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Nurses' Beliefs Regarding Pain in Critically Ill Children: A Mixed-Methods Study

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Abstract

Purpose—The purpose of this study was to provide a current and comprehensive evaluation of nurses' beliefs regarding pain in critically ill children.

Design and Methods—A convergent parallel mixed-methods design was used. Nurse beliefs were captured via questionnaire and interview and then compared.

Results—Forty nurses participated. Most beliefs reported via questionnaire were consistent with effective pain management practices. Common inaccurate beliefs included the need to verify pain reports with physical indicators and the pharmacokinetics of intravenous opioids. Beliefs commonly shared during interviews concerned the need to verify pain reports with observed behavior, the accuracy of pain reports, the need to respond to pain, concerns regarding opioid analgesics, and the need to “start low” with interventions. Convergent beliefs between the questionnaire and interview included the use of physical indicators to verify pain, the need to take the child's word when pain is described, and concerns regarding negative effects of analgesics. Divergent and conflicting findings were most often regarding the legitimacy of a child's pain report.

Conclusions—Findings from this study regarding the accuracy of nurses' pain beliefs for critically ill children are consistent with past research. The presence of divergent and conflicting responses suggests that nurses' pain beliefs are not static and may vary with patient characteristics.

Practice Implications—While most nurses appreciate the risks of unrelieved pain in children, many are concerned about the potential adverse effects of opioid administration. Interventions are needed to guide nurses in minimizing both of these risks.

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Keywords

acute pain; pediatric nurse; pediatric intensive care; patient simulation; knowledge and attitudes; knowledge use in pain care

Introduction and Background

Health care professionals' inaccurate beliefs regarding the assessment and management of children's pain are noted barriers to effective pain management (American Academy of Pediatrics [AAP], 2001). However, studies in which pediatric intensive care unit (PICU) nurses' pain beliefs are evaluated are few, and many are nearly 20 years old (Coffman et al., 1997; Curley et al., 1992; Manworren, 2000; Mattsson, Forsner, & Arman, 2011; Pederson & Bjerke, 1999; Pederson, Matthies, & McDonald, 1997). Since these earlier studies, there have been multiple guidelines, standards, and reviews of the literature published regarding the assessment and management of acute pain that may have influenced PICU nurses' pain beliefs. Additionally, in 2001 the Joint Commission on Accreditation of Healthcare Organizations started to score hospitals' compliance with pain management standards (Joint Commission on Accreditation of Healthcare Organizations, 2003). Thus, a more recent and comprehensive description of PICU nurses' beliefs regarding pain is needed to determine any gaps that may exist and to guide future interventions to improve nurses' management of critically ill children's pain.

The knowledge use in pain care (KUPC) conceptual model (Latimer, Ritchie, & Johnston, 2010) and the theory of planned behavior (Ajzen, 1991; Fishbein & Ajzen, 2010) were guiding theoretical frameworks for this study. The KUPC addresses pediatric nurses' acquisition and use of pain knowledge. One proposition of the KUPC is that characteristics of the individual nurse (e.g., knowledge, education, critical thinking disposition, and past experience) are associated with better pain management practices. Nurses' judgments regarding pain are suggested to be "formulated as a result of nurses' critical decision-making ability, their attitudes and beliefs about pain, and/or the barriers and facilitators at work that influence the pain management process" (Latimer et al., 2010, p. 277). Thus, knowledge, attitudes, and beliefs are proposed to act as a compass, orienting a nurse's approach while assessing and managing pain. Misconceptions or inaccurate beliefs held by the nurse may misguide the nurse's judgments, leading to ineffective pain control.

The questionnaire used for this study was based on the theory of planned behavior (Ajzen, 1991; Fishbein & Ajzen, 2010); a main proposition of the theory is that an individual's behavior follows from salient information or beliefs held about the behavior. Beliefs may originate from a variety of sources, such as personal experience, formal education, media, or interactions with others; consequently, beliefs may or may not be based on accurate information or knowledge (Fishbein & Ajzen, 2010). Attitudes are proposed to develop from beliefs and reflect the degree to which one responds positively or negatively toward the behavior. For this reason, attitudes can be explored by eliciting the beliefs of individuals (Ajzen, 1991; Fishbein & Ajzen, 2010). Therefore, for this study, we define pain beliefs to be tenets of pain assessment or management that a nurse accepts as true or probable,

regardless of whether the tenets are supported with conclusive evidence. These beliefs reflect both the nurses' knowledge and attitudes regarding children's pain.

