



# IJSRM

INTERNATIONAL JOURNAL OF SCIENCE AND RESEARCH METHODOLOGY

An Official Publication of Human Journals



Human Journals

**Review Article**

December 2019 Vol.:14, Issue:2

© All rights are reserved by Samuel P. Abraham et al.

## Association between Sleep and Delirium in the Pediatric Intensive Care Patients



### IJSRM

INTERNATIONAL JOURNAL OF SCIENCE AND RESEARCH METHODOLOGY

An Official Publication of Human Journals



Shaelyn M. Atkins<sup>1</sup>, Anna M. Schoenhals<sup>1</sup>, Samuel P. Abraham<sup>\*2</sup>

<sup>1</sup>Bethel University School of Nursing at Grace College  
Campus, Winona Lake, Indiana, USA

<sup>2</sup>Associate Professor of Nursing, Bethel University  
School of Nursing, Mishawaka, Indiana, USA

**Submission:** 27 November 2019

**Accepted:** 2 December 2019

**Published:** 30 December 2019



HUMAN JOURNALS

[www.ijsrm.humanjournals.com](http://www.ijsrm.humanjournals.com)

**Keywords:** sleep, delirium, PICU, pediatric, intensive care unit, children

### ABSTRACT

**Background:** Admission into the hospital pediatric intensive care unit (PICU) could be stressful for the child, as well as his or her family. Stress can affect many aspects of a child's life, especially his or her sleep quality. One of the common complications of a patient's PICU experience is the development of delirium. Delirium has many additional complications such as lengthened hospital stays, post-traumatic stress disorder, and negative long-term neurocognitive effects. **Purpose:** The purpose of this study was to examine the association between sleep and delirium in children in the PICU. **Method:** The method used was to use a systematic review of the literature and collect data on the association between sleep and delirium in the PICU. The patient, intervention, comparison, outcome, and time (PICOT) question was: Are PICU patients who have a lack of sleep at increased risk for developing delirium when compared with PICU patients who received adequate sleep? **Conclusion:** Upon conclusion of the literature review, results indicated that while a PICU patient's amount of sleep and his or her development of delirium may be related, there is not enough evidence to confirm the association. In addition, more research needs to be conducted to further evaluate the effects of varying amounts of sleep in a PICU patient.

## 1. INTRODUCTION

The association between sleep and delirium development is crucial to investigate because while sleep is an important factor in overall human health, it is often compromised during one's hospital stay. The American Association of Critical-Care Nurses (AACN), propagated, delirium affects up to 80% of patients in the intensive care unit (ICU), and it is estimated that ICU costs associated with delirium equal between \$4 billion and \$16 billion annually in the United States [1]. In addition, the American Nurses Association (ANA, revealed that one of the top three challenges that nurses face is the lack of knowledge of delirium [2].

Several authors attempted to determine the association of noise level, lack of knowledge among staff, and additional factors that may impact delirium screening and diagnosing [3,4,5]. Delirium is defined, assessed, and diagnosed in different ways, as is evident throughout the literature studied in this review. Various researchers have sought to find the association between delirium and different causal variables, including sleep, medication, sedation, age, the severity of illness, and noise. Along with evaluating delirium diagnostics, researchers have found a common theme: nurses' knowledge of delirium is lacking greatly. Overall, the literature gave many insights about the obstacle of patients' sleep and sleep's association with health, healing, and delirium.

The current study addressed gaps in the literature by reviewing the connection between the amount of sleep PICU patients received and their development of delirium. The purpose of this literature review was to determine the association between the amount of sleep a PICU patient received and their development of delirium. The new knowledge presented may advance nursing care provided to PICU patients by understanding how the amount of sleep a patient gets affects the patient's healing and risk of delirium development. Are PICU patients who have lack of sleep at increased risk for developing delirium when compared with PICU patients who are getting adequate sleep?

