Published in final edited form as:

J Spec Pediatr Nurs. 2018 April ; 23(2): e12209. doi:10.1111/jspn.12209.

Pediatric Nurses' Perceived Knowledge and Beliefs of Evidence-Based Practice in the Care of Children and Adolescents with Moderate-to-Severe Traumatic Brain Injury

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Abstract

Purpose—Pediatric nurses play a significant role in all phases of traumatic brain injury (TBI) recovery, particularly during the hospital stay. Although evidence-based nursing practice is known to improve patient outcomes, limited research exists on nurses' evidence-based perceived knowledge and beliefs specific to TBI care. As nurses' perceived knowledge and beliefs are known to guide their practice behaviors, this assessment is important to overall TBI outcomes. The purpose of this study was to evaluate pediatric nurses' evidence-based perceived knowledge and beliefs in providing care for children and adolescents with moderate-to-severe TBI.

Design and Methods—Data for this study were obtained from a larger parent study on nurses' perceptions of caring for patients of all ages with moderate-to-severe TBI. The parent study was an exploratory, cross-sectional electronic survey of registered nurses across all hospital departments within a large Midwestern health system. Only data specific to pediatric nurses (n=330) were analyzed for this study. Descriptive statistics and latent class analysis (LCA) were performed.

Results—Pediatric nurses, on average, were 38.79 years, female (90.37%), had over a decade of nursing experience (13.55 years), and practiced as a staff nurse (80.07%) on an inpatient unit (45.51%). Findings indicated pediatric nurses reported overall low levels of evidence-based perceived knowledge and had inaccurate beliefs about caring for patients with TBI. LCA indicated two distinct homogenous sub-groups specific to evidence-based perceived knowledge: low (41%) and high (59%). Nurses in the low evidence-based perceived knowledge group were younger, had less nursing experience, worked primarily on an inpatient unit, and cared for patients with TBI at a higher frequency compared to high evidence-based perceived knowledge nurses. Additionally, there were significant differences in beliefs about sex-based patient differences after TBI and the role of nurses in caring for patients with TBI based on level of evidence-based perceived knowledge.

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Conflicts of Interest: The authors have no conflicts of interest to declare.

Practice Implications—Assessing nurses’ perceived knowledge and beliefs of evidence-based practice is a foundational step towards implementing evidence-based care for patients with moderate-to-severe TBI. Implications of these findings indicate the need to provide additional education to increase pediatric nurses’ perceived knowledge and ensure accurate beliefs about evidence-based TBI care.

Keywords

pediatric; nursing; traumatic brain injury (TBI); beliefs; evidence-based practice

Introduction

Traumatic brain injury (TBI) is the leading cause of death and disability for children and adolescents in the United States (U.S.) (Centers for Disease Control and Prevention, 2016). TBI is defined as “a bump, blow or jolt to the head or a penetrating head injury that disrupts the normal function of the brain” (Centers for Disease Control and Prevention, 2014). Each year, greater than 700,000 U.S. children, aged 0 to 19 years, are seen in emergency departments, hospitalized, or die each year because of TBI (Centers for Disease Control and Prevention, 2016). Children and adolescents have higher rates of TBI compared to adults, with injuries occurring most often in young children between 0 and 4 years, followed by adolescents between 15 and 19 years (CDC, 2016; Faul et al., 2010).

As members of interdisciplinary care teams, nurses play a significant role in all phases of TBI care and recovery, which commonly occurs in the hospital setting (LeCroy & McMahon, 2015; McNett & Gianakis, 2010). The delivery of evidence-based nursing care is known to affect patient outcomes and is an important area of inquiry for this population (Melnik & Fineout-Overholt, 2011; Thoroddsen, Ehnfors, & Ehrenberg, 2010). Both perceived knowledge and beliefs are important components of evidence-based practice, as the provider’s perceived knowledge and beliefs are known to influence their own practice behaviors (Grol, 1997; Melnyk et al., 2004). Despite the large numbers of children and adolescents who receive nursing care for TBI, little is known about the evidence-based perceived knowledge or beliefs of these important care providers. The purpose of this study was to assess pediatric nurses’ evidence-based perceived knowledge and beliefs in providing for children and adolescents with moderate-to-severe TBI.

Traumatic Brain Injury and Its Consequences

TBI severity is classified as mild, moderate, or severe based on a number of indicators, including length of loss of consciousness, Glasgow Coma Scale (GCS) and presence of post-traumatic amnesia (Teasdale et al., 2014). Of all severities, mild TBI, also known as concussion, is estimated to encompass approximately 75% of these injuries (Rao et al., 2010). Common consequences of concussion in pediatrics include cognitive, physical and emotional symptoms, such as headaches, dizziness, mental fatigue and irritability in addition to sleep disturbances (Centers for Disease Control and Prevention, 2016; Zemek, Farion, Sampson, & McGahern, 2013). Symptoms of concussion are typically considered short-lived and the majority of individuals experience a full recovery within a few weeks. Though

some experience prolonged symptoms, they very rarely require in-patient hospital care (Corwin et al., 2014).

