Overcoming Barriers to Delirium Screening in the Pediatric Intensive Care Unit

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BACKGROUND Delirium is associated with poor outcomes in adults but is less extensively studied in children.
OBJECTIVES To describe a quality improvement initiative to implement delirium assessment in a pediatric intensive care unit and to identify barriers to delirium screening completion.
METHODS A survey identified perceived barriers to delirium assessment. Failure modes and effects analysis characterized factors likely to impede assessment. A randomized case-control study evaluated factors affecting assessment by comparing patients always assessed with patients never assessed.
RESULTS Delirium assessment was completed in 57% of opportunities over 1 year, with 2% positive screen results. Education improved screening completion by 20%. Barriers to assessment identified by survey (n = 25) included remembering to complete assessments, documentation outside workflow, and "busy patient." Factors with high risk prediction numbers were lack of time and paper charting. Patients always assessed had more severe illness (median Pediatric Index of Mortality 2 score, 0.90 vs 0.36; $P < .001$), more developmental disabilities (moderate to severe pediatric cerebral performance category score, 54% vs 32%; $P = .007$), and admission during lower pediatric intensive care unit census (median [interquartile range], 10 [9-12] vs 12 [10-13]; $P < .001$) than did those never assessed (each group, n = 80). Patients receiving mechanical ventilation were less likely to be assessed (41.0% vs 51.2%, $P < .001$).
CONCLUSIONS Successful implementation of pediatric delirium screening may be associated with early use of quality improvement tools to identify assessment barriers, comprehensive education, monitoring system with feedback, multidisciplinary team involvement, and incorporation into nursing workflow models. (*Critical Care Nurse.* 2018;38[4]:57-67)

Delirium is a manifestation of cerebral dysfunction,[1] defined as an acute disturbance in attention, awareness, and cognition that fluctuates in severity and is not explained by an established neurocognitive disorder.[2] Delirium is estimated to occur in 20% to 80% of critically ill adults.[3-7] It has been associated with increased mortality rates, longer hospital stays, prolonged mechanical ventilation, greater reintubation rates, short- and long-term cognitive impairment, and posttraumatic stress disorder.[3,7-10]

Pediatric delirium has been studied less extensively. Investigators suggest that the incidence is 5% to 29% in critically ill pediatric patients.[11-16] Risk factors associated with delirium include young age (< 5 years), developmental delay, increased illness severity, and mechanical ventilation.[13,16,17] Delirium in pediatric intensive care unit (PICU) patients has been associated with prolonged hospitalization and increased

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hospital cost.[18] Furthermore, long-term outcome data support the association between delirium and increased mortality rate in children,[19] highlighting the need to recognize, prevent, and treat delirium in the PICU. Despite increasing recognition of the potential harm of delirium in children, recent survey data indicate that routine delirium screening occurs in only 2% of PICUs.[20]

Delirium rates as high as 29% have been reported in critically ill children.

Although implementing a validated delirium assessment tool is a crucial first step in delirium management, using it effectively and consistently may present challenges to a busy PICU practice. Identification of barriers to implementation is critical to both process improvement and reliable data collection.

Nurses spend significant time with patients and are most likely to identify early signs of delirium. In addition, nurses have a tremendous effect on factors most likely to prevent delirium, such as adequate pain management, avoidance of oversedation, maintenance of day-night routines, and provision of a comforting environment. Nursing care is the cornerstone of delirium detection, prevention, and treatment, which in turn increase patient well-being.

Herein we describe implementation of the Pediatric Confusion Assessment Method for the Intensive Care Unit (pCAM-ICU)[12] in a 16-bed PICU. To improve screening rates, we used survey data, failure modes and effects analysis (FMEA), and a retrospective case-control study to identify barriers to delirium assessment. This work emphasizes the utility of quality improvement (QI) methodology to guide implementation of delirium screening in the PICU.

Methods

Clinical Setting

The QI project setting was a 16-bed PICU in a large midwestern tertiary academic medical center. The patient population included medical and surgical patients requiring intensive and progressive care and solid-organ and bone marrow transplant recipients requiring general care. Postoperative cardiovascular surgical patients were admitted to a separate cardiovascular surgical intensive care unit and were not part of this project.