## 2. BACKGROUND

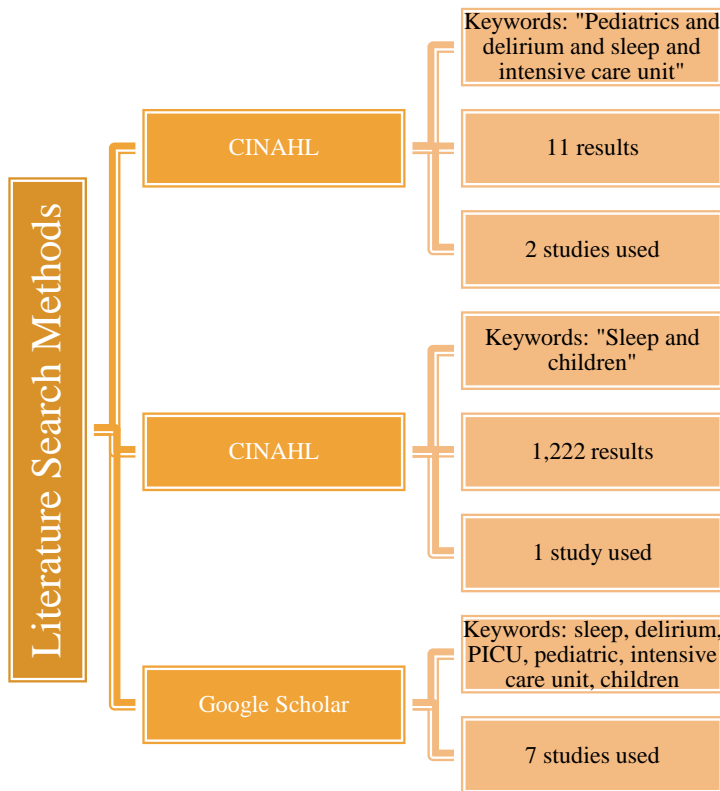
Historically, in PICU patients, the development of delirium is under-recognized even though it is a serious complication [6]. Since delirium can be manifested as a minor change in behavior, nurses are often unable to recognize these slight behavior changes in their patients. Bettencourt and Mullen [6] claimed, delirium screening was not done in 71% of PICUs, and only 2% of PICUs indicated doing delirium screening twice a day for their patients.

Not only is the under-diagnosing of delirium a variable with the current study, but also, nurses often fail to recognize delirium in their patients. Bryant [7] studied the knowledge of delirium, screening, and intervention among PICU nurses. Understanding incorrect statements, 38% of PICU nurses believed that benzodiazepines were an effective treatment for delirium, and 11% of nurses believed that the Glasgow Coma Scale was an effective screening tool for pediatric delirium [7]. The nature of the problem could stem from the lack of education in the specialty field of the PICU regarding appropriate screening tools, identification, and treatment methods for delirium used by registered nurses. Studying the association between sleep and delirium in the PICU patient is necessary because of the prevalence of delirium in this population, and the potential association between sleep and delirium development. Delirium is present in greater than 30% of critically ill pediatric patients [4].

### 3. METHODS

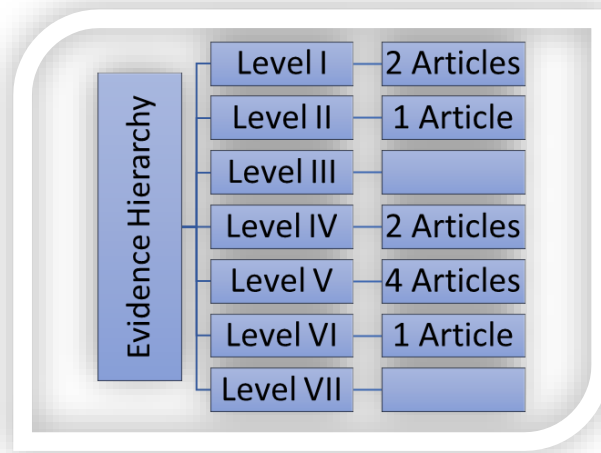
For this study, a systematic literature review on the association between the amount of sleep a PICU patient received and the health, healing, and development of delirium for this population was collected. Studies were located from the databases Cumulative Index to Nursing and Allied Health Literature (CINAHL) and Google Scholar using the following keywords *sleep, delirium, PICU, pediatric, intensive care unit, children*. To ensure the relevance of research, searches were narrowed to include studies published from 2016-2019. These studies were further narrowed to only peer-reviewed, full-text manuscripts.