Review of Literature

In a review of literature spanning 15 years, Twycross (2010) concluded that knowledge deficits and inaccurate beliefs of nurses were contributing factors to poor pain management in hospitalized children. Gaps were noted in pediatric nurses' knowledge of assessment and pharmacological and non-pharmacological interventions for pain. Additionally, beliefs that pain is to be expected and is of lower priority were noted. Subsequent research with pediatric nurses demonstrated similar results (Stanley & Pollard, 2013; Vincent, Wilkie, & Wang, 2011).

In studies specific to pediatric critical care, investigators have identified both strengths and weaknesses in nurses' beliefs about pain. PICU nurses scored most accurately in response to items regarding pain interventions and drug actions (Pederson et al., 1997), the negative consequences of pain, children's ability to feel and remember pain, and the credibility of a parent's report of her or his child's pain (Pederson & Bjerke, 1999). Additionally, PICU nurses (along with nurses in hematology/oncology and the emergency department) scored significantly higher on a pain knowledge and attitudes questionnaire than pediatric nurses in other clinical areas (Manworren, 2000). However, inaccuracies in PICU nurses' beliefs regarding children's pain have also been noted. PICU nurses did not consistently identify children's self-report as the preferred method of pain assessment (Pederson & Bjerke, 1999; Pederson et al., 1997). They also scored poorly in knowledge assessments on items related to pain treatments, including the dosing and pharmacodynamics of analgesics, risks of addiction and respiratory depression with opioids, and use of non-pharmacologic interventions (Manworren, 2000; Pederson et al., 1997).

Yet the assessment of nurses' knowledge of pain facts is not enough. It is also important to evaluate how nurses interpret and apply their beliefs during patient care. It is likely that nurses' pain beliefs are not static and vary with differing patient situations. Past investigators have evaluated PICU nurses' pain beliefs quantitatively through knowledge assessments or questionnaires (Manworren, 2000; Pederson & Bjerke, 1999; Pederson et al., 1997) and qualitatively through participant interview (Mattsson et al., 2011). Additionally, investigators have used vignettes, or patient scenarios, in both quantitative and qualitative studies to elicit responses from nurses regarding children's pain (Manworren, 2000, 2001; Van Hulle Vincent, Wilkie, & Szalacha, 2010; Vincent & Gaddy, 2009; Vincent et al., 2011). However, no investigators have used all of these methods concurrently. By combining qualitative and quantitative data to triangulate findings, a more comprehensive evaluation of a phenomenon of interest can be achieved (Ostlund, Kidd, Wengstrom, & Rowa-Dewar, 2011).

Purpose/Aims

The purpose of this mixed-methods study was to provide a current and more comprehensive evaluation of PICU nurses' beliefs regarding the assessment and management of children's pain. The specific aims were to:

1. Describe PICU nurses' beliefs regarding the assessment and management of children's pain.
2. Compare PICU nurses' beliefs regarding children's pain as reported in a pain questionnaire to their beliefs expressed after viewing VH vignettes.

Methods

Methods for this study have been reported in prior publications, and additional details regarding the instruments as well as data collection and analysis can also be obtained elsewhere (LaFond, Van Hulle Vincent, Corte, et al., 2015; LaFond, Van Hulle Vincent, Lee, et al., 2015).

Design/Sample

To accomplish the specific aims of the study, a convergent parallel mixed-methods design was applied (Creswell & Plano Clark, 2011). Quantitative and qualitative data were collected concurrently and analyzed in parallel; qualitative themes were then transformed (quantified) and compared to quantitative questionnaire results. This design was chosen to facilitate an improved understanding of the complexities of nurses' pain beliefs and to triangulate findings. Subjects consisted of 40 registered nurses working a minimum of 20 hours a week for the past year in a PICU at one of the two participating hospitals in the Midwest United States.

Instruments

Instruments used in the study included a demographic form, the Pain Beliefs and Practices Questionnaire (PBPQ), and four VH vignettes (written responses and open-ended interview).

Nurse demographics—A researcher-developed demographic form was used to collect information about the nurses, including their nursing education and years experience as a PICU nurse (see Table 1).

Pain Beliefs and Practices Questionnaire (PBPQ)—Vincent, Wilkie, and Wang's (2011) PBPQ was adapted in collaboration with the instrument developers (authors CV and DW) for use with PICU nurses. Based on the theory of planned behavior (Ajzen, 1991), the PBPQ is comprised of three content areas: Total Beliefs, Opioid Kinetics, and Simulated Pain Management Practice. Here, results of the Total Beliefs and the Opioid Kinetics sections are reported. Simulated Pain Management Practices responses are reported elsewhere (LaFond, Van Hulle Vincent, Corte, et al., 2015).