The PICU QI team members included PICU registered nurses (RNs) (H.L.C. and J.M.D.), a pediatric clinical nurse specialist (G.M.R.), pediatric intensivists (S.T. and R.J.K.), a pediatric critical care fellow (D.R.P.), and a PICU quality specialist (K.R.F.). Prior PICU QI experiences identified RN QI team members as informal nursing leaders and effective change agents. The PICU intensivists, clinical nurse specialist, quality specialist, and PICU RNs collaborated to develop a plan to implement delirium assessment, identify outcome measures, and evaluate data. The PICU fellow completed a retrospective case study to identify barriers to assessment.

Implementation of Delirium Assessment

The initial step in implementing delirium assessment into practice was selecting an assessment tool. Two validated pediatric delirium tools, the Pediatric Anesthesia Emergence Delirium scale and the pCAM-ICU, were available when the project started. The Pediatric Anesthesia Emergence Delirium scale (sensitivity, 0.64; specificity, 0.14) was developed to assess delirium of children emerging from general anesthesia.[21] A later PICU study[22] reported that this scale had a sensitivity of 0.91 and specificity of 0.98. The pCAM-ICU has been validated (sensitivity, 0.83; specificity, 0.99) in critically ill children aged 5 years

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or older. This tool assesses fluctuation of mental status, attention, altered level of consciousness, and disorganized thinking.[12] We selected the pCAM-ICU because it was validated in the PICU population, directly assessed cognition (disorganized thinking), and seemed more likely than the Pediatric Anesthesia Emergence Delirium scale to identify hypoactive delirium.

We assessed delirium twice daily and with status changes. Because of logistical difficulties in quickly incorporating the pCAM-ICU into the electronic health record (EHR), we elected to proceed with implementation of delirium assessment using a hybrid paper and electronic documentation system. We acknowledged that this approach was outside the usual nursing workflow and would increase workload, but we believed further delay of delirium assessment was contraindicated. The hybrid documentation system required completion of a paper form and transfer of pCAM-ICU results to the EHR. The paper form and documentation process were intermittently reviewed at nursing meetings and modified on the basis of feedback.

Staff education was the final step in delirium assessment implementation. Nursing education included the evidence and rationale supporting delirium assessment, instruction on pCAM-ICU completion, and an outline of the documentation process. Quality improvement team RNs provided education at mandatory professional development sessions through formal verbal presentation and interactive sessions in which nurses watched a video and practiced completing a delirium assessment. Attending physicians and pediatric residents received a shortened version of the nursing presentation through email. Upon implementation of the delirium assessment, PICU QI team members were available in the PICU to remind staff to complete assessments, assist with pCAM-ICU completion, and answer questions.

Nurses use a script to present information during daily multidisciplinary patient care rounds. We added delirium assessment results to the script to share positive delirium screen results and to stimulate delirium discussion with the health care team. We listed potential causes of delirium on the back of the nursing script as a resource for the team.

Outcome Measures

We defined successful implementation of delirium assessment into the PICU standard of care as completion of delirium assessment at least 90% of the time. A delirium assessment opportunity occurred when the patient met pCAM-ICU assessment criteria and was physically in the PICU during morning and evening nursing assessment times. The timing of delirium assessment was not prescriptive, allowing nurses to complete assessments according to patient needs and nursing workflow. Patients who met pCAM-ICU criteria were at least 5 years old and developmentally able to complete the assessment, had a Richmond Agitation Sedation Score greater than -4, and were not admitted with a new traumatic brain injury. Patients with a baseline developmental age of at least 5 years were considered developmentally able to complete the pCAM-ICU. Nurses determined baseline developmental age through assessment, patient history, and discussion with family members.

We determined completed delirium assessment rates by comparing the number of documented assessments with the total number of assessment opportunities. The total number of documented assessments was the number of pCAM-ICU forms returned to the QI team. We calculated and reviewed assessment completion rates at 9 months and at 1 year after implementation. Nursing staff received documented assessment data reports through a nursing newsletter and email. We analyzed documented delirium assessment rates of less than 90% and identified further interventions. Secondary outcome measures included the rate of positive delirium assessment results, physician notification of positive results, and psychiatry consultations for positive delirium assessment results.

Consistent and universal delirium screening is key to management.