After searching for “pediatrics and delirium and sleep and intensive care unit” in CINAHL, the researchers found 11 studies. Upon reviewal of these studies, two were found to be relevant for this systematic literature review, and both were included. They were *Quality Improvement Initiative to Reduce Pediatric Intensive Care Unit Noise Pollution with the Use of a Pediatric Delirium Bundle* and *Delirium in Children: Identification, Prevention, and Management*. An additional CINAHL search for “sleep and children” resulted in 1,222 results. The article *Impact of Different Recommendations on Adequacy Rate for Sleep Duration in Children* was the second result and is included in this literature review. Figure 1 illustrates the retrieval methods.



**Figure 1. Research methods: Databases, keywords, and results.**

The remaining studies were located from Google Scholar searches including the following keywords: *sleep, delirium, PICU, pediatric, intensive care unit, and children*. This is also demonstrated in Figure 1. Nine of the research articles used were from the top five tiers of nursing level of evidence. For the level of evidence, 1 is the highest and 7 is the lowest [8]. Attempt was made to collect studies from the top tiers. One article from the sixth tier was included. This article was used because its authors revealed insights about the frequency of screening, the competence of nurses, and the nurses’ ability to screen PICU patients for delirium. Figure 2 demonstrates the levels of evidence of the research articles.



**Figure 2. Level of evidence for articles used in the sleep and delirium in the PICU patient study.**

#### **4. REVIEW OF THE LITERATURE**

Reviewing the literature revealed many themes related to delirium and its development. One theme was varying definitions make delirium difficult to define and identify. Another theme was multiple screening tools make delirium difficult to diagnose. Additional themes were a direct association between sleep and delirium has not been identified; multiple factors contribute to delirium development; and an education gap noted in delirium screening and treatment. The themes identified can be reviewed in Figure 3.

##### **4.1 Varying Definitions**

Differences exist between multiple definitions of delirium. Bettencourt and Mullen [6] defined delirium as a syndrome characterized by the acute onset of cerebral dysfunction with a change or fluctuation in baseline mental status, inattention, and either disorganized thinking or an altered level of consciousness. Meanwhile, Bryant [7] more broadly defined delirium as transient behavioral manifestations of acute neurologic disturbances. Furthermore, Calandriello, Tylka, and Patwari [9] defined delirium as an alteration in both cognition and arousal that can have hypoactive or hyperactive subtypes. The American Psychological Association's fifth edition of *Diagnostic and Statistical Manual of Mental Disorders* established five components of delirium: difference in attention, development of symptoms over a short period of time with fluctuations of symptoms, changes in memory and orientation, no evidence of a neurocognitive disorder causing symptom changes, and other findings

showing that patient changes are a direct physiological consequence of one or more etiologies [9].

Delirium is difficult to identify in PICUs because the patients are not routinely screened for this condition. Bettencourt and Mullen [6] found that screening for delirium does not occur in the majority of PICUs. While reliable delirium screening tools exist for PICU nursing staff, the screening tools are often not used. Bettencourt and Mullen confirmed that in 71% of PICUs, no type of screening tool for delirium was used.

#### **4.2 Multiple Screening Tools**

Multiple screening tools for delirium in the pediatric population have recently been developed and validated. These scales include the pediatric anesthesia emergence delirium scale, the pediatric confusion assessment method for the ICU, the Cornell assessment of pediatric delirium, and the Sophia observation withdrawal symptoms-pediatric delirium scale [10]. Of these four assessment tools, one has not proven to be more effective than the others. The Cornell assessment of pediatric delirium (CAPD) tool is used the most often, and it was also recommended for the screening of delirium in PICU patients [11]. This scale distinguishes pain, agitation, and residual sedation from true delirium. This screen can be performed by nurses and recommended to be done twice daily; however, the diagnosis of delirium must be confirmed by a physician [11]. Even with pediatric delirium screening tools, it is often difficult to identify whether or not a PICU patient has delirium. Traube et al. [11] found 16% of children were not timely assessed for delirium. For children with already established developmental disabilities, it was difficult for a medical professional to determine if a patient's neurological status was different from his or her baseline.