Previous research results support the construct validity and internal consistency (Cronbach's alpha 0.83 to 0.85) of the PBPQ with pediatric nurses (Vincent et al., 2011). Because the PBPQ was adapted for this study, content validity was assessed through expert review; four advanced practice nurses with an average of 10 years' experience in pediatric critical care affirmed the accuracy and relevance of content for PICU nurses (LaFond, Van Hulle Vincent, Corte, et al., 2015; LaFond, Van Hulle Vincent, Lee, et al., 2015). Further, a PICU clinical pharmacist confirmed accuracy and relevance of opioid kinetics items. For the

current study, Total Beliefs items were examined for internal consistency, with a resulting Cronbach's alpha of 0.72.

The Total Beliefs content of the original PBPQ includes 26 items regarding the legitimacy of children's self-report of pain, the effects of unrelieved pain, and the use of analgesics. Nurses rate items from 1 = *do not agree at all* to 6 = *agree very much*. The Total Beliefs score is calculated as the mean score for the items; higher means indicate beliefs consistent with effective pain management. Because past investigators have questioned PICU nurses' differentiation of pain and sedation when assessing patients in practice (Simons & Moseley, 2009), an item was added regarding children's ability to experience pain while receiving sedatives. Thus, 27 items were included for this study.

The original PBPQ Opioid Kinetics score consists of 16 open-ended items in which nurses' knowledge of the time of peak effects and duration of action for intravenous morphine, intravenous hydromorphone, and oral oxycodone is evaluated. The Opioid Kinetics score is the sum of items answered correctly; higher scores indicate more accurate beliefs (Vincent et al., 2011). Internal consistency of these items has been supported, with 71 to 73% of nurses reporting the same answer for repeated items in the instrument (Vincent et al., 2011). For the adapted PBPQ, repetitive items were removed and the oral oxycodone questions were replaced with two items regarding the peak effect and duration of action of intravenous fentanyl. With a total of 6 items, the possible range for the opioid kinetics scores was 0 to 6.

Virtual human (VH) vignettes—Four computer-generated patient scenarios, or virtual human (VH) vignettes, were developed for this study (LaFond, Van Hulle1, Lee, et al., 2015). The vignettes depicted four 10-year-old African American boys admitted to the PICU. With the VH vignettes, nurses were able to observe each child's behavior and current vital signs via short video clips; they were also able to review information about the child (demographics, diagnosis, and vital signs, pain scores, and analgesic doses provided within the past 2 hours) via a simulated electronic health record. Content of the four vignettes is the same, with the exception of the child's diagnosis and facial expression. Two children are in their first postoperative day after abdominal surgery, and two children are experiencing a sickle cell vaso-occlusive crisis. For each diagnosis, one child is smiling and one child is grimacing. The boys all report the same pain intensity (8 out of 10) and have the same provider order for intravenous morphine for pain. Content, face, and convergent validity of the VH vignettes was established respectively through expert review, PICU staff nurse endorsement, and evaluation of nurses' responses to the VH vignettes and similar written vignettes (LaFond, Van Hulle Vincent, Lee, et al., 2015).

After viewing each vignette, nurses documented their rating of the child's pain intensity on a numeric pain scale from 0 to 10 (0 being no pain and 10 being the worst imaginable pain) and if/how they would treat the child's pain. Upon viewing all four vignettes, each nurse participated in a semi-structured interview about their choices for the children in the vignettes; the nurses were asked to explain what they were thinking when making the choices and were encouraged to share anything more they believed was important for the investigators to know regarding children's pain (LaFond, Van Hulle Vincent, Corte, et al., 2015).

Data Collection Procedures

Approval was obtained from the appropriate Institutional Review Boards, and nurses were recruited from the participating PICUs for study participation. Nurses met with the first author individually, in a private setting in the hospital or another location of choice. During the appointment consent was obtained, and nurses (1) completed the demographic survey, (2) were guided through a practice VH vignette of a child with asthma and a neutral facial expression, (3) viewed the four study VH vignettes and chose pain intensity ratings and treatments for each child, (4) participated in an interview, and (5) completed the PBPQ. Interviews were audio recorded and transcribed verbatim (LaFond, Van Hulle Vincent, Corte, et al., 2015; LaFond, Van Hulle Vincent, Lee, et al., 2015).