Delirium Awareness and Education

Because the baseline screening documentation rate in our interim analysis was 51%, we implemented targeted interventions to increase delirium awareness and provide further education to increase assessment rates. Quality improvement team RNs sent a document by email to nurses reviewing the rationale for delirium assessment, assessment documentation, and negative outcomes associated with delirium. Delirium assessment documentation rates were discussed at nursing meetings and compliance rates posted at strategic locations within the unit to increase awareness and compliance. We solicited

Table 1 Failure modes and effects analysis

Process step analyzed	Success criteria	Potential failure mode[a]	Potential effects of failure
pCAM-ICU form prepared and readily available	Patient information added to form	Completed assessment not associated with patient and not recognized as completed	Assessment not completed or successful assessment not recognized
	Form placed at the bedside	Form not readily available	Delirium assessment not completed
Delirium assessment opportunity recognized	Delirium assessment opportunity completed	Delirium assessment opportunity not recognized because of knowledge deficit, lack of knowledge retention, or patient is intubated or developmentally delayed	Delirium assessment not completed
Decision made to complete the delirium assessment	Delirium assessment opportunity completed	No time to complete assessment	Delirium assessment not completed
		Unable to find worksheet	Delirium assessment not completed
		Unable to locate pCAM-ICU assessment tools (picture cards)	Delirium assessment not completed
Delirium assessment completed	Presence of delirium is recognized by the health care team	Decision made to not complete assessment	Health care team unaware of delirium presence and treatment not initiated
Delirium assessment documented	pCAM-ICU form completed and EHR updated	Form not completed and information not transferred to EHR	Delirium assessment not documented, health care team unaware of assessment results

Abbreviations: DET, detection; EHR, electronic health record; OCC, occurrence; pCAM-ICU, Pediatric Confusion Assessment Method for the Intensive Care Unit; RN, registered nurse; RPN, risk priority number; SEV, severity.

[a] A process step can have more than 1 failure mode.
[b] How severe is the effect to the patient (on a scale of 1 to 10, with 1 being no danger and 10 being extremely dangerous)?
[c] Estimate the frequency of the occurrence (on a scale of 1 to 10, with 1 being remote probability and 10 being certain probability of occurrence).
[d] How likely is it that you will detect the failure mode (on a scale of 1 to 10 with 1 being almost certain and 10 being no chance of detection)?

feedback regarding the documentation process, subsequently provided delirium assessment forms, and made process revisions.

Nursing Survey

We used a nursing survey to identify barriers to delirium assessment. The survey measured perceptions of assessment frequency and factors leading to incomplete assessment. Informal dialogue with PICU nurses revealed potential barriers to assessment; to simplify survey completion, we included these barriers in the survey. Nurses could select all barriers encountered in practice and had the option of adding barriers not listed. The survey also gave respondents the opportunity to add free-text suggestions to remove barriers to delirium assessment.

Retrospective Case-Control Study

We conducted a retrospective case-control study to identify patient-specific barriers to delirium assessment. We compared data from 80 randomly selected patients with 100% documented assessments with data from 80 patients with no documented assessments. We evaluated the patient factors of age, sex, principal diagnosis, severity of illness (Pediatric Index of Mortality 2 [PIM2] score), and cognitive impairment (pediatric overall performance

SEV[b]	Potential cause(s)	OCC[c]	Current process controls	DET[d]	RPN (SEV × OCC × DET)
3	Patient information not added to form by health unit coordinator	3	RN education on assessment process; RN recognizes absence of patient information and is able to add appropriate information	8	72
3	Form not placed in designated space at bedside	3	RN education on assessment process; RN recognizes absence of form and knows where extra forms are kept	8	72
10	RN is not aware that assessment should be done and does not complete assessment	9	Charge nurse recognizes the assessment opportunity and reminds RN to complete the assessment; nursing script during multidisciplinary rounds includes delirium assessment results	7	630
10	Increased RN workload	8	None	10	800
10	Worksheet not in designated space at bedside or location of extra forms unknown	2	None	2	40
10	Unable to complete assessment	2	None	5	100
10	Assessment not considered priority because positive delirium screens not consistently acted on	7	Nursing script during multidisciplinary patient care rounds includes delirium assessment results	10	700
10	Increased RN workload, paper documentation outside of normal work flow, transferring results from worksheet to EHR duplicative	5	Nursing script during multidisciplinary patient care rounds includes delirium assessment results, which ensures team awareness of assessment results	10	500

category and pediatric cerebral performance category [PCPC] scores). We measured average PICU census and patient acuity as surrogates for workload index. In addition, we compared the rate of delirium assessment among all patients requiring mechanical ventilation with that of all patients who did not need such ventilation.

