmental interventions	0.847	Very good

C. Feasibility to Implement the Sleep Assessment Tool

When the nurses were asked if they are currently using any sleep assessment tools, 74% answered no. We then asked the nurses to report on their perceived feasibility of asking the patient five dichotomous questions to assess the sleep quality. The overall mean perceived feasibility to implement this sleep assessment tool was 3.82 (SD = 0.13), ranging between very feasible and somewhat feasible on the 5-point Likert

scale. Table 4. shows the results from the questions asked about the feasibility of implementing sleep assessment.

Table 4 Sleep Assessment

Sleep	**Result**
Are you currently using any tool to assess sleep quality in your patients?	yes 6 (19%)
	No 23 (74%)
Rate how feasible it is for you to ask these 5 dichotomous questions to assess sleep quality in your patients	1- Not feasible 2-Somewhat not feasible 3-Neutral 4-Somewhat feasible 5-Very feasible
Sleep assessment tool	Mean (SD)
Did you sleep well?	3.9 (1.01)
Did you sleep better than you were expecting	3.8 (0.99)
Did you sleep better than your sleeping quality at home	3.7 (1.28)
Were you awake for a long time before sleeping	3.7 (1.35)
Do you feel rested	4 (0.98)
Total feasibility	3.82 (0.13) Somewhat Feasible

1. Barriers to Implement the Sleep Assessment Tool:

The perceived barriers to sleep tool implementations assessment showed that time constraints were the most frequently endorsed barrier in the sample overall (51.61%), followed by inadequate staffing and lack of interest at 48.39% and 29%, respectively. Lack of organizational support was a perceived barrier by 22.58% of our nurses, followed by a lack of teamwork (16.13%). Lastly, lack of resources and access to information were perceived as barriers in 12.9% of our sample. Table 5 shows the barriers to implementing the sleep tool.

Table 5 Perceived Barriers for implementing the sleep tool

Barriers for sleep	Frequency	Percentage
Time constraints	16	51.61%
Inadequate staffing	15	48.39%
Lack of interest	9	29.03%
Lack of organization support	7	22.58%
Lack of teamwork	5	16.13%
Lack of resources	4	12.90%
Lack of access to information	4	12.90%

Bivariate Analysis of Sleep Quality Assessment Tool

Each answer for the feasibility question was changed to binary (0=not feasible, and 1=feasible that includes4 = somewhat feasible and 5= very feasible). A higher total sum score (Sleep_Q_Binary_Score) on the five questions indicated a better feasibility. Years of experience were further grouped into 2 categories (less than 10 years and 10 years and above). Male nurses reported higher feasibility than female nurses 3.11 (1.16) vs 3 (1.29), however, this difference was not statistically significant ($p = 0.9$). The feasibility of performing the sleep quality questionnaire was positively correlated with the nurse's age, but it was not statistically significant ($p = 0.603$, Spearman's correlation test). Moreover, the perceived feasibility was the highest in RCU compared to the rest of the units with a mean of 4 (0), but without statistical significance ($p = 0.3$, Kruskal Wallis test). Feasibility was higher in master's prepared nurses than in nurses with a bachelor's degree, and it was the highest among nurses with a master's degree not in nursing with a mean of 4 (0); however, this difference was not significant ($p = 0.3$, Kruskal Wallis test). Feasibility was the highest in nurses with less than 10 years of experience, but also without statistical significance ($p=0.94$, Mann- Whitney test).

The perceived barriers score was changed to a summative score over seven based on rating each item as 0=No and 1=Yes (Barriers_SQ_Binary_Score). Using the

Mann-Whitney test, male nurses showed higher perceived barriers mean than female nurses, 2.08 (1.24) vs. 1.75 (1.03); however, this difference was not statistically significant (p = 0.9). The nurse who identified most barriers to performing the sleep quality questionnaire were aged 31 to 35 but with no statistical significance between the different age groups (p = 0.966, Spearman's correlation test). There was no difference in perceived barriers between the various units, but ICU nurses reported the highest number of barriers with a mean of 2.29 (1.26) (p = 0.3, Kruskal Wallis test). Moreover, the perceived barriers were higher in master's prepared nurses than in nurses with a bachelor's degree, and it was the highest in nurses with a master's degree not in nursing with a mean of 2.50 (2.12); however, this difference was not statistically significant (p = 0.49, Kruskal Wallis test). Barriers were the highest in nurses with less than 10 years of experience (p=0.31, Mann- Whitney test).

Table 6 Bivariate Analysis of Sleep Quality Assessment Tool

	Feasibility		**Barriers**		
Variables	**Mean (SD)**	**p-value**	**Mean (SD)**	**p-value**	**Test**
Gender		0.906		0.648	Mann-Whitney test
Male	3.11 (1.16)		2.08 (1.24)		
Female	3.00 (1.29)		1.75 (1.03)		
Age		0.603		0.966	Spearman's correlation test
<20	2.00 (-)		1.00 (-)		
20-25	2.75 (1.89)		1.75 (2.20)		
26-30	3.50 (1.30)		2.20 (2.67)		
31-35	3.40 (0.89)		2.68 (1.63)		
36-40	3.00 (1.41)		1.63 (1.00)		

41-45	4.00 (-)		1.00 (-)		
Unit		0.318		0.305	Kruskal-Wallis test
ICU	3.29 (1.06)		2.29 (1.26)		
CCU	2.25 (1.70)		1.60 (1.34)		
NCU	3.50 (1.73)		2.00 (1.14)		
RCU	4.00 (0.00)		1.25 (0.50)		
Education level		0.328		0.498	Kruskal-Wallis test
Bachelor of Science in Nursing	2.93 (1.33)		1.79 (1.08)		
Master of Science in Nursing	3.57 (1.27)		2.33 (1.41)		
Master's degree not in Nursing	4.00 (0.00)		2.50 (2.12)		
Years of Experience		0.94		0.31	Mann-Whitney test
less than 10 years	3.22 (1.30)		2.19 (1.36)		
10 years and above	3.17 (1.32)		1.56 (0.72)		

D. Feasibility of Cognitive Assessment and Orientation Interventions

We explored the nurse's perceived feasibility (on a scale of 1 to 5) of assessing cognitive performance and orientation interventions. The results showed that 45.16% of participants scored 4 on cognitive assessment every 8 hours, indicating that this act is somewhat feasible. The mean for cognitive assessment was 3.46 (1.07). As for providing orientation to time, place, and person, this intervention seemed feasible among 45.16% of nurses, with a mean of 4.28(0.93). When asked about reminding patients about the reason for admission, the mean was 4 (0.98), indicating that it is somewhat feasible, with 41.94% of the nurses thinking that reminding patients about their reasons for admission is somewhat feasible.

When asked about verbal and non-verbal communication, 48.38% of the nurses considered it somewhat feasible, with a mean of 4.7 (0.87). Informing patients about tasks before doing them was 4.25(0.75), indicating that it is also somewhat feasible. The overall mean of this set of questions was 4.13 (0.45), indicating it is somewhat feasible. Table 7 below shows the detailed results of cognitive assessment and orientation.