In contrast, although a smaller proportion, pediatric patients with moderate-to-severe TBI have both immediate and long-lasting effects that are more onerous in nature and almost universally require immediate hospitalization for stabilization, ongoing treatment and subsequent rehabilitation (Babikian & Asarnow, 2009). These injuries have a high likelihood to cause chronic, residual deficiencies, including cognitive impairments such as issues with memory, attention, and executive function, along with emotional, social, and behavioral problems (Anderson & Catroppa, 2005). Moderate-to-severe TBI often affects the pediatric patient and their family across the life span and requires extended coordinated evidence-based care to enhance overall outcomes (Corrigan & Hammond, 2013; Jaglal et al., 2014).

Nurses' Role In Caring for Patients with TBI

As members of an interdisciplinary care team, nurses play a significant role in all phases of TBI recovery, which commonly occurs in the hospital setting (LeCroy & McMahon, 2015; McNett & Gianakis, 2010). Most specifically, hospital-based nurses support patients with moderate-to-severe TBI through clinical phases that encompass critical, acute, subacute and rehabilitative care, engaging in a multitude of important roles and responsibilities: 1) vital assessment of changing patient condition and needs; 2) coordination and communication of patient status and related plan of care; 3) timely and humanistic completion of technical and physical care; 4) provision of emotional support to family members; and 5) education of patients and their families throughout the recovery process (LeCroy & McMahon, 2015). Because of TBI patients have broad care needs, hospital-based nurses, despite the area of assignment, are likely to provide care to patients with moderate-to-severe TBI at some point in their practice (McQuillan & Mitchell, 2002). Therefore, it is important that all nurses have the skill and competence to provide evidence-based care to this population.

Evidence-Based Nursing Practice, Perceived Knowledge, and Beliefs

Evidence-based practice is defined as “integrating individual clinical expertise with the best available external clinical evidence from systematic research” (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996, p. 71). Over the past two decades, federal agencies such as the Institute of Medicine (Institute of Medicine & Committee on Quality of Health Care in America, 2001) and Agency for Health Research and Quality (Agency for Healthcare Research and Quality, 2015) have emphasized the importance of using evidence-based practice to direct nursing care for all patients (Melnyk et al., 2004) as it is known to improve patient outcomes (Melnyk & Fineout-Overholt, 2011; Thoroddsen et al., 2010). Although a growing body of research exists in nurses' perceptions and implementation of evidence-based practice (Grønvik, Ødegård, & Bjørkly, 2016; Sredl et al., 2011; Verloo, Desmedt, & Morin, 2016), few scholars have studied the important component of evidence-based practice—the clinician's expertise (Melnyk et al., 2004; Rycroft-Malone et al., 2004). A clinician's expertise is comprised of their evidence-based perceived knowledge of nursing practice and their beliefs about providing this care (Grol, 1997; Herling, 2000; Tonelli & Guyatt, 2017).

Clinically speaking, evidence-based perceived knowledge is conceptually distinct from beliefs as *evidence-based perceived knowledge* is defined as an individual's view of their own practical understanding of clinical practice and a *belief* is as an individual's attitudes or thoughts about a clinical concept (Leung, Trevena, & Waters, 2014). Both evidence-based perceived knowledge and beliefs are important components of evidence-based practice, as the provider's perceived knowledge and beliefs are known to influence their own practice behaviors (Grol, 1997; Melnyk et al., 2004). The importance of high levels of evidence-based perceived knowledge and accurate beliefs (i.e., beliefs that are aligned with the evidence-based perceived knowledge) about care cannot be overemphasized as both are important to the complex care and related outcomes of patients with moderate-to-severe TBI.

Research on Nurses' Evidence-Based Perceived Knowledge about Care of Patients with TBI

Limited research has been conducted on pediatric nurses' evidence-based perceived knowledge or beliefs about caring for children and adolescents with moderate-to-severe TBI. Current research has focused primarily on mild TBI in both pediatric and adult patients (Ernst, Trice, Gilbert, & Potts, 2009; Watts, Gibbons, & Kurzweil, 2011). Research on adult patients with mild TBI shows nurses report low levels of evidence-based perceived knowledge specific to assessment, treatment, and evaluation of adult patients with mild TBI (Watts et al., 2011). When caring for adult patients with moderate-to-severe TBI, research indicates that nurses who care for these patients more frequently have high levels of perceived confidence but low levels of evidence-based perceived knowledge (Oyesanya, Brown, & Turkstra, 2016). In addition, nurses' level of evidence-based perceived knowledge was related to their clinical expertise (Oyesanya, Brown, et al., 2016; Oyesanya, Thomas, Brown, & Turkstra, 2016). Although not specific to care of children and adolescents with moderate-to-severe TBI, these findings have already suggested the need for additional nurse training and education specific to evidence-based guidelines and integration into nursing care.