We used standard statistical tests—*t* test for parametric continuous data, Wilcoxon/Kruskal-Wallis test for nonparametric continuous data, and χ^2 test for categorical data—to compare and analyze patient factor data. Values are represented as mean (SD), median (interquartile range), and number (percentage) where appropriate. We analyzed the data with statistics software (JMP, SAS Institute Inc) and considered $P < .05$ to be statistically significant.

Failure Modes and Effects Analysis

We completed FMEA to determine potential failures within the delirium assessment process. We outlined each step in the assessment and identified opportunities for failure within each step, known as failure modes. We assigned a risk priority number (RPN) to each failure mode (Table 1). The RPN can range from 1 to 1000, with 1000 being the worst score. It is determined by the product of 3 factors: the severity of the effect of failure on the patient, an estimate of how frequently the failure mode occurs,

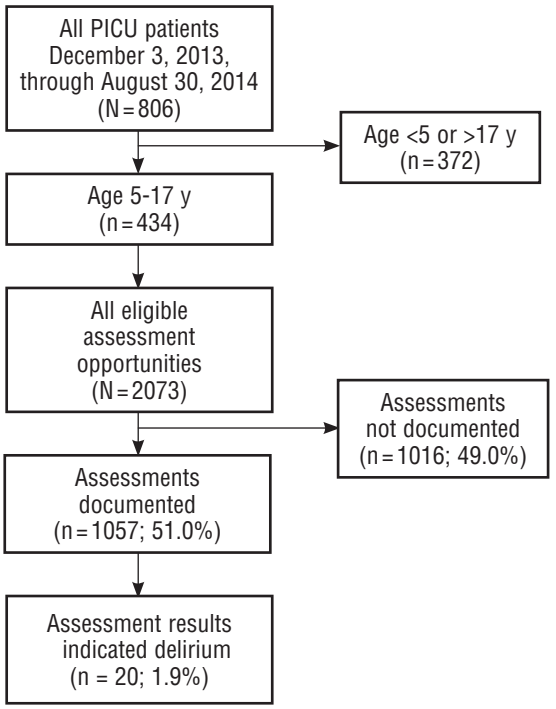

Figure 1 Interim data analysis results.

Abbreviation: PICU, pediatric intensive care unit.

and the likelihood that the failure mode will be detected. Addressing areas with high RPNs may increase the probability of incorporating successful delirium assessment implementation into practice.

Results

Interim Data Analysis

We completed interim data analysis after 9 months of data collection (Figure 1). In this interim analysis, the documented delirium assessment rate was 51%, and 1.9% of assessment results were positive for delirium. No psychiatry consultations for delirium were placed during this period.

Postintervention Delirium Assessment Rate

The completed delirium assessment documentation rate in our interim data analysis did not meet our goal of 90%. Therefore, we implemented focused delirium teaching and awareness (data-sharing) efforts. Repeated data analysis 3 months later showed that the documented delirium screening rate increased from 51% to 71%. Despite this improvement, the positive delirium assessment rate remained at 2%.

Overall Data Analysis

During the 1-year project implementation, 1050 patients were admitted to the PICU. Of these, 767 patients were older than 5 years. The completed delirium assessment documentation rate was 57% (Table 2). The rate of positive delirium screen results was 2% (28 of 1720 completed assessments). No psychiatry consults were placed, and physician notification of positive delirium screen results was not measured consistently.