Data Analysis

Descriptive statistics were used to analyze nurse demographics and PBPQ results. A directed content analysis approach (Hsieh & Shannon, 2005) was applied for analysis of qualitative data; this approach included developing operational definitions and evaluating interview transcripts for the presence of the KUPC concepts and sub-concepts (LaFond, Van Hulle Vincent, Corte, et al., 2015). Beliefs were operationalized to be general statements made by the nurses about children's pain. Two nurse researchers (authors CL and KO) independently reviewed and confirmed qualitative coding.

The 27 PBPQ Total Beliefs items were compared to the resulting qualitative belief codes and were matched for similarity in meaning/content. A matrix was developed to evaluate the individual nurses' responses to the PBPQ items and their beliefs expressed during the interviews. The matched items and codes were evaluated for convergence (similar findings) and divergence (contradiction of findings; Ostlund et al., 2011).

Results

Demographic Information

As reported elsewhere, 40 nurses (11 from one site, 29 from the other) with an average of 9.2 (*SD* 8.7) years of PICU experience participated in the study (LaFond, Vincent, Lee, et al., 2015). The nurses were primarily female, non-Hispanic/White, and held a baccalaureate degree in nursing (Table 1). The patient age groups they reported most often providing care for included 1 to 3 years and 4 to 9 years. All nurses reported caring for patients in pain weekly.

Description of PICU Nurses' Beliefs Regarding Pain Assessment and Management

The nurses' beliefs were captured quantitatively through the PBPQ Total Beliefs items and Opioid Kinetics items. Their beliefs were captured qualitatively through analysis of the interview transcripts for the presence of belief statements.

PBPQ—Nurses' scores ranged widely for the PBPQ items (Tables 2 and 3). The nurses' mean score for the Total Beliefs items was 4.31 (*SD* 0.42) and ranged from 3.63 to 5.48 out of a possible range of 1 to 6. For the Opioid Kinetics items, the mean score was 3.4 (*SD* 1.46), and ranged from 1 to 6 out of a possible range of 0 to 6.

Seven items from the PBPQ Total Beliefs section were related to pain assessment and the legitimacy of children's self-report (Table 2). Beliefs that were rated higher (agreed with item) included the beliefs that children receiving sedatives can still experience pain, children less than 8 years of age can reliably report pain intensity, and the child is the most accurate judge of the child's pain intensity. Nurses rated items lower (disagreed with item) that observable behavioral and vital sign changes must not be relied upon to verify a child's report of severe pain.

Twelve of the items from the PBPQ Total Beliefs section were related to pain management (Table 2). Nurses' beliefs that were rated higher (agreed) included the belief that there are multiple points along the pain pathway at which pain relief strategies can be directed, opioids combined with non-opioids can provide more effective pain relief than either one alone, and after the initial recommended dose of opioid analgesic, subsequent doses should be adjusted to the individual child's response. Nurses more often rated lower (disagreed) that there is not a real danger of respiratory depression, physical dependence, deep sedation, and tolerance from opioids when used for acute pain management.

For the Opioid Kinetics items, PICU nurses most often reported a timeframe within the appropriate range for the peak effect (65%) and duration of action (75%) of intravenous fentanyl and duration of action (67.5%) of intravenous morphine (see Table 3). Hydromorphone duration (30%) and morphine peak (41%) were least often reported within an appropriate timeframe.

Qualitative Belief Codes—All PICU nurses expressed beliefs regarding the assessment and/or management of pain in children during the interview. The most common pain assessment beliefs included the use of behavior and vital signs to verify pain, and beliefs regarding the accuracy of a child's pain report (see Table 4). As described elsewhere, beliefs regarding behavior and the assessment of pain were prevalent (LaFond, Vincent, Corte, et al., 2015). Nearly half of the nurses supported using behavior to verify pain ($n = 19$, 47.5%). Beliefs were also expressed regarding the need to use vital signs to verify pain ($n = 11$, 27.5%). One nurse describing pain assessment stated, "I think that as nurses we go more off of vital signs and how they're behaving versus the word, the number that they're actually saying."

