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Implementing the Richmond Agitation-Sedation Scale to Assess Delirium in a Pediatric ICU

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Delirium is an acute cerebral dysfunction incurred in the setting of systemic illness or because of treatment efforts (Silver et al., 2015). Delirium presents acutely with a fluctuating change in a patient's awareness. The pathophysiology is complex and multifactorial, including alterations in neurotransmission, cerebral blood flow, energy metabolism, and disordered cellular homeostasis (Silver et al., 2015). In the Pediatric Intensive Care Unit (PICU), it results from the underlying illness, treatment side effects, and the abnormal intensive care unit environment. There are three different types of delirium: hypoactive, hyperactive, and mixed (Holly, Porter, Echevarria, Dreker, & Ruzehaji, 2018, p. 24). Delirium has not been studied in pediatrics to the extent that it has been in adults. In adults, the prevalence is 60-80% in ventilated patients and 20-60% in non-ventilated patients (Smith et al., 2011, pg. 150). In pediatrics, delirium is associated with increased length of intensive care unit (ICU) stay, higher mortality risk, post-traumatic symptoms, increased cost, and possible neurocognitive dysfunction after discharge (Kaur et al., 2020, p. 409). Due to the wide variety of ages and development in pediatrics, delirium is often underreported and undertreated (Flaigle, Ascenzi, & Kudchadkar, 2016).

Children with developmental delay are among the highest risk patients for developing delirium in the intensive care unit (ICU) (Silver et al., 2015). Patients with developmental delays account for approximately 38% of the critical care population (Kaur et al., 2020, p. 409). Pediatric patients with abnormal brain function at baseline are more susceptible to the body's stress and metabolic changes during illness. Patients with developmental delays are often hard to assess in the critical care setting. It takes a very detailed history to understand the patient's baseline (Silver et al., 2015). Silver et

al. (2015) found that developmentally delayed children were diagnosed three times more than typically developing children with delirium. Their study found that out of 50 PICU patients, 29% of them were diagnosed with delirium. They also noted that 24% had a prior diagnosis of developmental delay (Silver et al., 2015).

The early recognition and management of delirium in the pediatric population can reduce tests such as laboratory work, imaging, stress on the family, and unnecessary costs (Holly et al., 2018, p. 34). Currently, the PICU at an urban Midwest children's hospital uses the Cornell Assessment of Pediatric Delirium (CAPD) delirium screening tool. This tool has been verified in pediatrics and enhances the detection of delirium. The CAPD screening tool has a reported specificity of 79% and a sensitivity of 94% in critically ill children (Smith et al., 2016, p. 593). This tool can be used for children of any age and varying developmental stages to assess behavior. As such, the CAPD tool has proven to be a promising clinical screening tool and is validated for use in the PICU setting to detect delirium in most children (Kaur et al., 2020, p. 409).

A CAPD score is completed every shift by the bedside RN, and a score of nine or higher that is consistently tracked indicates that a child is experiencing delirium (Simone et al., 2017, p. 3). However, the CAPD has a decreased specificity for children with a developmental delay because, without a precursor tool, the score may be interpreted as static encephalopathy (Kaur et al., 2020, p. 410). The CAPD is an observational tool that does not consider a child's neurological baseline and needs a precursor tool to capture the fluctuating level of awareness (Kaur et al., 2020, p. 410). The current precursor tool used in the PICU at the urban Midwest children's hospital for the proposed site is the State Behavior Scale (SBS). This tool, as shown in the research, is only validated for capturing

a patient's awareness while they are on mechanical ventilation and sedation (Kerson et al., 2016). Because the current tool does not capture a patient's awareness of all varying levels of support, the Richmond Agitation Sedation Scale (RASS) was researched. It was found that the RASS is a precursor tool that determines a patient's awareness with little limitation in varying levels of responsiveness and respiratory support (Kerson et al., 2016).