Identification of Perceived Barriers to Delirium Assessment

Despite a 20-point increase in delirium assessment documentation rate after focused interventions, our overall rate stayed less than 90%. To identify barriers to delirium assessment, we began with a nursing survey. We sent the survey to all active nursing staff; 25 of 70 nurses (36%) completed it. No nurses supported the statement that delirium was not an issue for our PICU, and none confirmed completing assessments 100% of the time (Figure 2). Nurses identified the following barriers: difficulty remembering to complete the assessment, completing documentation outside the usual workflow, having a busy patient, and having an intubated patient. Only 4% of respondents felt the pCAM-ICU took too much time to complete. Nurse suggestions for removing delirium assessment barriers included elimination of paper charting, assessment of all patients

Table 2 Completed delirium assessment documentation rates

Time frame	No. of assessment opportunities	No. of completed assessments documented	Completed assessment documentation, %
Before targeted interventions, December 3, 2013-August 30, 2014	2073	1057	51
After targeted interventions, September 1-December 3, 2014	929	663	71
Cumulative period, December 3, 2013-December 3, 2014	3002	1720	57

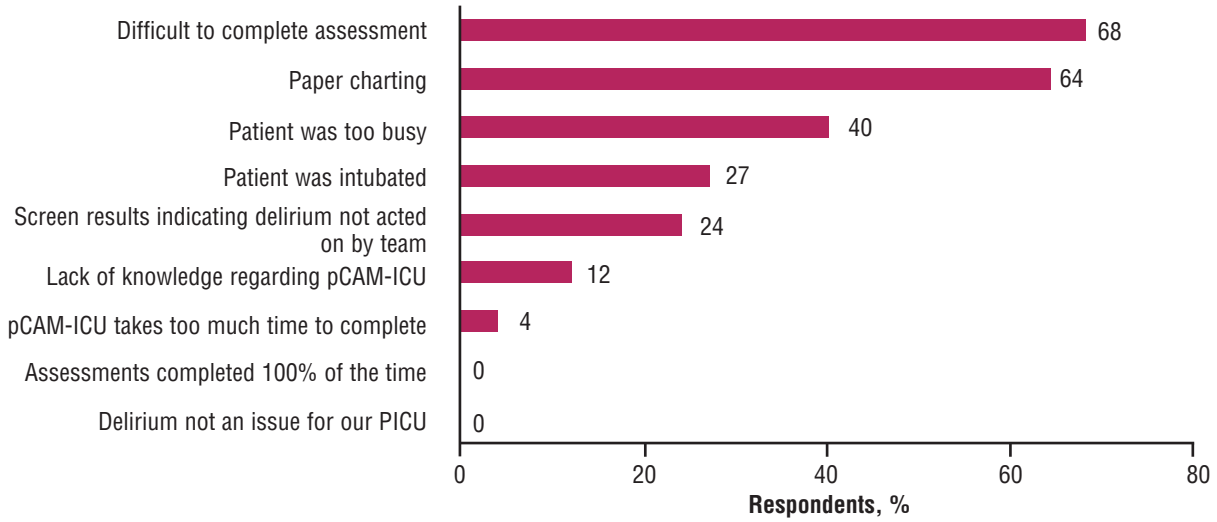

Figure 2 Nurse perceptions of barriers to delirium assessment.

Abbreviations: pCAM-ICU, Pediatric Confusion Assessment Method for the Intensive Care Unit; PICU, pediatric intensive care unit.

Table 3 Comparison of patients with all versus no assessments documented

Variable	Patients always assessed (n=80)	Patients never assessed (n=80)	*P*
Age, y, median (range)	12.05 (8.32-15.75)	13.30 (9.17-15.30)	.62
Female, No. (%)	38 (47.5)	40 (50.0)	.75
PIM2, median (interquartile range)	0.90 (0.36-1.0)	0.36 (0.13-0.86)	<.001
PICU total census, median (interquartile range)	10 (9-12)	12 (10-13)	<.001
PICU with ICU status, mean (SD), %	52.0 (13.09)	51.28 (13.0)	.70
PCPC moderate to severe, No. (%)	43 (53.7)	26 (32.5)	.007
POPC moderate to severe, No. (%)	43 (53.7)	35 (43.7)	.21

Abbreviations: ICU, intensive care unit; PCPC, pediatric cerebral performance category; PICU, pediatric intensive care unit; PIM2, Pediatric Index of Mortality 2; POPC, pediatric overall performance category.

regardless of age, electronic reminders to complete assessment, more education on assessment importance, and development of a delirium treatment protocol.