Table 7 Feasibility of cognitive assessment and orientation interventions

cognitive Assessment and orientation	**1**	**2**	**3**	**4**	**5**	**N/A***	**Mean (SD)**
Cognitive Assessment every 8 hours (CAM-ICU)	6.45 %	9.68 %	19.35 %	45.16 %	9.68%	9.68%	3.46 (1.07)
Provide orientation to time place and person	3.23 %	0.00 %	9.68%	32.26 %	45.16 %	9.68%	4.28 (0.93)
Remind patients about reasons for admission	3.23 %	3.23 %	12.90 %	41.94 %	29.03 %	9.68%	4.0 (0.98)
Apply verbal and non-verbal communication skills	3.23 %	0.00 %	9.68%	48.39 %	25.81 %	12.90%	4.7 (0.87)
Inform patients with every task before doing it	0.00 %	0.00 %	16.13 %	32.26 %	38.71 %	12.90%	4.25 (0.76)
						Overall mean	4.13 (0.45)
***N/A: Not Answered**							

1. Barriers to Cognitive Assessment and Orientation:

More than half of the nurses chose time restraint (58%) and inadequate staffing (52%) as the main barriers to implementing this intervention set. Moreover, 23% of the participants chose lack of teamwork as a barrier, followed by lack of organizational support (16%) and lack of resources (13%). Very few nurses chose lack of interest and lack of access to information, with a percentage of 10% and 3%, respectively. Table 8. shows the perceived barriers to implementing cognitive assessment and orientation.

Table 8 Barriers to Cognitive Assessment and Orientation

Barriers for cognitive assessment and orientation	**Frequency**	**Percentage**
Time constraints	18	58%
Inadequate staffing	16	52%
Lack of teamwork	7	23%
Lack of organization support	5	16%
Lack of resources	4	13%
Lack of interest	3	10%
Lack of access to information	1	3%

a. Bivariate Analysis of Cognitive Assessment and Orientation Interventions

Each answer for the feasibility question was changed to binary (0=not feasible, and 1=feasible that includes 4= somewhat feasible and 5= very feasible), then a higher total sum score on the five questions showed better feasibility. Female nurses reported higher feasibility than male nurses, 4.67 (0.51) vs. 3.82 (1.71); however, this difference was not statistically significant ($p = 0.88$). The feasibility of performing cognitive assessment and orientation interventions was associated with nurse's age, but this association was not significant ($p = 0.172$, Spearman's correlation test). Moreover, the feasibility was highest in ICU with a mean of 4.46 (0.87), but without statistical significance ($p = 0.34$, Kruskal Wallis test). Feasibility was higher in master's prepared nurses than nurses with a bachelor's degree, and it was the highest in nurses with a

master's degree not in nursing with a mean of 5.00 (0.00); however, this difference was not significant (p = 0.41, Kruskal Wallis test). Feasibility was higher in nurses with more than 10 years of experience, but this difference was not statistically significant (p=0.7, Mann Whitney test).

As for the perceived barriers, we changed the scores to a numerical score over seven (0=No, 1=Yes). A higher total sum score on the seven questions indicated a higher perceived barrier. Male nurses reported more perceived barriers than female nurses 1.73 (1.42) vs 1.57 (0.78); however, this difference was not statistically significant (p = 0.88). Barriers to performing cognitive assessment and orientation interventions were the highest in nurses aged 31 to 35 with a mean perceived barriers of 2.67 (1.63) and no statistical significance (p = 0.350, pearman's correlation test). The perceived barriers were the highest in the NCU with a mean of 2.25 (1.89), but without statistical significance (p = 0.41, Kruskal Wallis test). Moreover, the perceived barriers were higher in master's prepared nurses than in nurses with a bachelor's degree, and it was the highest in nurses with a master's degree in nursing with a mean of 2.25 (1.38); however, this difference was not statistically significant (p = 0.59, Kruskal Wallis test). Nurses with less than 10 years of experience reported higher perceived barriers with a mean of 2.05, but also without statistical significance (p=0.6, Mann Whitney test).

Table 9 Bivariate Analysis of Cognitive Assessment and Orientation Interventions

	Feasibility		**Barriers**		
Variable	**Mean (SD)**	**p-value**	**Mean (SD)**	**p-value**	**Test**
Gender		0.427		0.881	Mann-Whitney test
Male	3.82 (1.72)		1.73 (1.42)		
Female	4.67 (0.51)		1.57 (0.78)		

Age		0.172		0.350	Spearman's correlation test
<20	5.00 (-)		1.00 (-)		
20-25	4.00 (0.81)		1.75 (1.50)		
26-30	3.00 (1.77)		2.20 (1.22)		
31-35	5.00 (0.00)		2.67 (1.63)		
36-40	4.17 (1.16)		1.63 (0.74)		
41-45	5.00 (-)		1.00 (-)		
Unit		0.343		0.410	Kruskal-Wallis test
ICU	4.46 (0.87)		2.13 (1.50)		
CCU	4.40 (0.89)		1.80 (0.83)		
NCU	3.50 (1.73)		2.25 (1.89)		
RCU	2.75 (2.21)		1.00 (0.00)		
Education level		0.417		0.598	Kruskal-Wallis test
Bachelor of Science in Nursing	3.81 (1.55)		1.83 (1.42)		
Master of Science in Nursing	4.25 (1.03)		2.25 (1.38)		
Master's degree not in Nursing	5.00 (0.00)		1.50 (0.70)		
Years of Experience		0.70		0.60	Mann-Whitney test
Less than 10 years	3.95 (1.47)		2.05 (1.50)		
10 years and above	4.29 (1.11)		1.63 (0.91)		

E. Feasibility of Early Therapeutic Interventions

Nurses were also asked about the feasibility of performing selected therapeutic interventions using a 5-point Likert scale. Nurses perceived pain assessment and management as feasible, with a mean of 4.48 (0.7). Almost half (48%) of the nurses thought this intervention was feasible, and 35% of the nurses perceived it as somewhat feasible.

When asked about providing adequate nutrition, the nurses' responses had a mean of 4.07 (0.91), indicating it is feasible; most nurses answered with somewhat

feasible and very feasible 35 and 32%, respectively. As for providing hydration and electrolyte balance, more than half of the nurses (51.61%) answered very feasible, with a mean of 4.55 (0.57), indicating it is feasible. Removing unnecessary catheters had a mean of 4.29 (0.6), indicating it is feasible. Almost half of the nurses answered somewhat feasible (48 39%), followed by 32.26% as very feasible.

The majority of nurses answered that it is very feasible to provide adequate oxygenation to prevent hypoxia (61.29%). This question had a mean of 4.66 (0.55). Early detection and management of infections was 4.37 (0.62), indicating its feasibility. Almost half (41.94%) of the nurses answered that it is somewhat feasible, followed by 38.71% who said it is very feasible. Careful use of sleeping pills, anticholinergics, and opiates had various answers, with a mean of 3.92 (1.05) indicating it is feasible. On this question, nurses who answered somewhat feasible and very feasible were equal, 29.03%. This intervention is perceived as feasible.

Additionally, encouraging early mobility had the lowest mean of 3.11 (1.33). Although it had the lowest mean, it was also considered feasible. For this question, 25.81% of the nurses answered somewhat feasible, and 12.9% answered very feasible. Finally, consulting a physical therapist to perform active and passive range of motion exercises had a mean of 3.88 (0.97), indicating its feasibility; most of the nurses answered somewhat feasible 41.94%. The total mean for this set of interventions was 3.67 (0.47), also indicating its perceived feasibility.