Nurses who described the need to use behavior or vital signs to verify pain often explained that this was due to the unreliability of self-report in children. One nurse commented, "because sometimes if you ask if they're in pain they're just going to say yes. So you just have to look at how they are before you ask how they are." Seventeen nurses (42.5%) shared beliefs that children are unreliable reporters of pain/inflate reports of pain intensity. Rationale for this belief included (some reported multiple reasons): children exhibit behaviors inconsistent with their pain reports, e.g. playing, watching TV, sleeping ($n = 6$), have difficulty picking out an appropriate number for pain ($n = 5$), attention seeking ($n = 3$), always rate pain high ($n = 2$), coping mechanism ($n = 2$), faking ($n = 2$), anxiety/nervousness ($n = 1$), boys can be dramatic ($n = 1$), and the influence of the child's family ($n = 1$). Conversely, nurses who expressed a belief that children are accurate reporters of pain ($n =$

19, 47.5%) often described needing to believe what the child told them. One nurse stated, “Every patient’s unique, every pain is unique. So I have to take them for their word at it.”

Five of the nurses noted that they were more likely to believe a pain report from a child with sickle cell disease. One nurse stated, “I feel like when they’re telling me that they’re in pain I want to believe them more because I know that they know what pain is.” Ten nurses also described beliefs that children with sickle cell disease are “used to pain” and therefore less likely to display pain behaviors. One nurse noted, “with sickle cell in particular they’re used to pain and so the way they deal with it is different. So a kid can be smiling and be in pain because he’s so used to all the pain.”

When describing what they were thinking as they chose a pain intervention for a VH vignette patient, most (85%) nurses expressed a belief regarding the management of children’s pain. The most common beliefs described by the nurses were that nurses cannot ignore a child’s pain report ($n = 18$, 45%), concerns regarding administration of opioid analgesics ($n = 14$, 35%), and the need to “start low” with analgesics/pain interventions ($n = 14$, 35%). Nurses who described the belief that nurses cannot ignore a pain report were often responding to the context of a child who does not display behavioral indicators of pain but reports that pain is present. These nurses noted that though they may question the child’s report, the nurse is still obligated to provide some sort of relief measure. One nurse noted, “I think that if you’re reporting pain that we should treat it.”

Concerns regarding administration of opioids described by the nurses were diverse and ranged from vague concerns/apprehensions (“I’m cautious”) to very specific concerns regarding the negative side effects of opioids. Some nurses expressed multiple concerns regarding opioids during the interview. Specific concerns that were described included the risk of over-sedation ($n = 7$), drug-seeking ($n = 6$), respiratory depression ($n = 4$), and physical tolerance ($n = 3$). Of note, the concerns of drug-seeking and physical tolerance were only described for patients with sickle cell disease.

Several nurses described a pain management philosophy of “starting low.” The rationale for this approach to pain management was often described to avoid complications such as over-sedation or respiratory depression and was supported by the notion that “you can always give more.” Some of these nurses described using opioids as a “last resort” for treating patients with acute pain, even in the context of a patient who received an opioid but continues to report pain. One nurse stated:

my first thought is to do the least amount of intervention as far as medication goes and not to say that you’re not going to do the most amount, but start with the least and try to get him so that he doesn’t end up having an RRT [rapid response team call] or any of those things. So that’s always in the back of your mind as well.

Comparison of PICU Nurses’ Beliefs Reported via Questionnaire and Interview

The 7 PBPQ Total Beliefs items regarding pain assessment were matched in content to the qualitative belief codes; as a result, four PBPQ items were matched to five codes (Table 3). Of the 71 times that a belief code regarding pain assessment was present in a nurses’ interview transcript, 31 times (43.7%) the belief was divergent with his/her rating for the

matching Total Beliefs item. For example, of the 19 nurses who voiced beliefs that behavior should be used to verify pain, six had a divergent response to the PBPQ, agreeing with the PBPQ item (rated 4 or greater) that observable behavioral changes cannot be relied upon to verify a child's statement that he/she is having pain.

The greatest convergence and divergence of pain assessment beliefs between the qualitative belief codes and the PBPQ Total Beliefs items were for the same content: the legitimacy of a child's report of pain intensity. Two belief codes (child accurate, child unreliable) were matched to one PBPQ item. For the PBPQ item, 38 nurses agreed the most accurate judge of a child's pain intensity is the child (rated 4 or higher). Nineteen of these nurses expressed a similar belief during the interview, with a "child accurate" code (100% agreement with PBPQ response). Conversely, 17 nurses expressed a belief that children are unreliable reporters of pain during the interview. This code was divergent from the nurse's PBPQ response for 15 of the nurses (12% agreement). Further, seven nurses expressed inconsistent beliefs during the interviews, with both a "child is accurate" and "child is unreliable" code present.