Another limitation to the pediatric delirium screening tools is their inability to screen for certain variables. While no delirium screening tool is superior when compared to another, sleep quality is one important factor that no tools screened. Calandriello et al. discovered that no pediatric delirium tool took into consideration the patient's level of sleep disturbance, but rather only looked at the overall sleep-wake cycle, sleep duration, and restlessness [9]. Therefore, it is difficult to identify the singular cause of a patient's delirium when screening tools are omitting overarching variables.

### 4.3 A Definite Association Not Identified

For both the hospitalized child and the healthy child, sleep is important for general health and well-being [12]. A hospitalized child's body is already altered from its homeostasis because of his or her pathophysiology, and a disruption in sleep further hinders the healing potential. Circumstances, such as experiencing inadequate sleep duration and quality, are found to be associated with the development of delirium [6]. Sleep patterns vary by age, culture, and sleeping arrangements. There is no "magic number" of the recommended hours of sleep for children [12].

The environment of the PICU often forces patients to experience stimuli beyond their normal comprehension and bodily limits. Overstimulation from noise, light, and activities beyond the walls of one's patient room impacts the PICU patient by altering the patient's sleep-wake cycle and quality of sleep. Additionally, patients are often woken up throughout the night for assessments by nurses and other hospital staff. This greatly decreases the amount and quality of sleep the PICU patient receives (Bettencourt & Mullen, 2017). The amount of sleep a patient receives is a factor in the development of delirium in PICU patients [9].

### 4.4 Factors that Contribute to Delirium

While the amount of sleep a PICU patient receives is a contributing factor to delirium development, other factors play roles as well. One such factor is the amount of noise pollution in the PICU. While noise pollution can be expected to be high in a PICU, it often reaches dangerous levels. Kawai et al. [3] found that the noise levels were above the recommendations set by the World Health Organization and the Environmental Protection Agency and indicated the level which disrupts sleep. Furthermore, Kawai et al. [3] reported that previous data have shown a higher degree of noise pollution is associated with a higher morbidity rate. This demonstrated an inverse relationship between noise pollution and sleep. Taking this data regarding noise and sleep into consideration, further background knowledge into the causes of poor sleep in PICU patients is evident.

In a quality improvement initiative study, Kawai et al. [3] acknowledged that a pediatric delirium bundle was developed to normalize the nocturnal cycle and to reduce noise pollution for pediatric patients. This bundle included interventions done during daily resident and physician rounds, morning interventions by day shift nurses, and nightly interventions by night shift nurses. This pediatric delirium bundle was implemented on 8 out of 116 patients during

the 28-day period. The intervention resulted in significantly reduced noise pollution in the PICU, especially during the night shift hours. The noise level was six decibels less in the pilot rooms during the evening hours when the pediatric delirium bundle was implemented [3].

Many factors have been confirmed to directly relate to delirium development. Traube et al. [5] found an association between the presence of delirium and a patient's age less than five, the severity of the patient's illness, ventilation, and sedation. These studies indicated that patients younger than two years of age, patients requiring mechanical ventilation, exposure to vasopressor therapy, and exposure to anti-epileptic medications were directly associated with a high risk for delirium. Their study did not directly identify the patients' amount of sleep as an associated factor in delirium development. The use of physical restraints was strongly associated with the presence of delirium in the pediatric population; however, it is unclear as to whether the children developed delirium as a result of the presence of restraints, or if the patients required restraints because of their already developed delirium [5].

Additionally, sedation may play a larger role in delirium development. In a study of 1,547 PICU patients, 267 patients were delirious at some point during their hospitalization. Of these 267 patients, being in a coma was the cause of 34.83% of delirium development [5]. Coma was defined in this situation as, "...unresponsive to verbal stimulation, generally as a result of pharmacologic sedation" [5]. Not only is sedation a variable to developing delirium, but mechanical ventilation could also play a role. A patient may not always be sedated when he or she is mechanically ventilated; however, 72% of physicians use a combination of benzodiazepines and opioids when sedating a mechanically ventilated child. While sedation and mechanical ventilation can both independently lead to the development of delirium, the risk is much greater when sedation and mechanical ventilation are used in combination [7].