Given the perspectives offered and validated by the research, it is abundantly clear that the purpose of this quality improvement project was to establish early identification of delirium in the intensive care setting to reduce the impact of long-term patient outcomes. As such, the aim of this project was to implement the use of the RASS in addition to CAPD scoring to increase delirium screening in the PICU at an urban Midwest children's hospital. The IOWA Model of Evidence-Based Practice helped guide interdisciplinary conversations and efforts and the implementation of the RASS scale. The primary outcome measure was successfully implementing the RASS scale into the PICU standard of care as completion of delirium assessment at least 50% of the time. The secondary outcome measure is notification to the provider team of the range of RASS scores over 24 hours and the daily CAPD score during daily rounds. To guide the literature review and obtain the most relevant evidence, the following study questions were developed: In pediatric patients aged two months to twenty-one years in the PICU, what is the effect of RASS and CAPD scoring compared to SBS and CAPD scoring when managing patients for delirium? What is the effect of the scoring in previously diagnosed developmentally delayed patients?

<center>Literature Review</center>

A review of the literature regarding the use of the RASS scale and CAPD compared to the State Behavior Scale (SBS) and CAPD was used to guide the research. The search terms used were delirium, pediatric, screening tools, Richmond Agitation-Sedation Scale, Cornell Assessment of Pediatric Delirium, and post-intensive care syndrome. EBSCO host, PubMed, Cochrane Review, and the University of Missouri- St. Louis library websites were used to search these terms. Each search looked at the last five years of literature except for the inquiry related to the CAPD, which was expanded to the previous ten years due to not enough results. The inclusion criteria were articles that were full text, in English, related to pediatrics and critical care. The exclusion criteria were any anesthesia, surgical, or hematology, and oncology-related delirium articles as they are too specific and do not relate to the proposed patient population. Articles that included ages above 21 years of age were also excluded. All studies were performed in the United States. After removing duplicates, titles and abstracts were reviewed for inclusion and exclusion criteria, and studies not related to the RASS scale. Ten final articles were used in this synthesis.

A second literature review was performed regarding pediatric primary care and post-intensive care syndrome (PICS) related to undiagnosed and under-treated delirium. A Cochrane review search was done with the keywords PICS. This yielded 15 results, and they were assessed for eligibility. A keyword search for PICS was also done in PubMed, which yielded 247 results. Pediatric was added to the keyword search. The search was then narrowed to full text and articles published in the last five years. This yielded 30 results for review. Five articles were examined further after excluding articles based on their titles and abstracts. Two additional articles were used in this synthesis,

creating a total of 12 total articles for this literature review. Articles used in this review focused on the barriers to delirium screening, delirium screening tool limitations, the validation of the RASS scale and its usage, the importance of using the RASS and CAPD for delirium screening, and finally the convolution of delirium in post-intensive care syndrome (PICS) and how it effects pediatric primary care providers.

Simone et al. (2017) and Flaigle et al. (2016) found barriers to delirium screening. Common conclusions were the lack of education provided to the staff, difficulty with use of delirium screening tools, and investment of the providers. The quality improvement project done by Simone et al. (2017), found that collaborative practice among the bedside staff and provider team can have positive improvement on delirium screening. The screening compliance in that study showed a 96% compliance rate in the first month of implementation and stayed at 95% for the next 22 months (Simone et al., 2017).

The few delirium screening tools validated in pediatrics had limitations when used in a PICU setting. Kerson et al. (2016), Smith et al. (2011), and Smith et al. (2016) found that the RASS scale fills these gaps. Tools such as the Comfort Scale and Comfort-B, are too comprehensive for a PICU environment (Kerson et al., 2016, p. 5). The Pediatric Sedation-Agitation Scale (P-SAS) has not been formally tested in pediatrics (Kerson et al., 2016, p. 5). The Pediatric Confusion Assessment Method for Intensive Care Unit (pCAM-ICU) and the Preschool Confusion Assessment Method for the ICU (psCAM-ICU) have both been validated in pediatrics by Smith et al. (2011) and Smith et al. (2016). However, the pCAM-ICU is not valid for children under the age of five and the psCAM-ICU does not have the increased specificity for developmentally delayed

children. The State Behavior Scale (SBS), used at the proposed project

site children's hospital, only determines a pediatric patient's awareness while on sedation

and mechanical ventilation (Kerson et al., 2016, p. 5). These tools are not adaptable to

children of all levels of respiratory support, agitation, and sedation continuums (Kerson et

al., 2016, p. 1).