Research on Nurses' Beliefs about Caring for Patients with TBI

Specific to mild TBI, research on nurses' beliefs about caring for pediatric patients notes significant inaccurate beliefs surrounding recognition and treatment, including limited knowledge of clinical care guidelines, nursing specific roles in education of patients, and proper strategies to support return to school and return to play (Weber, Welch, Parsons, & McLeod, 2014; Zonfrillo et al., 2012). Additionally, research shows nurses hold inaccurate beliefs about caring for adults with mild TBI, specific to unconsciousness, amnesia, and recovery (Ernst et al., 2009), and visibility of injury (Linden & Redpath, 2011). Related to care of adults with moderate-to-severe TBI, a recent study found that nurses had inaccurate beliefs about sex-based patient differences after TBI (Oyesanya, Thomas, et al., 2016). Although not specific to moderate-to-severe TBI in pediatric patients, these findings can be extended to care of pediatric patients with TBI and indicate additional nurse training and education is needed.

Despite the prevalence of pediatric TBI, the known relationship of nurses' perceived knowledge and beliefs to their own practice behaviors, and the findings indicating low

perceived knowledge and presence of inaccurate beliefs in caring for adult TBI patients, no research exists focused on the nursing care of children and adolescents with TBI. Thus, the purpose of this study is to assess pediatric nurses' evidence-based perceived knowledge and beliefs about caring for children and adolescents with moderate-to-severe TBI, using the following research questions:

Research Questions

1. What is the level of pediatric nurses' evidence-based perceived knowledge specific to caring for children and adolescents with moderate-to-severe TBI?
2. What are pediatric nurses' beliefs specific to caring for children and adolescents with moderate-to-severe TBI?
3. Does the level of pediatric nurses' evidence-based perceived knowledge vary based on demographics or beliefs about caring for children and adolescents with moderate-to-severe TBI?

Methods

Study Design

Data for this study were obtained from a larger parent study on nurses' perceptions of caring for patients of all ages with moderate-to-severe TBI and was approved by the participating institutional review board (Oyesanya, Brown, et al., 2016; Oyesanya, Thomas, et al., 2016). The parent study was an exploratory, cross-sectional electronic survey of registered nurses across all hospital departments within a large, Midwestern health system. This project is a secondary analysis investigating the evidence-based perceived knowledge and beliefs of pediatric nurses caring for children and adolescents with moderate-to-severe TBI. The parent study was approved by the participating institutional review board.

Data Collection

Parent study data were collected electronically between October and December 2014. Eligible participants were registered nurses in any role (N=2,523) who were employed by the participating hospital, a large Midwestern, Level I trauma center. For purposes of this study, data were extracted for respondents who identified themselves as pediatric nurses, caring for patients 18 years old.

Sample Characteristics

Of the 2,523 registered nurses who received the email invitation, 330 pediatric nurses completed the survey. Sample characteristics are described in Table 1.

Survey Instrument

Data were collected using the *Perceptions of Brain Injury Survey* (PBIS) (Oyesanya, Brown, et al., 2016; Oyesanya, Thomas, et al., 2016). This survey was created by adapting two surveys: 1) a survey about school speech-language pathologists' perceived knowledge, perceived confidence, and beliefs to provide services to students with TBI (severity level unspecified) (Hux, Walker, & Sanger, 1996); and 2) a survey on nurses' perceived

knowledge regarding care of patients with mild TBI (Watts et al., 2011). Reliability statistics from the initial survey are reported below as both Cronbach's alpha (α) and McDonald's omega coefficients (ω) for each subscale (Zinbarg, Revelle, Yovel, & Li, 2005).

Survey Items

Demographic items—Demographic items asked nurses about their age, sex, prior nursing education, total number of years in active nursing practice, total number of years in current nursing position, primary place of employment, primary role as a nurse, and the age range of patients whom they regularly care for.

Evidence-based perceived knowledge subscale items—Twenty items from the PBIS asked nurses' about their evidence-based perceived knowledge on nursing care topics specifically related to care of pediatric with TBI, including evidence-based clinical guidelines, nursing care plans, medication management, stages of recovery, and treatment and therapy options. Evidence-based perceived knowledge items were in a 'check-all-that-apply' and Likert-type scale format with a 4-point scale with the following ratings: 1= none, 2= some, 3= moderate and 4= expert. Nurses with higher scores on this subscale had higher perceived knowledge ($r= 0.93$; $\omega=0.99$).