The problem of sedation in PICU patients was addressed in a randomized controlled trial in the Netherlands. In a group of 129 PICU patients, each patient was blindly assigned to the daily sedation interruption plus protocolized sedation (DSI + PS) group or the protocolized sedation (PS) group. This study was conducted from October 2009 to August of 2014 in which the DSI + PS group received blind, placebo infusions of saline, and the PS group received their previous sedative/analgesic prescriptions. In this specific study, it was found that there was no significant reduction in ventilator-free days and no significant reduction in hospital length-of-stay [13]. While this study did not examine delirium development specifically, ventilator use is a factor that may have contributed to delirium. Therefore, it is vital to determine if there is



an association between sedation and ventilator days for this patient population. In this study, it was determined to not have a strong association.

#### 4.5 Gap in Delirium Screening and Treatment

In current medical practice, delirium in PICU patients is often under-recognized and therefore is undertreated. It is important to assess the knowledge level of current PICU staff regarding delirium, to know how to best educate these staff. Flaigle et al. [4] evaluated gaps in the knowledge of delirium among PICU nurses. A survey was developed which was completed by 105 nurses, answering questions about delirium facts. For example, 38% of the respondents thought that benzodiazepines were an effective treatment option for delirium, while, benzodiazepines have instead been an independent risk factor for delirium. Misconceptions about the treatment and occurrence of delirium impair adequate recognition and treatment of delirium [4].

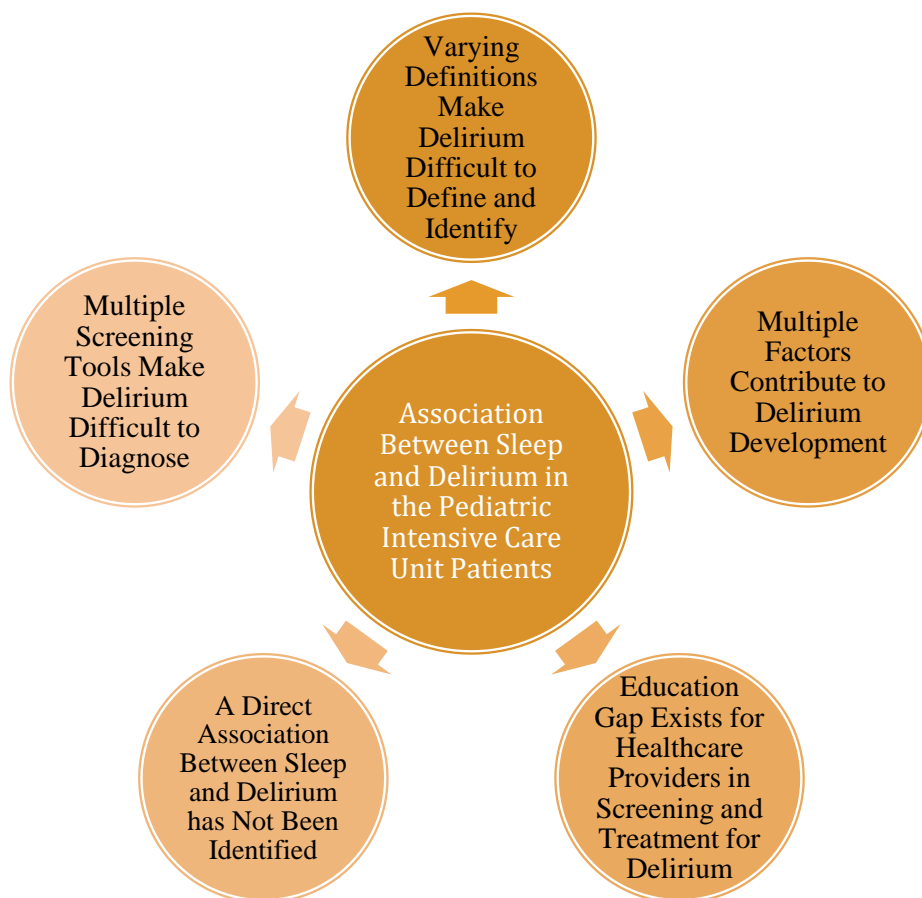
Along with Flaigle et al. [4], Bettencourt and Mullen [6] discovered there was a severe gap in the frequency of delirium screening in PICUs. They found only 2% of health care professionals who are part of the World Federation of Pediatric Intensive and Critical Care Societies comply with the recommendation for screening every PICU patient at least once a shift for delirium. Along with this knowledge, it was found that 71% of health care professionals admitted to not screening for delirium in PICU patients at all [6]. These practices are alarming to all those concerned with the health and well-being of children in the PICU and are representative of the education gap that exists among healthcare providers.