The RASS scale is a delirium screening tool that has been validated for awareness

in the pediatric population and can be used in patients with varying levels

of responsiveness and respiratory support (Kerson et al., 2016, p. 4). Kerson et al. (2016),

used the visual analog scale (VAS) and the University of Michigan Sedation Scale

(UMSS) to validate the RASS scale in critically ill children in an observational study.

While many studies validated use of the RASS scale in adults, very few have done this in

the pediatric population. Using the RASS in a pediatric population, Silver et al. (2015)

found that certain subgroups are more susceptible to delirium in the PICU. One of those

subgroups included the developmentally delayed. A study by Sessler et al. (2002) used

the RASS scale in adults and showed a high validity rating ($r = 0.93$) using the same

VAS analog in the Kerson et al. (2016) pediatric study. Ely et al. (2003) performed a

prospective study in a 38-bed adult ICU and found differences in levels of consciousness

($P<.001$) and correct fluctuations of patients' awareness over time ($P<.001$) using the

RASS scale.

In the literature, the RASS scale's current practical use is to determine a "RASS

goal" specific to the patient and their clinical status (Kerson et al., 2016, p. 5). This goal

number is to be determined by the provider team. The nurse then scores the patient every

four hours minimum dependent on their agitation-sedation and awareness level. The

Kerson et al. (2016) study did not include severely auditory and visually impaired

patients due to the scale being dependent on responsiveness to eye contact and verbal

response. As shown in Table 1, "the RASS scale runs from -5 (unarousable), through 0

(alert and calm), to +4 (combative)" (Kaur et al., 2020, p. 410). The bedside RN assesses

the level of awareness every four hours and documents the RASS score. If the RASS

score varies by two in a twenty-four-hour period and a CAPD score is greater than or

equal to nine, the patient would be diagnosed with delirium (Kaur et al., 2020, p. 411).

The literature has also shown that the RASS and CAPD scores combined have

increased specificity for the developmentally delayed. In a study published by Kaur et al.

(2020), the study evaluated the RASS and CAPD in a prospective observational double-

blind cohort study to determine if developmentally delayed children could be accurately

scored for delirium. Delirium screening tools such as the CAPD were developed for

typical pediatric development resulting in unreliable results for developmentally delayed

children. In the Kaur et al., (2020) study, the patients were scored on the CAPD twice-

daily according to the clinical practice guidelines published by the European Society of

Pediatric and Neonatal Intensive Care. A RASS scale was performed every four hours

and as often as every hour if there was a fluctuation in awareness. If the patient met the

criteria of a CAPD score of nine or above and had a RASS score fluctuation of two points

over a twenty-four-hour period then they were diagnosed with delirium (Kaur et al.,

2020). This diagnosis was assessed against a once-a-day psychiatric evaluation from the

Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, criteria for

delirium. "Specificity of the Cornell Assessment for Pediatric Delirium + Richmond

Agitation-Sedation Scale fluctuation was 97% (CI, 90-100%), positive predictive value of

Cornell Assessment for Pediatric Delirium + Richmond Agitation-Sedation Scale fluctuation was 89% (CI, 65-99%); and negative predictive value remained acceptable at 87% (95% CI, 77-94%)" (Kaur et al., 2020, p. 409). These results reflected higher accuracy of scores (66%; CI, 54-77%) when the CAPD was scored alone (Kaur et al., 2020, p. 412). The CAPD and the RASS scored together is essential in knowing if there is an acute change from the child's developmental baseline. Based on the literature, few studies have been done on the RASS scale in pediatrics and even fewer on the RASS scale as it relates to developmentally delayed children. The Kerson et al., (2016) study is one of the first and only studies done on the RASS scale's validity in pediatrics. Also, Kaur et al. (2020) is also one of the only studies done on the specificity of the RASS scale on developmentally delayed children. These studies showed high predictive values in most pediatric ICU patients' delirium screening. Hence increased identification of delirium particularly in developmentally delayed children hospitalized in a pediatric ICU is important toward proper discharge planning and subsequent problems with post intensive care syndrome (PICS).