Table 10 Early Therapeutic Interventions Feasibility

Early Therapeutic Interventions	**1**	**2**	**3**	**4**	**5**	**N/A***	**Mean (SD)**

Pain assessment every 4 hours and pain management	0.00%	3.23 %	0.00%	35.48 %	48.39 %	12.90 %	4.48 (0.70)
Provide adequate nutrition	0.00%	6.45 %	12.90 %	35.48 %	32.26 %	12.90 %	4.07 (0.91)
Provide hydration and electrolyte balance	0.00%	0.00 %	3.23%	32.26 %	51.61 %	12.90 %	4.55 (0.57)
Remove unnecessary catheters	0.00%	0.00 %	6.45%	48.39 %	32.26 %	12.90 %	4.29 (0.60)
Provide adequate oxygenation to prevent hypoxia	0.00%	0.00 %	3.23%	22.58 %	61.29 %	12.90 %	4.66 (0.55)
Early detection and management of infections	0.00%	0.00 %	6.45%	41.94 %	38.71 %	12.90 %	4.37 (0.62)
Careful use of sleeping pills, anticholinergics, and opiates	3.23%	3.23 %	19.35 %	29.03 %	29.03 %	16.13 %	3.92 (1.05)
Encourage early mobility	12.90%	16.13 %	16.13 %	25.81 %	12.90 %	16.13 %	3.11 (1.33)
Consult a physical therapist to perform active and passive ROM exercises	3.23%	3.23 %	16.13 %	41.94 %	22.58 %	12.90 %	3.88 (0.97)
***Not Answered**					**Overall mean**		3.67 (0.47)

1. Barriers to Early Therapeutic Interventions

Inadequate staffing was the predominant barrier to early therapeutic interventions, 20 nurses (64.52%) identified this as a barrier, followed by lack of resources 15 (48.39%) and lack of teamwork 10 (32.26%). Table 11 shows the full list of barriers with respective frequency and percentages.

Table 11Perceived Barriers for Early Therapeutic Interventions

Barriers for early therapeutic interventions	Frequency	Percentage
Inadequate staffing	20	64.52%
Time constraints	16	51.61%
Lack of resources	15	48.39%
lack of teamwork	10	32.26%
lack of interest	6	19.35%
lack of organization support	5	16.13%
Lack of access to information	1	3.23%

Bivariate Analysis for Early Therapeutic Interventions

Each answer for the feasibility question was changed to binary (0=not feasible, 1=feasible that includes 4= somewhat feasible and 5= very feasible), then a higher total sum score on the five questions showed a better feasibility. Female nurses reported a higher feasibility mean than male nurses 8 (1.52) vs 7.5 (1.26); however, this difference was not statistically significant ($p = 0.35$). The perceived feasibility of implementing an early intervention to prevent delirium was the highest in CCU with a mean of 8.80 (0.44), but without statistical significance ($p = 0.16$, Kruskal Wallis test). Perceived feasibility was higher in master's prepared nurses than nurses with a bachelor's degree, and it was the highest in nurses with a master's not in nursing with a mean of 9 (0.00); however, this difference was not statistically significant ($p = 0.31$, Kruskal Wallis test). Feasibility was higher in nurses with more than 10 years of experience, but this variation had no statistical significance ($p=0.09$, Man-Whitney test).

As for the perceived barriers, we changed them to a numerical score over seven (0=No, 1=Yes), then a higher total sum score on the seven questions indicated a higher perceived barrier. Female nurses reported higher perceived barriers than male nurses

3.14 (1.34) vs. 2.36 (1.85); however, this difference was not statistically significant (p = 0.24). Perceived barriers to performing early therapeutic interventions were the highest in nurses aged 20 to 25 years, with a mean of 3.50 (2.60) but with no statistical significance (p = 0.85, Kruskal Wallis test). The perceived barriers were the highest in the ICU with a mean of 3.2 (1.85), but without statistical significance (p = 0.2, Kruskal Wallis test). Moreover, the perceived barriers were higher in master's prepared nurses than in nurses with a bachelor's degree, and it was the highest in nurses with a master's in nursing with a mean of 3.75 (1.9); however, this variance was not statistically significant (p = 0.1, Kruskal Wallis test). Barriers were the highest in nurses with less than 10 years of experience with a mean of 2.80 (1.98), but also without statistical significance (p=0.46, Mann-Whitney test).

Table 12 Bivariate Analysis of Early Therapeutic Interventions

	Feasibility		**Barriers**		
Variable	**Mean (SD)**	**p-value**	**Mean (SD)**	**p-value**	**Test**
Gender		0.359		0.247	Mann-Whitney test
Male	7.50 (1.26)		2.36 (1.85)		
Female	8.00 (1.52)		3.14 (1.34)		
Age		0.178		0.787	Spearman's correlation test
<20	9.00 (-)		2.00 (-)		
20-25	8.25 (1.50)		3.50 (2.38)		
26-30	6.50 (2.44)		2.44 (1.59)		
31-35	6.67 (1.63)		3.00 (2.60)		
36-40	8.17 (1.60)		2.29 (1.25)		
41-45	9.00 (-)		1.00 (-)		
Unit		0.160		0.206	Kruskal-Wallis test
ICU	7.29 (1.54)		3.20 (1.85)		
CCU	8.80 (0.44)		1.80 (1.30)		
NCU	6.75 (1.50)		2.50 (2.38)		
RCU	6.33 (4.61)		1.50 (1.00)		

Education level		0.316		0.106	Kruskal-Wallis test
Bachelor of Science in Nursing	7.25 (2.14)		2.11 (1.60)		
Master of Science in Nursing	7.25 (1.75)		3.75 (1.90)		
Master's degree not in Nursing	9.00 (0.00)		2.50 (2.12)		
Years of Experience		0.09		0.46	Mann-Whitney test
Less than 10 years	7.05 (2.04)		2.80 (1.98)		
10 years and above	8.29 (1.49)		2.13 (1.24)		

F. Feasibility of Implementing Environmental Interventions

Nurses were asked to rate a series of questions regarding their perceived feasibility of early therapeutic interventions on a 5-point Likert scale. The first question was related to the perceived feasibility of assessing for visual and hearing impairments and asking the family to bring hearing aids and glasses. The mean perceived feasibility for this intervention was 3.6 (0.83), indicating its feasibility. Forty five percent (45%) of the nurses were neutral towards this intervention, and 25.8% stated it is somewhat feasible. The second question was about allowing the family to bring favorite items such as pillows and blankets from home. The mean was 3.46 (1.07), indicating its feasibility. The most answered option was somewhat feasible (35.48%). As for providing family pictures to make the patient feel at home, the mean was 3.25 (1.04), indicating its feasibility. The majority of nurses (35.48%) answered 4 for this question.

When asked about the feasibility of playing soft music for the patients to help them relax, the mean answer for this question was 3.03 (1.20), indicating its non-

feasibility. The answers to this question varied a lot; however, the most answered options were 2 (somewhat not feasible) (29%) and 3 (neutral) (22.58%).

Turning off the unit's lights at 12 am and turning them back on at 7 am had more perceived feasibility than playing music, with mean feasibility of 3.67 (1.3). The most selected response was somewhat feasible (32.26%) and neutral (25.81%).