#### 4.6 Summary of Findings

For this systematic review of the literature, resources from the top five levels of evidence were used. Diverse designs were included in this literature review. The literature, as seen in Appendix A, included 1 systematic review of randomized controlled trials, 2 randomized controlled trials, 1 point prevalence study, 2 cohort studies, 3 literature reviews, and 1 qualitative study. The hierarchy of literature ranges from level I to level VII with level I as the highest level of evidence [8]. An illustration of the hierarchy of literature for this current study can be found in Figure 2.

The identification of multiple themes occurred after collecting pertinent literature and reviewing it thoroughly. One theme was varying definitions of delirium make delirium difficult

to define and identify. Another theme was that multiple screening tools make delirium difficult to diagnose. Additional themes were a direct association between sleep and delirium has not been identified, multiple factors contribute to delirium development, and an education gap noted in delirium screening and treatment. These themes found in the literature review help to answer the PICOT question, as delirium is a complex diagnosis. Since there are many unknowns, it cannot be concluded that a lack of sleep alone puts PICU patients at an increased risk for developing delirium when compared to patients getting adequate sleep. These themes can be reviewed in Figure 3 below.



**Figure 3. Themes - Association between sleep and delirium in the pediatric intensive care patients.**

## 5. DISCUSSION

Multiple definitions of delirium exist. One major challenge of addressing the prevalence and related risk factors for delirium in PICU patients is the fact that different definitions of delirium exist. Along with the differing definitions of delirium, multiple pediatric delirium screening tools with different diagnostic criteria are being used. As these screening tools are being used

throughout hospitals, it is difficult to compare data related to pediatric delirium and its development and to define a relationship between sleep and delirium. Data collection, comparison, and analysis of pediatric delirium could occur more seamlessly if a standardized pediatric delirium screening tool was formed. This may need to be researched further.

### **5.1 Recommendations**

Care for PICU patients involves many people and skills. It is important to involve families and pediatric patient caregivers in helping to manage the patients' delirium to comfort them. Families and support systems play a large role in health promotion for PICU patients. Visitation of PICU patient's friends and peers can also help to improve patient satisfaction and healing.

Healthcare professionals interacting with PICU patients need to be better educated on how and when to screen for delirium, how to identify delirium, and what treatments to anticipate for delirium. Nurses are not only in a prime position to identify and treat delirium in PICU patients but also seek to prevent the occurrence of delirium in the first place. To do so, nurses should not only encourage sleep and educate their patients on the importance of sleep, but also establish an environment conducive to sleep by reducing noise and light levels [6]. Posting a personalized patient schedule to the patient's door to alert all interdisciplinary team members of the patient's daily schedule will be beneficial. Efforts should be focused on controlling the entire PICU environment to help prevent the development of delirium. It may be necessary for physicians to prescribe melatonin for pediatric patients to help them sleep and maintain an appropriate sleep-wake cycle. One study warns, diphenhydramine should be avoided as it may make delirium worse [7].

### **5.2 Need for Additional Research**

While many studies have researched delirium in the adult population, very few studies have looked specifically at delirium in the pediatric population. It is important to recognize that differences in delirium exist between the adult and the pediatric populations. Calandriello et al. [9] proclaimed, *a direct relationship of sleep disturbance and delirium has not been evaluated in pediatric critical illness*. Research should be conducted in hospital PICUs to evaluate the occurrence of delirium in these hospital units. Research should also include the staff's knowledge of delirium, any delirium screening tools in use, and any delirium protocols in use. Studies should be done at multiple hospitals, in various locations, and include all shifts.