PICS is a convolution of physical, psychological, and cognitive symptoms (Hartman, Williams, Hall, Bosworth, & Piantino, 2020). Delirium during critical illness is a risk factor for PICS (Hartman et al., 2020). The data has shown that delirium causes post-traumatic stress symptoms in children after discharge from the hospital (Hartman et al., 2020). Several studies done in the adult population conclude that there is uncertainty in the improvement of care after ICU discharge with the use of follow-up clinics (Schofield-Robinson, Lewis, Smith, McPeake, & Alderson, 2018). The research also shows that 87% of PICU survivors will require ongoing care after discharge (Hartman et

al., 2020). These articles express the difficulty in gathering pediatric data on PICS, especially in follow-up care, due to the lack of literature. Nevertheless, PICS is an outcome that can be improved with proper, early identification in the PICU setting.

The evidence-based practice framework selected to guide this project is the IOWA Model of Evidence-Based Practice. This model was chosen for the systematic approach in a new practice change. The specificity of delirium screening for all patients was an identified concern by the pediatric attendings, advanced practice registered nurses (APRNs), and bedside staff at an urban Midwest children's hospital. The IOWA Model of Evidence-Based Practice helped pilot this quality improvement project and enhanced the investment and communication between the stakeholders. The IOWA Model of Evidence-Based Practice was used to guide this quality improvement project to implement the RASS scale in the PICU.

The literature highlighted that delirium screening tools currently being used do not accurately screen for all PICU patients. The validated RASS scale increases the specificity of delirium screening for all patients, especially the developmentally delayed, contributing to 38% of the PICU population (Kaur et al., 2020, p. 409). The largest gap in the literature is the lack of research being done in pediatrics. Many of the studies being done are the first in their field.

<div align="center">Methods</div>

Design

This was a quality improvement initiative using an observational descriptive design. The method used was a retrospective-prospective medical record review.

Setting

The project site for this quality improvement project took place in a PICU in a hospital situated in the center of a major metropolitan area and frequently receives referrals for critically ill patients around the Midwest who need specialized, high-level care. At any given time, the PICU can care for 40 pediatric patients who require varying degrees of advanced mechanical support and care. The patients' socioeconomic backgrounds in the PICU are vastly different with many supported by resources of the hospital. Additionally, the cultural values and linguistic preferences of the patients within the PICU are similarly variable. The PICU is staffed by well over 170 employees who uphold a variety of positions. The bedside nursing staff alone compromises 152 of those positions. Other team members include attending physicians, fellow physicians, resident physicians, APRNs, patient care technicians, respiratory therapists, physical therapists, occupational therapists, speech therapists, and nursing executive managers.

Sample

A convenience sample was used for the study. Inclusion criteria were patients ages 2 months to 21 years admitted to the PICU between October 2020 to December 2020 for retrospective data and June 2021 to September 2021 for prospective data. The patients had an expected ICU stay for longer than 24 hours and were intubated on mechanical ventilation. Exclusion criteria were patients ages 2 months to 21 years with hearing and vision impairments.

Data Collection/Analysis

Data was collected by medical record review and personal information was de-identified. The data was aggregated by the data collector at the urban Midwest children's hospital and disseminated into an excel spreadsheet. Any

patient identifiers were taken out of the data. As shown in Table 2, the

patients admitted between October 2020 and December 2020 were given a number 20-1,

20-2, 20-3… Demographical data such as age, gender, race, admitting

diagnosis, diagnosis of developmental delay, PICU length of stay (LOS), other

interventions, number of RASS scores in 24 hours, and number of CAPD scores in 24

hours were coded. Other interventions included extracorporeal membrane oxygenation

(ECMO) and continuous renal replacement therapy (CRRT). ECMO was given a yes or

no and CRRT was given a yes or no to identify them. As shown in Table 3, the patients

admitted between June 2021 and September 2021 were given a number 21-1, 21-2, 21-

3... to de-identify patients. Their demographical data includes age, gender, race, admitting

diagnosis, diagnosis of developmental delay, PICU LOS, other interventions, number of

RASS scores in 24 hours, number of CAPD scores in 24 hours, and number of times the

range of RASS scores over 24 hours and daily CAPD scores are presented on daily

rounds. Anticipated data analysis methods include descriptive statistics standard

deviation, skewness, and kurtosis, and first and third quartile. This will highlight any

potential relationships between the variables.