On the other hand, providing earplugs for patients at night did not seem feasible according to the nurses, with mean feasibility of 2.21 (1.31). In this question, unlike all other questions, most nurses chose not feasible (38.71%), followed by neutral (19.35%). Similarly, when asked about providing eye masks for patients at night, the mean feasibility was 2 (1.18), indicating its non-feasibility (41.94%), followed by very feasible (22.58%). Combining interventions to decrease patient manipulation at night had a mean of 2.89 (1.39), indicating its non-feasibility. For this question, the most chosen answer was neutral (45.16%), not feasible, and somewhat not feasible (12.9% each). Putting clocks inside patients' rooms for reorientation had a mean of 3.33 (1.13), indicating its feasibility. In this question, most nurses' answers were neutral (25.81%) or very feasible (25.81%). Finally, increasing family visitation time was perceived as not feasible, with a mean of 2.53 (1.4). In this question, most nurses chose not to answer (58%). The total mean feasibility for environmental interventions is 3 (0.59), indicating its non-feasibility in total. Table 13 below describes the results for the perceived feasibility of environmental interventions.

Table 13 Perceived Feasibility of Environmental Interventions

Environmental interventions	**1**	**2**	**3**	**4**	**5**	**N/A***	**Mean (SD)**
Assess for visual or hearing impairments, ask the family to	0.00%	3.23%	45.16 %	25.81 %	16.13 %	9.68%	3.6 (0.83)

bring hearing aids and glasses							
Allow bringing home favourite items like blankets, pillow…	6.45%	6.45%	29.03 %	35.48 %	12.90 %	9.68%	3.46 (1.07)
Provide family pictures, posters to make the patient feel at home	6.45%	12.90 %	29.03 %	35.48 %	6.45%	9.68%	3.25 (1.04)
Put soft music for 30 min during the day and 30 min in the afternoon (relaxing piano, soft music)	6.45%	29.03 %	22.58 %	19.35 %	12.90 %	9.68%	3.03 (1.20)
Turn off the unit's lights at 12 am and turn them back on at 7 am	9.68%	3.23%	25.81 %	19.35 %	32.26 %	9.68%	3.67 (1.30)
Provide earplugs for patients at night	38.71 %	16.13 %	19.35 %	9.68%	6.45%	9.68%	2.21 (1.31)
Provide eye cover for patients at night	41.94 %	19.35 %	22.58 %	0.00%	6.45%	9.68%	2.0 (1.18)
Combine interventions to decrease patient's manipulation during the night	12.90 %	12.90 %	45.16 %	9.68%	9.68%	9.68%	2.89 (1.39)
Put clocks in all patient's room facing the patient on the wall, with cards that show sun and moon to indicate day and night	12.90 %	9.68%	25.81 %	12.90 %	25.81 %	12.90 %	3.33 (1.13)
Increase family visit time	16.13 %	0.00%	16.13 %	6.45 %	3.25 %	58.06 %	2.53 (1.4)
*Not answered					**Overall Mean**		3 (0.59)

1. Barriers to Environmental Interventions

We assessed the perceived barriers to implement the above-mentioned environmental interventions. Lack of resources and inadequate staffing were the top two equally identified barriers by 64.52% of the nurses. Time constraints and lack of teamwork were identified as barriers, too, reported by 45.16% and 29.35% of the sample, respectively. Table 14 below shows the details result of the list of barriers.

Table 14 Perceived Barriers for Environmental Interventions

Perceived Barriers to environmental interventions	**Frequency**	**Percentage**
Inadequate staffing	20	64.52%
Lack of resources	20	64.52%
Time constraints	14	45.16%
Lack of teamwork	9	29.03%
lack of organizational support	6	19.35%
Lack of access to information	3	9.68%
lack of interest	3	9.68%

a. Bivariate Analysis for Environmental Intervention

Each answer for the feasibility question was changed to binary (0=not feasible, and 1=feasible includes 4= somewhat feasible and 5= very feasible), then a higher total sum score on the five questions showed better feasibility. Female nurses reported higher feasibility mean than male nurses 10 (-) vs 3.6 (2.51); however, this difference was not statistically significant ($p = 0.13$). The feasibility of performing early therapeutic interventions was changing with nurse's age, but this variance was also with no statistical significance ($p = 0.587$, Spearman's correlation test). Furthermore, the feasibility was the highest in the ICU with a mean of 4.2 (4.02), but without statistical significance ($p = 0.98$, Kruskal Wallis test). Feasibility was higher in bachelor prepared

nurses than in nurses with a master's degree, and it was the highest in nurses with a master's not in nursing with a mean of 6 (-); however, this difference was not statistically significant (p = 0.49, Kruskal Wallis test). Feasibility was the highest in nurses with 10 years of experience and above, with a mean of 4 (3.46), but this variation had no statistical significance (p=0.73, Mann-Whitney test).

As for the perceived barriers, we changed them to a numerical score over seven (0=No, 1=Yes), then a higher total sum score on the seven questions showed higher perceived barriers. Female nurses reported higher perceived barriers than male nurses 3.29 (1.60) vs 1.73 (1.61); this difference was statistically significant (p = 0.049). Barriers to performing environmental interventions were the highest in nurses aged between 20 to 25 years, with a mean of 3 (2.30), but with no statistical significance (p = 0.794, Spearman's correlation test). The perceived barriers were the highest in ICU with a mean of 2.67 (2.02), but without statistical significance (p = 0.64, Kruskal Wallis test). Moreover, the perceived barriers were higher in master's prepared nurses than in nurses with a bachelor's degree, and it was the highest in nurses with a master's degree in nursing with a mean of 3.38 (1.68); however, this difference was not statistically significant (p = 0.06, Kruskal Wallis test). Barriers were the highest in nurses with less than 10 years of experience with a mean of 2.50 (1.96), but also without statistical significance (p=0.67, Mann-Whitney test).

Table 15 Bivariate Analysis of Environmental Interventions

	Feasibility		**Barriers**		
Variable	**Mean (SD)**	**p-value**	**Mean (SD)**	**p-value**	**Test**
Gender		0.132		**0.049***	Mann-Whitney test
Male	3.60 (2.51)		1.73 (1.61)		

Female	10.00 (-)		3.29 (1.60)		
Age		0.587		0.789	Spearman's correlation test
<20	-		1.00 (-)		
20-25	5.25 (3.20)		3.00 (2.30)		
26-30	2.80 (2.16)		2.22 (1.64)		
31-35	1.00 (-)		2.83 (2.48)		
36-40	3.00 (4.24)		2.14 (1.34)		
41-45	6.00 (-)		1.00 (-)		
Unit		0.988		0.649	Kruskal-Wallis test
ICU	4.20 (4.02)		2.67 (2.02)		
CCU	3.50 (0.70)		2.40 (1.67)		
NCU	3.67 (2.51)		2.25 (1.89)		
RCU	3.00 (2.64)		1.25 (0.500)		
Education level		0.495		0.063	Kruskal-Wallis test
Bachelor of Science in Nursing	3.70 (3.02)		1.83 (1.61)		
Master of Science in Nursing	2.50 (2.12)		3.38 (1.68)		
Master's degree not in Nursing	6.00 (-)		3.00 (2.82)		
Years of Experience		0.73		0.67	Mann-Whitney test
Less than 10 years	3.60 (2.79)		2.50 (1.96)		
10 years and above	4 (3.46)		2.00 (1.30)		

CHAPTER VI

DISCUSSION

This study examined the feasibility of implementing a tailored sleep-targeted delirium prevention bundle in critical care areas to prevent delirium from the perspective of critical care nurses. Overall, the majority of the nurses reported that the implementation of a tailored sleep targeted delirium prevention bundle was feasible.