Beliefs subscale items—Seventeen beliefs items asked nurses to rate their level of agreement or disagreement with a series of statements about caring for patients with TBI, including: consequences of TBI and prognosis, sex-based differences after TBI, nursing role and training; and importance of knowledge of TBI to the nurse's practice. These items were in a 4-point Likert-type scale format: strongly agree (1), agree (2), disagree (3), and strongly disagree (4). Nurses with higher scores on this subscale had more accurate beliefs about the listed statements ($r= 0.62$; $\omega=0.92$).

Statistical Analysis

Descriptive statistics—Frequencies and percentages were calculated to describe pediatric nurses' demographics and evidence-based perceived knowledge and beliefs on various topics related to care of children and adolescents with TBI.

Latent Class Analysis—We applied latent class analysis (LCA) to assess how pediatric nurses differed on evidence-based perceived knowledge, including assigning nurses into classes based on level of evidence-based perceived knowledge (Kline, 2015). Authors conducted the LCA using Mplus version 7.3 using multiple criteria, including: 1) entropy variable > 0.7 (Li, Ma, & Ogihara, 2004); 2) Akaike's information criterion (AIC), Bayesian information criterion (BIC), and adjusted BIC (Xu & Wunsch, 2008); and 3) Lo-Mendell Rubin and Vuong-Lo-Mendell-Rubin likelihood ratio tests (Muthén & Muthén, 2010).

Pairwise comparison of demographic and beliefs variables—After the evidence-based perceived knowledge class structure was identified, we used the evidence-based perceived knowledge subgroups to analyze demographics and beliefs variables. More specifically, multi-level regression analyses (two sample t -tests) were conducted for pairwise comparisons using Number Cruncher Statistical System (NCSS: Hintze, 2006). We used

False Discovery Rate (FDR) to correct for multiple pairwise comparisons (Verhoeven, Simonsen, & McIntyre, 2005). Adjusted p-values were assessed for significance at $p = .05$

Results

Outcome of LCA

Table 2 summarizes pertinent goodness-of-fit statistics, likelihood ratio tests values, and p-values for different class models. Figure 1 shows the final 2-class model. Authors selected the 2-class model based on pertinent LCA criteria, parsimony, and substantive interpretation. This model yielded two subgroups based on evidence-based perceived knowledge: low ($n = 124$) and high ($n = 177$).

Detailed Results

Research Questions

Evidence-Based Perceived Knowledge: What is the level of pediatric nurses' evidence-based perceived knowledge specific to caring for children and adolescents with moderate-to-severe TBI?—The LCA yielded two homogenous subgroups: low and high evidence-based perceived knowledge. The low evidence-based perceived knowledge group had 124 nurses (41.20% of sample), and the high evidence-based perceived knowledge group had 177 nurses (58.80% of sample).

Beliefs: What are pediatric nurses' beliefs specific to caring for children and adolescents with moderate-to-severe TBI?—Pediatric nurses were asked to rate their beliefs about various nursing care topics specific to care of patients with moderate-to-severe TBI (see Table 3). The majority of pediatric nurses had accurate beliefs about the following topics: care provision, sex-based patient differences in TBI incidence and recovery, and development of nursing plan of care. The majority of pediatric nurses disagreed with the statement “The role of registered nurses in regard to care of patients with TBI is clearly understood in my workplace.” The majority of pediatric nurses agreed with the statement “Nurses need specialized training to provide care for patients with moderate-to-severe TBI.”

Comparison: Does the level of pediatric nurses' evidence-based perceived knowledge vary based on demographics or beliefs about caring for children and adolescents with moderate-to-severe TBI?—Analysis of demographic and beliefs variables based on evidence-based perceived knowledge showed some significant differences based on level of evidence-based perceived knowledge (see Table 4).

Pediatric Nurses' Demographics based on Evidence-Based Perceived Knowledge—Demographics of nurses in both evidence-based perceived knowledge groups displayed minimal variability. Over 87% of nurses in both groups identified as female. The average age of nurses in the low evidence-based perceived knowledge group was 38.00 years and 39.35 years for the high evidence-based perceived knowledge group. Both low and high evidence-based perceived knowledge nurses had the same level of education and primary role, with the majority of nurses completing a bachelor's degree and identifying as a staff registered nurse, indicated by a mean of approximately 2. Nurses in the high evidence-based

perceived knowledge group had more years since graduation, total years in active nursing practice, and total years in their current nursing position compared to low evidence-based perceived knowledge nurses. Nurses in the low evidence-based perceived knowledge group had a significantly higher frequency of caring for patients with TBI compared to nurses in the high evidence-based perceived knowledge group. Most nurses in each group worked on an inpatient unit, with 56.45% of low and 37.85% of high evidence-based perceived knowledge nurses. Regarding age of patients seen, all nurses provided care to pediatric patients, with more nurses from each group providing care to pediatric patients age 13 to 18. Specific to work setting, nurses who reported practicing on an inpatient unit or an ambulatory clinic/physician's office had significant differences in evidence-based perceived knowledge (see Table 4).