Approval Processes

Approval for this clinical scholarship project was obtained by the PICU

leadership team and the attending and fellow physicians who oversee delirium studies. A

doctoral committee consisting of a committee chair, university committee member, and

research site member was developed and approved this project. International Review

Board (IRB) approval was obtained through the University of Missouri St. Louis before

starting the clinical scholarship project. Approval was given by St. Louis Children's

Hospital to determine that a separate IRB approval was not necessary. This project's risks were minimal, the intervention was a validated delirium screening tool used for pediatric patients, and the typical standard of nursing care was maintained. Benefits included early delirium detection and management. There were no foreseen ethical risks to the patient population in which the screening tool was used.

Procedures

In the preliminary phase of the project, a team of attending physicians, fellows, and APRNs studying delirium in the PICU convened about the current delirium screening tools being used. After a literature review and meeting with these clinical experts, a decision was made to implement the RASS delirium screening tool. The RASS delirium screening tool is a scale that has been validated for pediatric use. The next step was to have the RASS scale implemented into the electronic health record by the EPIC liaison. The project's implementation phase began with development of a bedside education sheet that was made about delirium, the RASS scale, the CAPD, and special considerations of the scoring process for both tools. This education was disseminated through virtual meetings and individualized bedside education along with educational signs posted around the unit. A bedside resource sheet that details the education was also produced. A bedside rounding script was made to include the RASS score and CAPD so the provider team can be notified of the scores during rounds. This project's implementation phase consisted of having bedside nurses score their patients' RASS and CAPD and presented those range of scores over 24 hours during daily rounds.

Results

Ninety-seven charts met eligibility criteria and underwent review. Fifty-two of those charts were patient admissions between October 1, 2020, and December 1, 2020. The remaining forty-five charts reviewed were patient admissions between June 1, 2021, and September 1, 2021. In 2020 62% of patients were male, and 38% were between the ages of 15-20 years old, the most frequent age group identified. In 2021 64% of patients were male, and 42% were less than one year old, the most frequent age group identified. More than 87% of patients were admitted to the PICU longer than twenty-four hours in the pre and post-intervention groups. Only six patients were identified as needing ECMO and CRRT interventions in the pre-intervention charts, and five were identified post-intervention. Demographic data is shown in tables 4, 5, 6, and 7.

The most frequently observed category for SBS charting compliance was 33%. Only four charts were 100% compliant in charting SBS scores. These results are shown in table 8. The most frequently observed category for RASS compliance charting was 100%. Only 16% of charts were non-compliant, and the lowest compliance percentage was 80%. These results are shown in Table 9. In the pre-intervention group, 19% of patients were identified as being diagnosed with a developmental delay. In the post-intervention group, only 4% of patients were identified as being diagnosed with a developmental delay. In the post-intervention data, 26% of charts were compliant with reviewing delirium screening with the providing team. These results are shown in Table 10. For patients with extra interventions such as ECMO and CRRT, each chart was compliant for RASS screening. Still, only one chart was compliant for reviewing delirium screening with the providers during daily rounds. For the developmentally delayed

patients, each chart was compliant for RASS screening, but only 66% compliant for

reviewing delirium screening with the provider.

<div align="center">Discussion</div>

In reviewing the analysis of charting compliance for SBS and CAPD screening

compared to RASS and CAPD screening, the RASS and CAPD charting compliance

percentage was 67% in the PICU. In developmentally delayed patients, charting

compliance was 100%; however, nurses only reviewed with providers 50% of the time.

The analysis results showed that nurses managing the patients with the highest

susceptibility to delirium, such as those on ECMO and CRRT and those with

developmental delay, were compliant with delirium charting; however, they were not

consistent with discussing delirium susceptibility with providers.

Due to the waxing and waning of delirium along with the unpredictability of the

PICU, the bedside nurse must understand the absence or presence of delirium. The

multidisciplinary education given to the nurses and the providers on the RASS suggests

there was an impact on the charting compliance increase post-intervention. However,

even with building a new script for daily rounds to include the RASS and CAPD scores

reviewed by the team, it was only reported 26% of the time. Many publications have

studied delirium's short and long-term effects, so discussing delirium with the providing

team is essential in managing these complex patients.