The response rate of almost 40% of the nurses who work in the critical care units is slightly limited; however, it is acceptable given that it is an online survey that could only be accessed by the people who received the invitation from their email. Each participant had their token, making it challenging to share the survey as a reminder between nurses on their phones. Moreover, during this period, the hospital was affected by the COVID-19 Pandemic, the country's financial collapse, and a significant resignation wave of nurses. Regardless, this response rate was higher than that found in a study done by Cooper et al. in 2017, which had a response rate of 32% (Cooper, A et al., 2017). This sample truly represents the ICU nurses, given that approximately 60% of the participants were from the ICU, but it might not truly represent the opinions of nurses from other critical care areas. As for years of experience, we had many participants with long years of experience, so they are critical care nursing management experts. Regarding gender, male participants were slightly more than females; however, 35% of the participants chose not to answer this question. Moreover, 32% of the participants have masters in nursing, which increases their credibility.

A. Delirium Knowledge and Assessment

Almost all of the participants (97%) stated that they are familiar with the CAM-ICU tool, and 90% received an educational session about delirium and CAM-ICU. Moreover, 94% of the participants said they are able to use the CAM-ICU tool in order to diagnose patients with delirium, which indicates a high perceived feasibility among critical care nurses. These findings were better than the ones found in a study by Troglic et al., in which only fifty eight percent of the participants reported that they use the CAM- ICU, and 51% of them stated that they are able to adequately perform the CAM-ICU to diagnose patients with delirium (Trogrlić et al., 2017). The perceived feasibility of using the CAM-ICU found in this study is related to the educational sessions given to the critical care nurses by the institution's clinical educators and clinical nurse specialist prior to its implementation. This step is very crucial and supported by evidence that educational intervention and hands-on practice are essential for a proper implementation of delirium assessment (Ramoo et al., 2018).

Nurses reported that assessing delirium in clinical practice is feasible; however, we found an inconsistency in answers when it came to delirium treatment and prevention. 42% of the nurses chose non-pharmacological treatment for the management of delirium; however few nurses gave examples about the treatments they would use to prevent delirium. Non-pharmacological interventions are the ultimate approach to prevent delirium as shown in a meta-analysis stating that non-pharmacological interventions are effective in preventing delirium and decreasing its prevalence (Hshieh et al., 2015). Some nurses in our study suggested family companionship, which is well supported, with evidence showing that family involvement in care and even their voice is significant to prevent delirium (Munro et al.,

2017). Other nurses suggested early mobilization and early cessation of sedation, which also were found to be effective approaches to prevent delirium (Bounds et al., 2016). The rest of the nurses suggested music therapy, TV in patient's room, early discharge from ICU, helping them to eat and drink, promoting rest and quite time, and others. Surprisingly, all the above-mentioned interventions are part of our proposed bundle to treat delirium and promote sleep in ICU patients.

Moreover, 32% of the nurses in the current study suggested pharmacological treatments. Very few gave examples regarding which medications to use; however, as expected Haloperidol was the only medication mentioned in the management of delirium. These findings are similar but less common than the findings of Trogrlic et al., (2017), where the participants stated that all physicians reported Haloperidol as the drug of choice to treat delirium (Trogrlić et al., 2017). These inconsistencies in current treatment modalities indicate that there is no standardization of care in delirium treatment in the critical care settings at this time. The latest clinical practice guidelines did not recommend the use of Haloperidol in the treatment or prevention of delirium (Devlin et al., 2018). Most of the recommendations supported the use of non-pharmacological interventions, focusing on orientation and targeting risk factors (Devlin et al., 2018). The interventions investigated in this study were based on these recommendations and our literature review.

Nurses were also asked if they are performing any intervention to prevent delirium before its occurrence. Forty-eight percent of the nurses answered yes. Out of these nurses, 33% reported interventions that include the family, especially family companionship; they also reported early discharge from the ICU (20%), reorientation (20%), and noise control (13%), which are interventions supported by evidence

(Bounds et al., 2016; Flannery et al., 2017; Martinez et al., 2012; Tsang et al., 2019; Young et al., 2021).

B. Sleep Assessment tool

Almost three-fourths of our survey participants stated they are not using any tool to assess sleep quality in the critical care units, and this is a clear indication that sleep and sleep deprivation are not currently being acknowledged. The proposed sleep quality assessment tool is a simple tool previously used by Van Rompey et al, and is able to accurately assess sleep quality in ICU patients (Van Rompaey et al., 2012). We asked the nurses about their perceived feasibility regarding every question of the tool, and the mean perceived feasibility score was 3.82, indicating that it is somewhat feasible. However, this feasibility does not come without identified barriers. As expected, the most identified barriers were time constraints (52%) and inadequate staffing (48%). Given that we are proposing the introduction of a new intervention, and given the current situation of the country, a lot of nurses are leaving, and most units are understaffed, which explains the identified barriers for this section. However, these sets of barriers are very commonly reported in many studies (Hosie et al., 2014; Qualls, 2020; Trogrlić et al., 2017; Yevchak et al., 2014). Margie Qualls (2020) found in their study 2020 that 83% of the participants showed an intent to implement a delirium screening tool but a lack of interest in the rest (17%); however, in our study, 29% expressed that they are not interested in implementing this new sleep screening tool.

C. Delirium Prevention Bundle

1. Cognitive Assessment and Orientation:

Our proposed sleep targeted delirium prevention bundle is divided into three categories. The first set of interventions includes cognitive assessment and reorientation related interventions. This set of interventions was relatively easy and very common interventions that nurses already practice in their daily work. Consequently, this section had a high perceived feasibility score with a mean of 4.13, confirming nurses' perceived feasibility for these interventions. The highest feasibility for these interventions was reported when nurses were asked to apply verbal and non-verbal communication with a mean of 4.7, and the lowest was related to performing cognitive assessment every 8 hours using the CAM-ICU tool with a mean of 3.46. Despite the introduction of CAM-ICU a year ago, nurses seem not very confident in using it, although this tool takes less than two minutes to perform and is present in each patient's room in all critical care areas. This low perceived feasibility does not come as a surprise. Delirium screening is not very well implemented worldwide; even in institutions using a standardized delirium screening, compliance is always an issue. A recent international survey showed that 71% of pediatric ICU nurses do not perform routine delirium screening, and only 2% stated that delirium screening is being performed daily on patients (Flaigle et al., 2017). In another study, only 34% of the responders believed that nurses could use a standardized and validated tool such as CAM-ICU to screen for delirium (Troglic et al., 2016). Unfortunately, we do not have any data on the current compliance rate of using the CAM-ICU by the nurses in the critical care units of AUBMC.