Pediatric Nurses' Beliefs Based on Evidence-Based Perceived Knowledge—

Regarding items that assessed nurses' beliefs about providing care to patients with TBI, nurses from both evidence-based perceived knowledge groups had similar levels of agreement. However, significantly more nurses from the high evidence-based perceived knowledge group agreed with the statement, "To assess and/or treat patients with TBI, nurses need specialized TBI educational materials." Similarly, significantly more nurses from the high evidence-based perceived knowledge group agreed with the statement: "The challenges of patients with TBI are typically more difficult to assess than the challenges of patients with other disabilities." Regarding sex-based patient differences in TBI, significantly more high perceived knowledge nurses agreed with the statement: "Male and female require different types of care after having a TBI."

Specific to survey items that assessed nurses' beliefs about their role in caring for patients with TBI, there was a discrepancy in the level of agreement with the statement: "The role of registered nurses in regard to care of patients with TBI is clearly understood in my workplace." Significantly more high evidence-based perceived knowledge nurses disagreed with this statement. In addition, significantly more nurses in the low evidence-based perceived knowledge group agreed with the statement: "Nurses on my unit do a good job when providing care to patients with moderate-to-severe TBI." Finally, significantly more nurses in the low perceived knowledge group disagreed with the statement, "Knowing about moderate-to-severe traumatic brain injury is important to my current nursing practice" (see Table 5).

Discussion

The purpose of this study was to assess pediatric nurses' evidence-based perceived knowledge and beliefs as a foundational step towards implementing evidence-based practice specific to care of children and adolescents with moderate-to-severe TBI. The overall sample had high evidence-based perceived knowledge (58.8% of sample; $n=177$ nurses) and mixed accuracy specific to beliefs about the care of pediatric patients with TBI. When analyzing pediatric nurses based on their level of evidence-based perceived knowledge, authors were able to assign nurses to two distinct homogenous sub-groups: low and high evidence-based perceived knowledge. Using these two sub-groups, results demonstrated significant group differences based on demographics and beliefs. A surprising finding, pediatric nurses with

the lowest evidence-based perceived knowledge provided the most care to pediatric patients with TBI, contrary to what we hypothesized. Pediatric nurses in both evidence-based perceived knowledge groups had significantly different beliefs about treatment, sex-based patient differences after TBI, and their role in caring for patients with TBI.

Our findings about the presence of inaccurate beliefs among nurses caring for patients with moderate-to-severe TBI are similar to other studies (Ernst et al., 2009; Linden & McClure, 2012; Oyesanya, Thomas, et al., 2016). More specifically, in another study, nurses caring for adult patients with moderate-to-severe TBI had similar inaccurate beliefs about treatment and sex-based patient differences after TBI (Oyesanya, Thomas, et al., 2016). The presence of inaccurate beliefs may suggest that nurses are providing inaccurate information to patients with TBI and their families (Ernst et al., 2009). To prevent this from occurring, adequate training and evidence-based education of nurses who care for these patients, including targeted information focusing on nurses' beliefs is necessary.

Low levels of evidence-based perceived knowledge were reported in approximately 40% our sample, similar to other studies (Oyesanya, Brown, et al., 2016; Watts et al., 2011). Yet, pediatric nurses in the low-evidence based perceived knowledge group reported providing the most care to patients with moderate-to-severe TBI. Low evidence-based perceived knowledge coupled with inaccurate beliefs about care could have a significant influence on patient outcomes. These findings, similar to the work of others (Baker, 2012; Edwards, 2006; Long, Kneafsey, Ryan, & Berry, 2002; Smith, 2002), emphasize the need for additional training and education for pediatric nurses who care for patients with TBI.

The need for additional training and education of nurses who care for patients with TBI is emphasized in nurses' disagreement with the statement, "The role of registered nurses in regard to care of patients with TBI is clearly understood in my workplace." Although the majority of nurses in low evidence-based perceived knowledge group agreed with this statement, there was a significant difference in the level of disagreement between both groups, with high evidence-based perceived knowledge group members reporting more disagreement. In addition there were significant differences in agreement for the statement "Knowing about moderate-to-severe TBI is important to my current nursing practice." Despite some nurses' response that knowledge of moderate-to-severe TBI may not be important to their current nursing practice, it is likely that all nurses will provide care to patients with moderate-to-severe at TBI at some point in their practice, regardless of assignment, as these patients can be located on any hospital unit based on time since injury, severity of injury, and comorbidities (McNett & Gianakis, 2010; McQuillan & Mitchell, 2002). Thus, all nurses should be knowledgeable about caring for these patients.