Patient and Environmental Barriers to Delirium Assessment

To determine patient- and environment-related barriers to delirium assessment, we used a retrospective case-control study to compare randomly selected eligible patients who had all assessments documented with patients who had no assessments documented. Compared with patients who had no assessments documented, patients with all assessments documented had a higher severity of illness (as measured by the PIM2 score) and a higher rate of moderate to severe disability (as determined by the PCPC score). We observed no differences in age, sex, or pediatric overall performance category score. The PICU census on day of admission, measured as a surrogate for workload index, was greater for patients with no documented delirium assessments (Table 3). However, we found no differences between the 2 groups in the percentage of patients assigned intensive care unit status or in diagnostic categories (data not shown).

Among the nurses surveyed, 27% reported that intubation was a barrier to delirium assessment. To determine the impact of mechanical ventilation on assessment, we compared the rate of documented delirium assessments in all patients receiving mechanical ventilation with that

Table 4 Delirium assessments and mechanical ventilation

Ventilation status	Assessments documented, No. (%)	Assessments not documented, No. (%)	Total
Mechanical ventilator	245 (48.8)	257 (51.2)[a]	502
No mechanical ventilator	1475 (59.0)	1025 (41.0)[a]	2500

[a] $P<.001$ by χ^2 test.

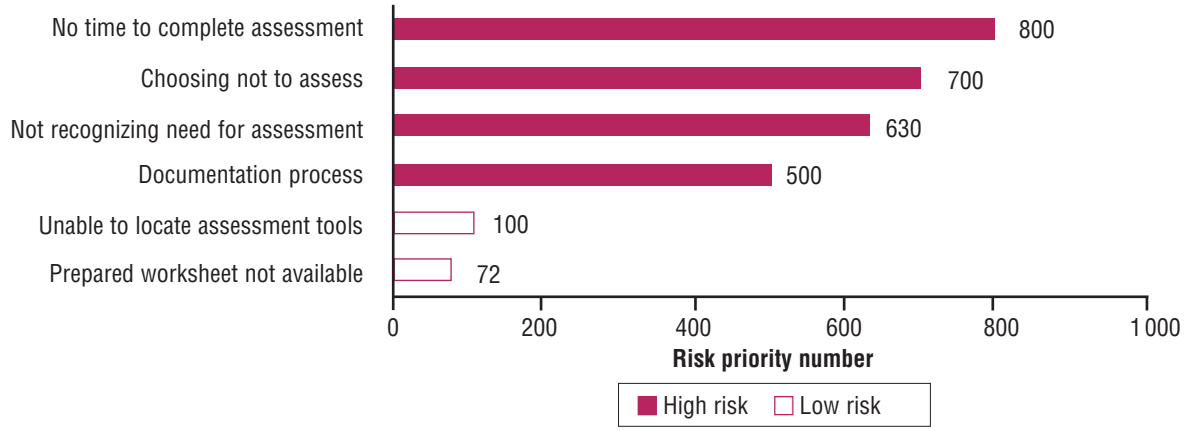

Figure 3 High-risk failure modes of delirium assessment.

in patients who did not require mechanical ventilation. We found that patients receiving mechanical ventilation were less likely than those not receiving mechanical ventilation to have documented delirium assessments (Table 4).

Failure Modes and Effects Analysis

To further analyze potential reasons for a documented delirium assessment rate of less than 90%, we completed FMEA to isolate the steps most likely to result in failure of the delirium assessment process. Several steps were associated with high risk of process failure (RPN > 500), including no time to complete the assessment and choosing not to assess delirium (Figure 3).

Discussion

This report elaborates our experience with implementation of pCAM-ICU assessment in an academic PICU. We found a positive delirium assessment result rate (2%) well below that reported in the literature, and we encountered challenges to achieving our goal of a greater than 90% assessment rate. Our results prompted further analysis to identify barriers contributing to the low rate of documented delirium assessment.

The low rate of positive delirium screen results could be associated with inaccurate assessment, inability to assess patients younger than 5 years, or a low assessment completion rate. On the basis of our low interim documented assessment rate (51%), we focused on interventions to increase assessment completion. We used 2 methods—education and increased awareness of assessment rates—to increase the number of documented assessments, thereby decreasing the possibility of missing a positive delirium screen result. Quality improvement team RNs provided reinforcement of education, similar to a successful adult delirium assessment program.[23] Evaluation of current delirium knowledge was recently used to identify barriers to screening and prevention and to develop educational programs.[24] Although not used in this project, a multidisciplinary team preassessment of knowledge could help tailor education and improve education effectiveness.