Barriers to this project included the COVID-19 pandemic and its effect on

behavioral health patients. Due to COVID-19 and the influx of behavioral health patients

that this Midwest hospital received in the proposed intervention months of this clinical

scholarship project, it delayed implementing the RASS screening tool into the medical

record system for five months. This delay might have impacted some findings for the project. Most of the education was done in December and January for the staff and the RASS did not go live in the medical record until June 1st.

After the RASS screening tool went live in this hospital's PICU, the Cardiac Intensive Care Unit researched the use of the RASS and gave education to their staff, and it has now gone live in their ICU. The pediatric pain service has also reached out for education, and a presentation was given on the RASS screening tool. They are currently looking into using it for their specialty in other areas of the hospital. The PICU has started a sedation protocol that requires RASS charting and delirium screening of patients. This protocol is the sustaining change that the RASS needs for the future. Future clinical scholarship projects could include an interrater reliability study for the RASS and evaluating the sedation protocol using the RASS.

The findings for this study are limited by the review of patient charts at a single institution. Delirium is a complex side effect of PICU admissions, and its assessment and screening are mostly subjective. Nurses and providers manage many diagnoses and other complex issues with these patients. They may not realize delirium's short and long-term effects, thus leading to poor diagnosis and management.

Conclusion

Delirium is a distressing symptom resulting from PICU interventions and can negatively impact cognitive development after discharge. While delirium has been extensively researched in adults, there is minimal evidence for treatment in pediatrics. The RASS screening tool can be used for any patient in the PICU, including those with developmental delay. Unlike other screening tools that can only be used with

mechanically ventilated patients and on sedation that are developmentally normal. While

used in conjunction with the CAPD, the RASS screening tool shows a specificity of 97%.

Furthermore, charting compliance is an integral part of the screening and management of

delirium. Effective strategies such as education of all staff should be well planned before

dissemination and implementation.

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Appendix A

Table 1

Scoring for the Richmond Agitation-Sedation Scale

+4	Combative	Overtly combative or violent
+3	Very Agitated	Pulls on or removes tube(s); aggressive
+2	Agitated	Frequent non purposeful movement
+1	Restless	Anxious or apprehensive
0	Alert and Calm	Spontaneously pays attention to caregiver
-1	Drowsy	Not fully alert, but sustained (>10s) awakening, with eye contact, to voice
-2	Light Sedation	Briefly (<10s) awake with eye contact to voice
-3	Moderate Sedation	Any movement (but no eye contact) to voice
-4	Deep Sedation	No response to voice, but movement to physical stimulation
-5	Unarousable	No response to voice or physical stimulation

Appendix B

Table 2

Data Collection Excel Spreadsheet October 2020-December 2020

	Age	Sex	Race	PICU LOS	ECMO	CRRT	# of SBS scores during admission	# of CAPD scores during admission	% Compliance SBS	Diagnosis of Developmental Delay
20-1										
20-2										
20-3										
20-4										
20-5										
20-6										
20-7										
20-8										
20-9										
20-10										
20-11										
20-12										
20-13										
20-14										
20-15										
20-16										
20-17										
20-18										
20-19										
20-20										
20-21										
20-22										
20-23										
20-24										
20-25										
20-26										
20-27										
20-28										
20-29										
20-30										
20-31										
20-32										
20-33										
20-34										
20-35										
20-36										
20-37										
20-38										
20-39										
20-40										

Appendix C

Table 3

Data Collection Excel Spreadsheet June 2021- September 2021

	Age	Sex	Race	PICU LOS	ECMO	CRRT	# RASS scores during admission	# CAPD scores during admission	% Compliance RASS	Diagnosis of Developmental Delay	Compliance of scores presented during rounds
21-1											
21-2											
21-3											
21-4											
21-5											
21-6											
21-7											
21-8											
21-9											
21-10											
21-11											
21-12											
21-13											
21-14											
21-15											
21-16											
21-17											
21-18											
21-19											
21-20											
21-21											
21-22											
21-23											
21-24											
21-25											
21-26											
21-27											
21-28											
21-29											
21-30											
21-31											
21-32											
21-33											
21-34											
21-35											
21-36											
21-37											
21-38											
21-39											
21-40											