Limitations

This study was a secondary analysis of cross-sectional survey data. Because of the nature of this analysis technique, authors were unable to add or change variables or response item formats, limiting analysis of variables. However, these findings provide a foundation for future research on pediatric nurses' beliefs about caring for these patients. In addition, although the majority of participants practiced on an inpatient unit, data collection did not include information on the type of hospital unit or demographics of patients cared for on

these units, limiting specific knowledge on the patient population represented in the sample. Nevertheless, data were collected on nurses' frequency of caring for patients with TBI, providing insight into whether these nurses cared for patients with TBI on a regular basis. Future research is needed to determine nurses' beliefs based on hospital unit, specifically comparing units that frequently provide care to patients with TBI (emergency room, ICU, rehabilitation, etc.) to those that do not (medical surgical, general medicine, psychiatric, etc.).

Conclusion

Pediatric nurses must possess evidence-based knowledge and have accurate beliefs about caring for children and adolescents with moderate-to-severe TBI to engage in evidence-based practice and improved patient outcomes. Pediatric nurses have an important role in coordinating care across the recovery continuum and providing education and accurate information to patients and families. Low levels of evidence-based perceived knowledge and inaccurate beliefs can contribute to inappropriate practice decisions that slow TBI recovery, affect overall outcomes, or influence the transfer of inaccurate information to patients, families, or other nurses. Our findings displayed low levels of evidence-based perceived knowledge and inaccurate beliefs by some pediatric nurses, providing evidence for the need to provide educational and training interventions. These interventions will aid in ensuring all pediatric nurses have current and evidence-based information about caring for patients with TBI and better understand their role in care in a evidenced-based practice environment.

How might this information affect nursing practice?

Concerning findings relative to pediatric nurses' perceived knowledge and beliefs of evidence-based practice in the care of children and adolescents with moderate-to-severe TBI were noted. These results can guide educational strategies at the individual-, unit-, hospital-, or nursing school curriculum-level to target inaccurate beliefs and low levels of evidence-based perceived knowledge. As TBI is the leading cause of death and injury for children and adolescents, inclusion of related training at all levels of nursing curriculum, employment onboarding and professional development is important. Pediatric nurses play a significant role in all phases of TBI recovery in addition to patient and family education. Because perceived knowledge and beliefs are known to drive practice, assessing pediatric nurses' evidence-based perceived knowledge and beliefs related to the care of patients with TBI is vital component of evidence-based nursing practice implementation. Tailoring educational interventions to meet assessed gaps in knowledge and beliefs and to educate nurses on how to determine best evidence can result in more efficient changes in TBI care that align with evidence-based nursing practice and support improvement in patient care outcomes.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Thank you to university faculty and staff and to staff at the participating study recruitment locations.

Funding: This research was funded by the University of Wisconsin-Madison, School of Nursing Eckburg Research and Eckburg Disertation Award. This project was supported by the NIH/NIGMS Initiative for Maximizing Student Development (PI, M. Carnes) Grant# R25GM083252. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH. Funding sources had no involvement with study design, data collection, analysis, interpretation, or decision to submit the article for publication. Funding sources had no involvement in conducting the research or preparation of this article.

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Figure 1.

Table 1**Demographics and Professional Background (n=330)**

Variables	mean (SD)
Age, mean years (SD)	38.79 (11.39)
Total years in active nursing practice, mean y (SD)	13.55 (11.19)
Total years in current nursing position, mean y (SD)	5.91 (6.41)
	n (%)
Sex	
Male	29 (9.63)
Female	301 (90.37)
Nursing education	
Associates'/nursing diploma	44 (14.62)
Bachelors'	219 (72.76)
Masters' or doctorate	38 (12.63)
Primary place of employment	
Primary care clinic	15 (4.98)
Emergency room	28 (9.30)
Ambulatory clinic or physician's office	64 (21.26)
Inpatient unit	137 (45.51)
Other	86 (26.06)
Primary role	
Staff registered nurse	241 (80.07)
Nurse practitioner/clinic nurse specialist/CRNA	17 (5.65)
Division officer/charge RN/care team leader	5 (6.31)
Department head/RN supervisor/nurse manager	9 (2.99)
Other	15 (5.00)

Table 2

Goodness-of-Fit Statistics and Likelihood Ratio Tests of Latent Class Analysis Models Containing Different Numbers of Classes