### 5.3 Weaknesses of the Study

One weakness of this study is the number of articles used. While only 10 sources were used in this literature review, the use of additional sources would have been valuable. Of additional importance is that limited research articles were available on this topic during this search. Finding the articles that are included in this review took hours of searching and analyzing. Thus, additional research needs to be accomplished to gain a better grasp on this topic.

## 6. CONCLUSION

Conclusively, many variables can lead to a PICU patient's development of delirium. While sleep is one likely variable, there is a lack of available research that would attest a definite association between lack of sleep and the development of delirium. Regarding the question of how lack of sleep affects a PICU patient, it can be related to the development of delirium and how delirium hinders health and healing in this patient population. Since delirium is a serious condition for a child, nurses and all members of the healthcare team must be able to identify and prevent delirium development. While there may not be literature defining a direct association between sleep and delirium, it is crucial to educate nurses on how to provide a healing, restful environment that would promote health for every PICU patient.

## REFERENCES

1. American Association of Critical-Care Nurses. (2016). Assessment and management of delirium across the life span. *CriticalCareNurse*, 36(5), 14-19. Retrieved from <http://dx.doi.org/10.4037/ccn2016242>
2. American Nurses Association. (2016). *Summary of ANA's delirium survey* [PowerPoint slides]. Retrieved from <https://www.nursingworld.org/~4afeb1/globalassets/practiceandpolicy/innovation--evidence/delirium-survey-ppt-20160517rev.pdf>
3. Kawai, Y., Weatherhead, J., Traube, C., Owens, T., Shaw, B., Fraser, E.,...Niedner, M. (2017). Quality improvement initiative to reduce pediatric intensive care unit noise pollution with the use of a pediatric delirium bundle. *Journal of Intensive Care Medicine*, 34(5), 383-390. doi:10.1177/0885066617728030
4. Flaigle, M. C., Ascenzi, J., & Kudchadkar, S. R. (2016). Identifying barriers to delirium screening and prevention in the pediatric ICU: Evaluation of PICU staff knowledge. *Journal of pediatric nursing*, 31(1), 81–84. doi:10.1016/j.pedn.2015.07.009
5. Traube, C., Silver, G., Reeder, R. W., Doyle, H., Hegel, E., Wolfe, H. A., ... Bell, M. J. (2017). Delirium in critically ill children: An international point prevalence study. *Critical care medicine*, 45(4), 584–590. doi:10.1097/CCM.0000000000002250
6. Bettencourt, A., Mullen, J. E., (2017). Delirium in children: Identification, prevention, and management. *CriticalCareNurse*, 37(3), 9-18. doi: 10.4037/ccn2017692
7. Bryant, K. J., (2018). Pediatric delirium in the cardiac intensive care unit: Identification and intervention. *CriticalCareNurse*, 38(4), 1-7. doi: 10.4037/ccn2018947
8. Schmidt, N. A., & Brown, J. M. (2019). *Evidence-based practice for nurses: Appraisal and application of research*, (4th ed.). Burlington, MA: Jones & Bartlett Learning.
9. Calandriello, A., Tylka, J. C., & Patware, P. P. (2018). Sleep and delirium in pediatric critical illness: What is

the relationship? *Medical Sciences*, 6(4), 90-107. doi:10.3390/medsci6040090

10. Thom, R. (2017). Pediatric delirium. *The American Journal of Psychiatry*, 12(2), 6-8. doi:10.1176/appi.ajp-rj.2017.120203

11. Traube, C., Silver, G., Gerber, L., Kaur, S., Mauer., Kerson, A.,...Greenwald, B. (2018). Delirium and mortality in critically ill children: Epidemiology and outcomes of pediatric delirium. *Journal of Critical Care Medicine*, 45(5), 891-898. doi:10.1097/CCM.0000000000002324

12. Bruni, O., & Brambilla, P. (2017). Impact of different recommendations on adequacy rate for sleep duration in children. *Italian Journal of Pediatrics*, 43(14). doi: 10.1186/s13052-017-0329-0

13. Vet, N., Wildt, S., Verlaat, C., Knibbe, C., Mooij, M., Woensel, J.,... & Hoog, M. (2016). A randomized controlled trial of daily sedation interruption in critically ill children. *Intensive Care Medicine*, 42, 233-244. doi:10.1007/s00134-015-4136-z