Appendix D

Figure 1. St. Louis Children's Hospital IRB Exemption Form

Children's
HOSPITAL · ST. LOUIS

One Children's Place
St. Louis, Missouri 63110-1077
StLouisChildrens.org

Date: December 10, 2020

Dear Ms. Paridy:

This letter confirms the proposed improvement project titled, **"Implementing the Richmond Agitation-Sedation Scale to Assess Delirium in a Pediatric ICU"** has been reviewed and is not considered human subject research. Therefore, review and approval by the Washington University in St. Louis' institutional review board is not required. The Quality, Safety & Practice Excellence Department of St. Louis Children's Hospital approves this project and request the project team members present an update at the hospital's Quality & Safety Coordinating Subcommittee (QSCS) meeting upon completion.

Sincerely,

Joan R. Smith, PhD, RN, NNP-BC, FAAN
Director Quality, Safety & Practice
Excellence
St. Louis Children's Hospital

Beverly S. Brozanski MD, CPHQ
Professor of Pediatrics
Vice Chair of Quality and Safety
Washington University School of Medicine
Vice President of Pediatric Quality and
Patient Safety for BJC Healthcare and St.
Louis Children's Hospital

Lisa M. Steurer, PhD, RN, CPNP-PC
Manager, Research & Outcomes
Jonas Nurse Scholar
St. Louis Children's Hospital

St. Louis Children's Hospital at Washington University Medical Center   BJC HealthCare

Appendix E

Table 4

Pre-Intervention Ages

Variable	*n*	*%*
Patient_Encounter_Age_		
<1 year	18	34.62
5-10 years	3	5.77
15-20 years	20	38.46
1-5 years	9	17.31
10-15 years	2	3.85
Missing	0	0.00

Table 5

Pre-Intervention Patient Sex

Variable	*n*	*%*
Patient_Sex		
1	20	38.46
2	32	61.54
Missing	0	0.00

Table 6

Post-Intervention Ages

Variable	*n*	*%*
Patient_Encounter_Age		
1-5 years	9	20.00
15-20 years	6	13.33
<1 year	19	42.22
10-15 years	7	15.56
5-10 years	3	6.67
11 years	1	2.22
Missing	0	0.00

Table 7

Post-Intervention Patient Sex

Variable	*n*	*%*
Patient_Sex		
1	16	35.56
2	29	64.44
Missing	0	0.00

Table 8

SBS Charting Compliance

Variable	*n*	*%*
Compliance_SBS		
33.33%	5	9.62
25.00%	4	7.69
26.19%	2	3.85
16.67%	4	7.69
13.43%	1	1.92
28.89%	2	3.85
35.94%	1	1.92
20.00%	1	1.92
0.00%	1	1.92
37.50%	1	1.92
26.61%	1	1.92
50.00%	4	7.69
27.78%	3	5.77
17.46%	1	1.92
12.50%	3	5.77
95.50%	1	1.92
22.92%	1	1.92
19.44%	2	3.85
14.10%	1	1.92
23.81%	1	1.92
28.27%	1	1.92
26.67%	1	1.92
22.22%	3	5.77
28.70%	1	1.92
18.75%	1	1.92

	1	1.92
22.50%	1	1.92
100.00%	4	7.69
Missing	0	0.00

Table 9

RASS Charting Compliance

Variable	*n*	*%*
Compliance_RASS		
83.3%	2	4.44
91.7%	1	2.22
8.3%	1	2.22
92.9%	1	2.22
80.0%	1	2.22
87.0%	1	2.22
100.00%	38	84.44
Missing	0	0.00

Table 10

Charting Compliance Reviewed with Care Team

Variable	*n*	*%*
Compliance_Reviewed_with_Care_Team		
14.3%	1	2.22
25.0%	2	4.44
60.0%	1	2.22
57.1%	1	2.22
63.6%	1	2.22
80.0%	1	2.22
0.0%	12	26.67
100.0%	12	26.67
50.0%	3	6.67
37.5%	1	2.22
7.7%	1	2.22
33.3%	2	4.44
58.3%	1	2.22
29.4%	1	2.22

58.8%	1	2.22
66.7%	1	2.22
13.3%	1	2.22
45.2%	1	2.22
11.1%	1	2.22
Missing	0	0.00