Goodness-of-Fit Statistics				
Latent Class Models	Entropy	AIC	BIC	Adjusted BIC
2-Class model	0.959	6878.953	7171.814	6921.271
3-Class model	0.975	5898.019	6339.165	5961.765
4-Class model	0.978	5661.297	6250.728	5746.470
5-Class model	0.972	5502.391	6240.106	5608.991
6-Class model	0.964	5441.612	6327.612	5569.640
Likelihood Ratio Tests				
Class Comparisons	Vuong-Lo-Mendell-Rubin LRT		Lo-Mendell-Rubin LRT	
2-Class model vs. 3-Class model	−3360.476, $p = 0.0001$		1056.307, $p = 0.0001$	
3-Class model vs. 4-Class model	−2830.009, $p = 0.0081$		315.340, $p = 0.0083$	
4-Class model vs. 5-Class model	−2671.670, $p = 0.0108$		237.907, $p = 0.0112$	
5-Class model vs. 6-Class model	−2552.196, $p = 0.7834$		140.165, $p = 0.7836$	

Table 3

Percent Values of Beliefs Items (n=301)

	True/False	Agree		Disagree	
		n	%	n	%
1. To assess and/or treat patients with TBI, nurses need specialized TBI educational materials.	True	263	92.61	21	7.31
2. The challenges of patients with TBI are typically more difficult to assess than the challenges of patients with other disabilities.	True	211	74.30	73	25.70
3. Knowing the location of brain damage from TBI helps in the development of nursing care plans that meet patients' needs.	True	279	98.24	5	1.76
4. Knowledge of a patient's background prior to TBI is necessary when developing a nursing care plan.	False	59	20.77	225	79.23
5. Patients with TBI often display behavior problems.	True	228	80.28	56	19.72
6. TBI is equally common in males and females.	False	73	25.70	211	74.30
7. Male and female recover in the same way after having a TBI.	False	31	10.92	253	89.08
8. Male and female require different types of care after having a TBI.	True	214	75.35	70	24.65
9. Family involvement in patient care is no different for men and women who are receiving care after having a TBI.	False	96	33.80	188	66.20
10. Recovery following TBI may continue for several years.	True	281	98.94	3	1.06
11. Greater variability exists in the population of patients with TBI than exists in populations of other patients with disabilities.	True	221	77.82	63	22.18
12. The role of registered nurses in regard to care of patients with TBI is clearly understood in my workplace.	N/A*	119	41.90	165	58.10
13. Medical labels that specify TBI as mild, moderate, or severe are useful for development of nursing care plans.	False	215	75.70	69	24.30
14. Nursing care plan goals for patients with TBI may need to be revised more frequently than nursing care plan goals for patients with other types of disabilities.	True	225	79.23	59	20.77
15. Nurses on my unit do a good job when providing care to patients with moderate-to-severe TBI.	N/A*	223	78.52	61	21.48
16. Nurses need specialized training to provide care to patients with moderate-to-severe TBI.	True	265	93.31	19	6.69
17. Knowing about moderate-to-severe TBI is important to my current nursing practice.	True	213	75.00	71	25.00

Note: N/A* indicates a subjective statement where it was not possible to determine if the statement is true or false. Two items have asterisks (#12 and #15) because the statement is subjective, specifically based on each nurse's perception of the performance of other nurses in her/his workplace and cannot be rated as accurate or inaccurate.

Table 4

Mean/Percent Values and Pairwise Comparisons of Demographic Items by Latent Class (n=301)

Demographic Items	Low Evidence-Based Perceived Knowledge (n=124) mean (SD)	High Evidence-Based Perceived Knowledge (n = 177) mean (SD)	P-values for Pairwise Comparisons of Low vs. High Perceived Knowledge
Age, mean years	38 (10.64)	39.35 (11.89)	$p = 0.38$
Primary role *	2.38 (1.00)	2.19 (0.76)	$p = 0.21$
Years since graduation from highest nursing degree	11.65 (9.05)	24.97 (15.12)	$p = 0.38$
Total years in active nursing practice, years	12.92 (9.68)	14.49 (12.05)	$p = 0.35$
Total years in current nursing position, years	5.83 (5.47)	6.49 (7.12)	$p = 0.42$
Frequency of caring for patients with TBI	1.81 (0.76)	1.40 (0.61)	$p = 0.001$
	% (SD)	% (SD)	
Sex, female	87.90 (0.32)	92.90 (0.27)	$p = 0.35$
Highest level of nursing education			
Associate's/nursing diploma	14.52 (0.55)	14.69 (0.47)	$p = 0.46$
Bachelor's	69.35 (0.81)	75.14 (0.91)	$p = 0.32$
Master's/PhD	16.13 (0.72)	10.17 (0.66)	$p = 0.09$
Current work setting			
Primary care clinic	4.83 (0.21)	5.08 (0.22)	$p = 0.92$
Emergency room	6.45 (0.24)	11.29 (0.31)	$p = 0.31$
Ambulatory clinic or physician's office	8.87 (0.28)	29.94 (0.45)	$p = 0.0116$
Inpatient unit	56.45 (0.49)	37.85 (0.48)	$p = 0.0116$
Other	25.00 (0.43)	20.90 (0.40)	$p = 0.42$
Age of patients seen			
0 to 1 years	63.70 (0.48)	71.18 (0.45)	$p = 0.32$
2 to 5 years	64.51 (0.48)	73.44 (0.44)	$p = 0.21$
6 to 12 years	66.12 (0.47)	75.70 (0.43)	$p = 0.21$
13 to 18 years	97.58 (0.15)	93.22 (0.25)	$p = 0.21$

Note:

* Coding for primary role: 1 = other; 2 = registered nurse (RN); 3 = department head/RN supervisor/nurse manager; 4 = division officer/charge RN/care team leader; 5 = CNS/NP/CRNA.