We increased awareness of delirium assessment by sharing documented assessment rates in various ways (eg, newsletters, emails, posters, and meetings), similar to successful adult delirium assessment projects.[1,23,25] Documented assessment rates measured for 3 months following these interventions increased by 20 percentage

points (from 51% to 71%), suggesting that education using nurse champions and the sharing of assessment data are important factors in successful introduction of delirium assessment into practice. Our nursing survey supported the theory that education is important in delirium assessment. No respondents indicated that delirium was not an issue for the PICU and 2 nurses suggested that further education could remove assessment barriers. Although not used in this project, preplanned educational updates and the display of rates could be used to increase completed assessments.

Our delirium assessment documentation rate of 71% after targeted interventions through multiple modalities suggests education alone may not be sufficient to facilitate practice change and that assessment barriers are present. More than 60% of survey respondents identified barriers such as difficulty in remembering to complete the assessment and paper charting, which health care system changes optimizing nursing workflow and efficiency could address. Examples of health care system changes are inclusion of delirium assessment into the EHR and electronic pop-up assessment completion reminders.[23]

The time required to complete a delirium assessment may be another barrier. Although only 4% of survey respondents believed the pCAM-ICU took too much time to complete, this response could have been affected by our low positive delirium rate. Progression through pCAM-ICU is shortened when features or steps are negative. Characteristics often considered the most time-consuming (eg, inattention and disorganized thinking) may not have been required in many of the negative delirium screens. We did not assess whether pCAM-ICU was completed correctly. Forty percent of nurses said patients were too busy to complete assessments. Thus, tool complexity should be factored into tool selection. This approach is especially important because the pediatric patients most at risk for delirium (eg, young, developmentally delayed, or patients receiving mechanical ventilation and those with high illness severity) are often considered the most "busy." The use of a tool both accurate and easy to manage would increase the likelihood of assessment completion.

We postulated that a decreased number of documented delirium assessments resulted in our small number of positive delirium screen results. Another potential explanation is the inability of the pCAM-ICU to assess for delirium in patients younger than 5 years and those with developmental delays. Both groups are at higher risk for delirium and account for a large number of the patients admitted to the PICU. Thus, a substantial number of high-risk patients may not have been screened, resulting in a low positive delirium screening rate. In addition, nurse survey comments indicated that screening only a portion of the PICU population was a barrier to completing delirium assessments. This response suggests that selection of a delirium assessment tool that can be used for all ages would eliminate 1 nurse-identified assessment barrier.

The European Society of Paediatric and Neonatal Intensive Care describes reliability, validity, and usability as important factors in delirium tool selection.[26] Since the implementation of our project, 2 additional pediatric delirium assessment tools have been validated. The Preschool Confusion Assessment Method for the Intensive Care Unit (sensitivity, 0.75; specificity, 0.91) can be used for children aged 6 months to 5 years.[17] The Cornell Assessment of Pediatric Delirium (sensitivity, 0.94; specificity, 0.79), described as a rapid nursing delirium screen for critically ill children, can be used for patients aged 0 to 21 years and those with developmental delays.[15] The pCAM-ICU, Preschool Confusion Assessment Method for the Intensive Care Unit, and Cornell Assessment of Pediatric Delirium are all valid tools that should be evaluated for use in a delirium management program. Further research is needed in comparing reliability and usability of delirium assessment tools, identifying criteria for tool selection, and describing experiences with assessment tool use. However, on the basis of persistent documented delirium assessment rates of less than 90% and low rates of positive delirium screen results, we believe that the Cornell Assessment of Pediatric Delirium would be a better fit for our PICU because of its reported ease of use and ability to assess patients most at risk for delirium. We are in the process of implementing this change.

More than 60% of nurses identify barriers to assessing for delirium.