Despite the simplicity of these interventions, nurses reported some barriers to implementing them. More than half of our nurses reported time constraints and

inadequate staffing as primary barriers, with percentages of 58% and 52%, respectively. Similarly, these results are commonly reported in many studies (Troglic et al., 2016; Elliot et al., 2014). Moreover, Elliot et al. (2014) found that the main barrier to using the delirium assessment tool is time constraints; in their study, 18% of the participants stated that time constraints are the main barrier. Our bivariate analysis did not show a statistically significant association between demographics and feasibility. In contrast, Zarei et al., (2016) found that nurses with less than 10 years of experience showed a higher acceptance to change.

2. Early Therapeutic Interventions:

In this second part of the bundle, the interventions targeted early therapeutic interventions. These proposed interventions were also perceived feasible, with an overall mean of 3.67. The perceived feasibility of these interventions was lower than the previous set of interventions, mainly because of the slight increase of complexity in these interventions. We noticed that the perceived feasibility decreased as the complexity of the intervention increased. For instance, nurses scored high in perceived feasibility regarding providing adequate oxygenation to the patient (4.66) compared to encouraging early mobility (3.11). Consulting with a physical therapist to perform range of motion exercises also had low perceived feasibility of 3.88, similar to early mobility. It is also worth mentioning that nurses felt that the interventions that do not necessitate collaborations with other departments are more feasible to implement. This highlights a lack of teamwork and collaboration, which was translated into a perceived barrier. One-third (32%) of the nurses stated that lack of teamwork is a barrier for the implementation of these interventions. A possible explanation is that currently, there is no early mobility protocol for patients in the critical care units at AUBMC. Presently,

early mobility mainly consists of active and passive range of motion exercises performed by the physical therapist and very few transfers of non-intubated patients from bed to chair. It is important to mention that currently, at AUBMC, we do not have a designated physical therapist for critical care units.

Lack of staff and time constraints were perceived as the two main barriers to the successful implementation of these interventions, with percentages of (65%) and (52%) respectively. These findings are similar to Troglic et al. (2016) and Qualls et al. (2020), who identified these two as the main barriers to implementing a delirium prevention bundle. Almost half (48%) of our participant nurses listed a lack of resources as a perceived barrier for this set of interventions, and this is mainly due to the unavailability of chairs to transfer the patients from bed to chair, the unavailability of standardized protocols that guide them to perform early mobility, and the lack of physical therapist dedicated to the critical care units. This emphasizes the need for the critical care clinical nurse specialist to establish a multidisciplinary protocol to introduce this practice to the nurses.

3. Environmental Interventions

The nurses reported that some environmental adjustments and interventions to promote sleep at night were feasible. These interventions were new interventions not currently practiced at AUBMC. As for their complexity, they were slightly more complex than the two sections tackled previously. Nurses scored the lowest on providing eye masks and earplugs perceived as somewhat not feasible, with a mean of 2 and 2.21, respectively. This is a new proposed intervention that showed many positive effects in decreasing the incidents of delirium when used in a bundle. This result is

different from Van Rompaey (2012), which used earplugs to decrease delirium; it was feasible and effective by showing a Hazard Ratio of 0.47. Another reason nurses might perceive this intervention as not feasible, other than the fact that it is a new intervention, is that these materials are not available in the critical care units yet. Moreover, combining interventions to decrease patient stimulation at night was perceived as somewhat not feasible (2.89). This is mainly related to the patients in the critical care units that present with a complex treatment regimen and nursing care.

Increasing family visitation time was also perceived as somewhat not feasible, despite much evidence supporting the benefits of family involvement in critical patient care (McClay, 2021. Nurses might have scored low on this question due to COVID-19 and its restrictions on family visitation. This section also revealed some barriers to implementation.

Three main barriers were predominant for this section, and these barriers are lack of resources (65%), inadequate staffing (65%), and time constraints (45%). Because some of these interventions are new and necessitate the introduction of new items and nursing care, nurses expressed that lack of resources is the main barrier. Given the economic crisis that Lebanon is going through, introducing a new product might be a challenge at the hospital level. Nurses may also lack the educational resources to perform these interventions. So, the need for a clinical nurse specialist was highlighted in order to facilitate and successfully implement this project. Time constraints and inadequate staffing were predominant throughout this survey and in many other studies (Qualls et al., 2020; Yevchak et al., 2014; Hosie et al., 2014). Inadequate staffing is currently a national and international disaster in nursing. Due to COVID-19, many nurses decided to quit their profession, the factor that aggravated this

already existing shortage. Additionally, given the crises that Lebanon is going through, the financial crisis and inflation, and lack of safety, many nurses decided to leave the country and seek a better opportunity, which clearly showed its impact in this study given that inadequate staffing was the number one barrier identified by the nurses.

In short, critical care nurses are familiar with the assessment of delirium using the CAM-ICU; however, they still are not very familiar with delirium management and the bundle approach of delirium management in a non-pharmacological approach. Despite all the identified barriers, this bundle is perceived feasible by our critical care nurses as a whole. The main identified barrier is inadequate staffing, time constraints, teamwork, and resources. These barriers are common and previously identified in many researches that tackled delirium and sleep management (Qualls et al., 2020; Yevchak et al., 2014; Hosie et al., 2014).

The findings in this study will help set the ground for the development of a delirium prevention bundle at AUBMC critical care units. Surveying critical care nurses have identified their perceived barriers that might hinder the proper implementation of such a bundle of care. Nurses declared they are familiar with delirium assessment but not management; the overall bundle was perceived as somewhat feasible.

D. Role of the Clinical Nurse Specialist

The critical care clinical nurse specialist (CNS) plays a key role in delirium prevention in critical care units. Nurses reported a lack of teamwork as one of their perceived barriers, which can be due to poor collaboration between nurses and physicians, and CNSs have mastered collaboration between various teams to improve patient outcomes. A multidisciplinary team can be formed to assess the current readiness, obstacles, and support of the administration, develop a delirium prevention

bundle in critical care units, and set the program's guidelines. A delirium prevention task force can also be formed, and a holistic protocol can be developed in order to prevent and treat delirium in critical care units. The CNS can push the hospital administration to purchase the needed missing equipment for the successful implementation of this program and collaborate with all healthcare providers to develop this protocol. Moreover, one of the most important barriers was inadequate staffing, so adequate staffing of critical care units is crucial for successfully implementing this program. After getting the equipment needed and setting the protocol, the CNS can lead the training of nurses so that critical care nurses feel confident and competent in managing delirium.

E. Reflection on the theoretical framework

The theoretical framework that we used was suitable. It tacked all the dimensions related to our feasibility study. According to our theoretical framework, we should carefully tackle the following to implement our delirium prevention bundle successfully. First, we must have strong evidence for the effectiveness of our interventions. In our proposed delirium prevention bundle, all interventions were selected from randomized controlled trials and meta-analyses and showed effectiveness on thousands of patients. Second, we should have strong facilitation of attitude, purpose, and skills. Our study helped identify the nurses' perceived barriers that should be solved to implement the bundle successfully. We were also able to assess nurses' perceived feasibility, which showed that nurses could introduce this change into their daily practice, given that some barriers were tackled. Third, we should foster a strong context in terms of culture, leadership, and evaluation. In our study, we were able to show the role that CNSs and project leaders must play to implement the delirium prevention bundle successfully. This

theoretical framework not only guided us while planning the feasibility study, but it can also be used while implementing this delirium prevention bundle and evaluating our outcomes.