Table 5
Percent Values and Pairwise Comparisons of Beliefs Items by Latent Class (n=301)

Beliefs Items	True vs. False	Agree vs. Disagree	Low Evidence-Based Perceived Knowledge (n=124)		High Evidence-Based Perceived Knowledge (n=177)		P-values for Pairwise Compar-isons of Low vs. High Perceived Knowledge
			n	%	n	%	
Please rate your agreement or disagreement with the following statements.							
1. To assess and/or treat patients with TBI, nurses need specialized TBI educational materials.	True	Agree	102	88.70	161	95.27	$p = 0.05$
		Disagree	13	11.30	8	4.73	
2. The challenges of patients with TBI are typically more difficult to assess than the challenges of patients with other disabilities.	True	Agree	77	66.96	134	79.29	$p = 0.03$
		Disagree	38	33.04	35	20.71	
3. Knowing the location of brain damage from TBI helps in the development of nursing care plans that meet patients' needs.	True	Agree	115	100	164	97.04	$p = 0.07$
		Disagree	0	0	5	2.96	
4. Knowledge of a patient's background prior to TBI is necessary when developing a nursing care plan.	False	Agree	23	20.00	36	21.30	$p = 0.43$
		Disagree	92	80.00	133	78.70	
5. Patients with TBI often display behavior problems.	True	Agree	94	81.74	134	79.29	$p = 0.40$
		Disagree	21	18.26	35	20.71	
6. TBI is equally common in males and females.	False	Agree	27	23.48	46	27.22	$p = 0.39$
		Disagree	88	76.52	123	72.78	
7. Male and female recover in the same way after having a TBI.	False	Agree	16	13.91	15	8.88	$p = 0.17$
		Disagree	99	86.09	154	91.12	
8. Male and female require different types of care after having a TBI.	True	Agree	74	64.35	140	82.84	$p = 0.0009$
		Disagree	41	35.65	29	17.16	
9. Family involvement in patient care is no different for men and women who are receiving care after having a TBI.	False	Agree	38	33.04	58	34.32	$p = 0.43$
		Disagree	77	66.96	111	65.68	
10. Recovery following TBI may continue for several years.	True	Agree	115	100	166	98.22	$p = 0.16$
		Disagree	0	0	3	1.78	
11. Greater variability exists in the population of patients with TBI than exists in populations of other patients with disabilities.	True	Agree	90	78.26	131	77.51	$p = 0.44$
		Disagree	25	21.74	38	22.49	
12. The role of registered nurses in regard to care of patients with TBI is clearly understood in my workplace.	N/A*	Agree	73	63.48	46	27.22	$p < 0.0001$

Beliefs Items	True vs. False	Agree vs. Disagree	Low Evidence-Based Perceived Knowledge (n=124)		High Evidence-Based Perceived Knowledge (n=177)		P-values for Pairwise Comparisons of Low vs. High Perceived Knowledge
			n	%	n	%	
13. Medical labels that specify TBI as mild, moderate, or severe are useful for development of nursing care plans.	False	Disagree	42	36.52	123	72.78	$p = 0.39$
14. Nursing care plan goals for patients with TBI may need to be revised more frequently than nursing care plan goals for patients with other types of disabilities.	True	Disagree	30	26.09	39	23.08	$p = 0.43$
15. Nurses on my unit do a good job when providing care to patients with moderate-to-severe TBI.	N/A	Disagree	23	20.00	36	21.30	$p < 0.0001$
16. Nurses need specialized training to provide care to patients with moderate-to-severe TBI.	True	Disagree	105	91.30	118	69.82	$p = 0.39$
17. Knowing about moderate-to-severe traumatic brain injury is important to my current nursing practice.	True	Disagree	10	8.70	51	30.18	$p < 0.0001$
		Agree	106	92.17	159	94.08	
		Disagree	9	7.83	10	5.92	
		Agree	107	93.04	106	62.72	
		Disagree	8	6.96	63	37.28	

Note: N/A* indicates a subjective statement where it was not possible to determine if the statement is true or false. Two items have asterisks (#12 and #15) because the statement is subjective, specifically based on each nurse's perception of the performance of other nurses in her/her workplace and cannot be rated as accurate or inaccurate.