One-quarter of survey respondents felt that a health care team that did not act on positive screen results was a delirium assessment barrier. Two factors may have resulted in a lack of health care team action following positive screen results and nurse-perceived assessment futility. First, the project focus was delirium assessment

implementation, and a management protocol was not developed. Second, delirium education and awareness interventions were nurse-centric despite the multidisciplinary nature of delirium management. For successful incorporation of delirium management into routine PICU care and an increased likelihood that health care teams act on positive delirium screens, it is imperative to simultaneously implement delirium assessment and management protocols and include the multidisciplinary team in all planning stages, as noted in adult medicine literature.[23,25]

The FMEA is a QI tool used in industry to identify process steps that are most likely to lead to process failure. It has only recently been used in health care settings.[27,28] Our FMEA identified 4 high-risk failure modes (Figure 3). Two of these—no time to complete assessment and the documentation process—were identified in the nurse survey as actual assessment barriers. One high-risk failure mode—not recognizing the need for assessment—was not identified in the nurse survey, but this result could be secondary to the fact that the FMEA and survey were completed after nursing education had been provided. Thus, FMEA seemed to have some success in identifying steps in the delirium assessment process that were likely to cause incomplete assessment. Further research and publication of health care QI projects using FMEA are needed to further define its effectiveness in the health care setting.

Education along with identification and elimination of barriers increase successful delirium screening.

The retrospective case-control review of patients who were always or never assessed for delirium identified 4 significant differences between the groups: PIM2 scores, PICU total census, PCPC scores, and mechanical ventilation. Patients who were sicker (higher PIM2 scores) and those with increased disability (higher PCPC scores) were more likely to have delirium assessments documented. This finding is reassuring given that greater illness severity is associated with a higher risk of delirium.

Although we found that sicker patients were more likely to have delirium assessments documented, our analysis showed a lower documented assessment rate in patients receiving mechanical ventilation (despite the likelihood that they were sicker). This outcome could be because mechanical ventilation itself is seen as a barrier to screening or related to a perceived difficulty of pCAM-ICU use in intubated patients. Intubation is not a contraindication to delirium assessment using pCAM-ICU, but was identified by 27% of PICU nurses as a barrier to assessment, consistent with findings reported in adult medicine literature.[29] Providing education about delirium assessment in patients who are intubated or receiving mechanical ventilation may improve screening in a population most at risk. Experiences with delirium assessment of patients receiving mechanical ventilation through various assessment tools and relative to sedation should be published to determine assessment barriers in this population.

Limitations

A limitation of survey data is that survey results were based on a small number of respondents (n = 25) and may not be reflective of barriers encountered by PICU nurses in general. The survey included a list from which nurses selected barriers encountered in practice. The list was created on the basis of informal discussions between the QI team and PICU nurses but may not have been comprehensive. Some barriers may not have been identified despite the survey option for free-text additional barriers.

Another limitation of the data is that we measured successful implementation of delirium assessment into PICU practice by using the number of assessments documented on a paper form. Possibly not all completed assessments were documented or the QI team did not receive all copies of the paper form. These factors may have affected the measured assessment completion rate.

After the initial implementation phase, we did not reassess correct application of pCAM-ICU in practice. Thus, it is unclear whether our low number of positive screen results could be related to inaccurate assessments. Importantly, future projects should ensure continued accurate delirium assessment to reflect true delirium rates.

Completion of FMEA after delirium assessment implementation may have affected FMEA accuracy. Quality improvement team interactions with nurses about experiences with delirium assessment or observations of delirium assessment process failures in practice may have introduced bias into the identification of and risk assigned to failure modes. High-risk failure modes identified by FMEA may not have been encountered in practice because the interventions to mitigate the risk

of failure, such as education, were implemented before FMEA completion.

Another limitation is that the present report explains only the barriers to implementation of delirium screening. We did not document measures for successful mitigation of these barriers. Finally, because of low compliance rates, the measures for incidence of delirium in our project cannot be considered reliable and should not be referenced as such.

Conclusion

Consistent and universal delirium screening in the PICU is increasingly relevant to improving outcomes after critical illness in children. Delirium screening in the PICU presents distinct challenges that may be addressed with selection of an appropriate screening tool, comprehensive education, a robust monitoring system with feedback, multidisciplinary team involvement, EHR integration, and incorporation into nursing workflow models. CCN

Financial Disclosures
None reported.

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