F. Limitations

This study has many limitations. It is a survey-based study; the critical care nurses answered the survey online, and we did not observe the practice or include the bundle in their day-to-day activity. It is important to mention that their answers might be susceptible to social desirability. Nevertheless, to our knowledge, the delirium prevention bundle is not yet practiced at AUBMC, so using surveys was appropriate as a first step to explore this issue. According to the results, the integration of this proposed bundle in daily clinical practice might later become the standard practice.

Moreover, this study was at AUBMC, so the findings may not be generalized to all hospitals in Lebanon. The sample size was small; despite multiple reminders, only 31 nurses out of 80 decided to fill the questionnaire. The survey link was individualized to each eligible participant and could not be shared via phone with nurses to encourage them to fill it. This safety feature had a major drawback on our sample size. In addition, Lebanon is undergoing an economic crisis; nurses are leaving the country, which increases the workload and demotivation of the nurses working here. This set a disadvantage in our results, as the number of the nurses included in the study was limited and the nurses might have been affected by a possible demotivation for change.

G. Implication to Clinical Practice

Delirium is a severe burden on the patient, family, hospital, and health care providers, especially nurses. Delirium assessment should be a daily practice in all critical care units using a validated tool. Delirium prevention should be integrated into critical

care nurses' interventions, and treatment should start immediately for patients with delirium.

Furthermore, this study showed good nursing education regarding delirium assessment but not prevention. This highlights the need for educating nurses about the management and prevention strategies for delirium in critical care units.

Before implementing any delirium prevention bundle, the hospital must carefully assess the barriers that hinder the successful implementation of just a project. As we saw in this study, inadequate staffing, lack of time, and lack of teamwork were the main barriers from the nurses' perspective, and they should be carefully addressed. This study highlighted the importance of delirium prevention, given its serious consequences for all involved parties. Finally, we could not show statistical significance in the bivariate analyses due to our small sample size, so more studies with larger samples are needed for delirium prevention and treatment.

H. Conclusion

Delirium is a very serious and, most importantly, preventable syndrome. It has been proven to increase morbidity, mortality, and length of hospitalization. This study highlighted the possibility of implementing a delirium prevention bundle at AUBMC and provided baseline data for setting the ground for implementing the sleep-targeted delirium prevention bundle at AUBMC. A positive attitude of nurses toward the implementation of the bundle was noted despite some hesitancy manifested by lower perceived feasibility for some of the tested interventions. This study revealed some barriers that should be tackled before implementation to ensure our critical care patients' proper and successful execution and positive outcome.

APPENDIX I

Evidenced-based tailored non-pharmacological interventions for non-sedated patients in critical care areas.

Cognitive assessment and orientation	**Cognitive Assessment every 8 hours (CAM-ICU)**
	Provide orientation to time place and person
	Remind patients about reasons for admission
	Apply verbal and non-verbal communication skills
	Inform patients with every task before doing it
Early therapeutic Interventions	Pain assessment every 4 hours and pain management
	Provide adequate nutrition
	Provide hydration and electrolyte balance
	Remove unnecessary catheters
	Adequate oxygenation to prevent hypoxia
	Early detection and management of infections
	Careful use of sleeping pills, anticholinergics, and opiates
	Encourage early mobility
	Consult a physical therapist to perform active and passive ROM exercises
Environmental interventions	Assess for visual or hearing impairments, ask the family to bring hearing aids and glasses
	Allow bringing home favourite items like blankets, pillow…
	Provide family pictures, posters to make the patient feel at home
	Put soft music for 30 min during the day and 30 min in the afternoon (relaxing piano, soft music)
	Turn off the unit's lights at 12 am and turn them back on at 7 am
	Provide earplugs and eye cover for patients at night
	Combine interventions to decrease patient's manipulation during the night
	Put clocks in all patient's room facing the patient on the wall, with cards that show sun and moon to indicate day and night
	Increase family visit time

APPENDIX II

The Feasibility of Implementing a Tailored Delirium Prevention Bundle for Intensive Care Unit (ICU) from Registered Nurses perspective- Survey

Consent to participate in an Online Research Study

Study title: The Feasibility of Implementing a Tailored Delirium Prevention Bundle for Intensive Care Unit (ICU) from Registered Nurses perspective
Investigators: Hala Darwish**,** Samar Noureddine, Souha Fares, Hasan Chami, Hratch Moskofian

Dear Critical Care Nurses,
You are invited to participate in a research study entitled: "The Feasibility of Implementing a Tailored Delirium Prevention Bundle for Intensive Care Unit (ICU) from Registered Nurses perspective'' by Dr. Hala Darwish, Hariri School of Nursing at the American University of Beirut. The conduct of this study will adhere to the IRB approved protocol.

***The IRB approved method for approaching subjects is by email invitation. The purpose* of the study is to** assess the feasibility of implementing a tailored delirium prevention bundle into their day-to-day practice.

This message invites you to read the consent document and consider whether you want to be involved in the study. Kindly note the following

- Your participation is voluntary
- If you agree to participate in the survey, kindly note that filling the questionnaire will take around 5 - 10 minutes of your time.
- Only the data you provide in the questionnaire will be collected and analyzed. The research team will not have access to your name or contact details.
- The results of the survey will be published in a research article
- We are critical care nurses working at AUBMC.

Potential benefits: You will not receive any payment for participation in the study**.** Although there is no direct benefit to you from participating in the survey, your responses will help in developing educational material related to this topic.

Potential risks: The risks of the study are minimal. Your participation in this survey does not involve any risk beyond the risks of daily life.

Confidentiality: This collected will remain confidential and anonymous. No identifying information such as your name or ID number is included in the questionnaire. We will not report individual results but will present the data at the group level. Only the research team will have access to the raw data. Records will be monitored and may be audited by the IRB while assuring confidentiality.

Participation and withdrawal: If you voluntarily consent to take part in this study, you can change your mind and withdraw at any time without consequences of any kind. You can skip any question and can withdraw at any time. Refusal to participate or

withdrawal from the study will involve no penalty or loss of benefits to which the subject is otherwise entitled, and neither will it affect their relationship with their organization and AUB/AUBMC.

Questions about the study: If you have any questions with regard to this survey contact the primary investigator Dr. Hala Darwish, Faculty of Medicine, Hariri School of Nursing, American University of Beirut, Lebanon. Telephone: 70911455 Email: hd30@aub.edu.lb

Access to the survey: If after reading the consent document and having your questions answered, you voluntarily agree to take part in the study; you can access the survey by clicking on the following link

Concerns or questions about your rights: If you have concerns about the study or questions about your rights as participant in this survey, you may contact the Institutional Review Board office for the Social and Behavioural Sciences at AUB. Tel: 01/350000, extension 5440; or by email at irb@aub.edu.lb

APPENDIX III

The Feasibility of Implementing a Tailored Delirium Prevention Bundle for Intensive Care Unit (ICU) from Registered Nurses perspective- Survey questions:

- **Demographic information**
  - **Gender:**
    - Male
    - Female
  - **Age:**
    - 20-25
    - 26-30
    - 31-35
    - 36-40
    - 41-45
    - 46-50
    - 51 and above
  - **Critical Care unit:**
    - ICU
    - CCU
    - NCU
    - RCU
  - **Years of experience:**
    - 1 -3
    - 4-6
    - 7-9
    - 10-13
    - 14 and above
  - **Highest level of education achieved**
    - PhD
    - Master of Science in Nursing
    - Master's degree not in Nursing, Specify:
    - Bachelor of Science in Nursing

- **Delirium knowledge**
  - Are you familiar with the CAM-ICU tool?
    - Yes
    - No
    - Not sure
  - Did you receive an educational session about delirium and CAM-ICU?
    - Yes
    - No
  - Do you think you can use the CAM-ICU to detect patients with delirium?
    - Yes
    - No

- Maybe

➢ What kind of treatment are you currently using to treat delirium?
- Pharmacological
  - Please specify
- Nonpharmacological
  - Please specify
- Not sure

➢ Are you currently implementing any intervention to prevent delirium in your unit?
- Yes
  - Please specify
- No
- Not sure

- **Sleep Assessment:**

➢ Are you currently using any tool to assess sleep quality in your patients?
- Yes
  - Please specify
- No

➢ **Rate how feasible it is for you to ask these 5 dichotomous questions to assess sleep quality in your patients using the likert scale below**

Did you sleep well?
Did you sleep better than you were expecting?
Did you sleep better than your sleeping quality at home?
Were you awake for a long time before sleeping?
Do you feel rested?
- Likert scale
  (1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)

➢ For the previous question which barrier/s is/are the most applicable to you for not applying these interventions into your practice (select all that apply)
- Lack of resources
- Lack of access to information
- Inadequate staffing
- Lack of organizational support such as incentives or help to continue your education
- Lack of teamwork
- Lack of interest
- Time constraints

Delirium Prevention Bundle

These set of questions will determine how feasible it is for you to implement each intervention in your daily practice

First section: Cognitive assessment and orientation

Rate how feasible you think it is for you to implement each one of the following interventions in your daily practice. The Likert scale will be used in which 1 is not feasible and 5 is very feasible.

Cognitive Assessment every 8 hours (CAM-ICU)	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*
Provide orientation to time place and person	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*
Remind patients about reasons for admission	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*
Apply verbal and non-verbal communication skills	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*
Inform patients with every task before doing it	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*

- For the previous set of question which barrier/s is/are the most applicable to you for not applying these interventions into your practice (select all that apply)
  - Lack of resources
  - Lack of access to information
  - Inadequate staffing
  - Lack of organizational support such as incentives or help to continue your education
  - Lack of teamwork
  - Lack of interest
  - Time constraints

Second section: Early therapeutic interventions

How feasible to you think it is to implement each one of the following interventions in your daily practice. The Likert scale will be used in which 1 is not feasible and 5 is very feasible.

Pain assessment every 4 hours and pain management	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*

Provide adequate nutrition	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*
Provide hydration and electrolyte balance	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*
Remove unnecessary catheters	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*
Provide adequate oxygenation to prevent hypoxia	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*
Early detection and management of infections	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*
Careful use of sleeping pills, anticholinergics, and opiates	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*
Encourage early mobility	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*
Consult a physical therapist to perform active and passive ROM exercises	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*

- For the previous set of question which barrier/s is/are the most applicable for not applying these interventions into your practice (select all that apply)
  - Lack of resources
  - Lack of access to information
  - Inadequate staffing
  - Lack of organizational support such as incentives or help to continue your education
  - Lack of teamwork
  - Lack of interest
  - Time Constraints

Third section: Environmental interventions

How feasible to you think it is to implement each one of the following interventions in your daily practice. The Likert scale will be used in which 1 is not feasible and 5 is very feasible.

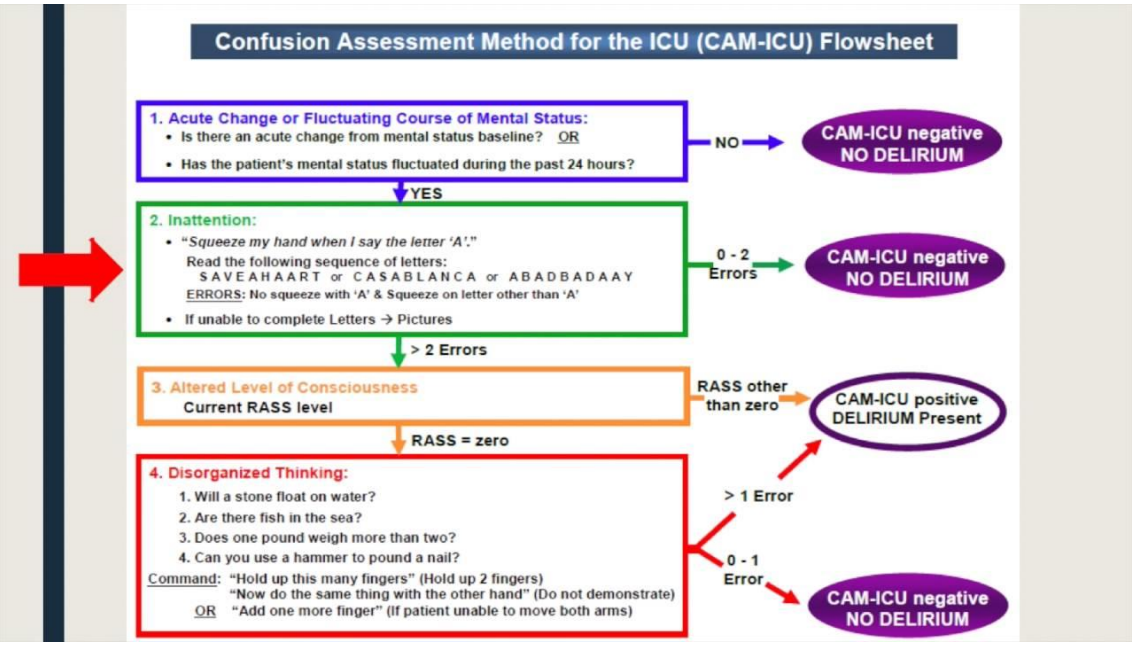
Assess for visual or hearing impairments, ask the family to bring hearing aids and glasses	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*
Allow bringing home favourite items like blankets, pillow…	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*

Allow family pictures, posters to make the patient feel at home	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*
Put soft music for 30 min during the day and 30 min in the afternoon (relaxing piano, soft music)	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*
Turn off the unit's lights at 12 am and turn them back on at 7 am	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*
Provide earplugs for patients at night	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*
Provide eye masks for patients at night	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*
Combine interventions to decrease patient's manipulation during the night	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*
Put clocks in all patient's room facing the patient on the wall, with cards that show sun and moon to indicate day and night	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*
Increasing family visitation time	*(1-Not feasible 2- somewhat not feasible 3- neutral 4- somewhat feasible 5- very feasible)*

- For the previous set of questions which barrier/s is/are the most applicable for not applying these interventions into your practice (select all that apply)
  - Lack of resources
  - Lack of access to information
  - Inadequate staffing
  - Lack of organizational support such as incentives or help to continue your education
  - Lack of teamwork
  - Lack of interest
  - Time Constraints

APPENDIX IV

CAM-ICU assessment tool



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