The 15 PBPQ beliefs items regarding pain management were also matched in content to the belief codes, resulting in six codes matched to 6 PBPQ items (see Table 4). Of the 32 times a qualitative pain management code was present in a nurses' interview transcript, 20 times the quote was convergent with the nurses' PBPQ response (62.5% agreement). Nurses who expressed a belief regarding respiratory depression, deep sedation, or tolerance concerns were in 100% agreement with their PBPQ item responses that there is real danger of these complications when opioids are used for acute pain management.

Nurses were most divergent in their responses between the belief codes and PBPQ Total Beliefs items regarding drug seeking and addiction (16.7% agreement) and providing analgesics postoperatively once pain is moderate to severe (25% agreement). Five of the six nurses who expressed a concern of drug-seeking during the interviews for the children with sickle cell vaso-occlusive crisis had a divergent response to the PBPQ, disagreeing with the item that there is real danger of addiction when opioids are used for acute pain management. Four nurses expressed a belief that analgesics (usually opioids) should be reserved until pain is more severe during the interviews. One nurse stated "In my opinion I just, if I can avoid giving somebody morphine, I mean if they're not significantly in pain—I know that he rated it as an eight—I just don't like to give it." Of these four nurses, three had a divergent response to the PBPQ item regarding the administration of analgesics for postoperative pain; the three nurses disagreed with the item that analgesics for postoperative pain should initially be given only when the nurse determines that the child has moderate to severe pain.

Discussion

The purpose of this study was to provide a more current and comprehensive description of PICU nurses' beliefs regarding the assessment and management of children's pain. Nurses' beliefs were captured using quantitative (PBPQ questionnaire) and qualitative (semi-structured interview) measures, and then compared to triangulate findings. The mean scores for the PBPQ Total Beliefs items suggested that many of the nurses' beliefs were consistent

with effective pain management practices (mean score four or greater). More common inaccurate beliefs included the need to verify pain reports with physical indicators, pharmacokinetics of intravenous opioids, and consequences of unrelieved pain on the immune system. Perhaps the greatest knowledge deficit was regarding pharmacokinetics; 45% of nurses missed half or more of the Opioid Kinetics items. The nurses' lower mean scores for the Total Beliefs items regarding the likelihood of respiratory depression, deep sedation, tolerance, and withdrawal from analgesics administered for acute pain should be interpreted cautiously. While literature supports that opioids administered for severe acute pain in children are safe and effective (Schechter, 2014), withdrawal and tolerance are frequent (Anand et al., 2010), and opioid reversal for respiratory depression is more prevalent (Chidambaran et al., 2014) in children who are critically ill. The nurses' lower scores for these items likely reflect their experiential knowledge caring for children in PICU.

These findings are consistent with research from the past two decades (Manworren, 2000; Pederson & Bjerke, 1999; Pederson et al., 1997), suggesting similar strengths and weaknesses in the accuracy of PICU nurses' pain beliefs. Results are also similar to Vincent, Wilkie, and Wang's (2011) study, in which pediatric floor nurses had lower mean scores for similar Total Beliefs items and had low scores for the Opioid Kinetics section.

Upon comparison of qualitative and quantitative findings, many beliefs nurses expressed during the interviews were convergent with their PBPQ responses, including the use of vital signs and behavior to assess pain, the belief that the nurse should take the child's word when pain is described, and concerns regarding the negative effects of analgesics. The nurses' belief in a pain management strategy of "start low" also likely reflects their concerns regarding the potential negative effects of opioid analgesics.

Divergent and conflicting findings were most often identified in regards to the legitimacy of a child's self-report for pain. While many nurses described the need to believe a child's report of pain and agreed with the PBPQ item that the child is the most accurate judge of his/her pain, many of these same nurses reported the need to verify a child's pain report with physical indicators and/or described beliefs that children are not reliable reporters of pain. The nurses' report of most often caring for younger children (less than 10 years) may have had an impact on the beliefs expressed about the accuracy of self-report. If the nurses have decreased exposure to older children, they may be less informed of the child's ability at this age and developmental level to self-report pain.

Limitations

Limitations of this study include a convenience sample of PICU nurses from an academic medical center and a large children's hospital in a Midwestern city; quantitative findings may not be generalizable to PICU nurses in different settings (e.g., rural areas, community hospital, outside the United States). Also, a criticism of the vignette technique is its selective simplification of complex processes and/or interactions (Hughes & Huby, 2002). Pain assessment and management is complex. While our VH vignettes provided more detail for the nurses than their written counterparts, they did not provide the same level of information as interaction with an actual child. The detail provided in the VH vignettes also may have influenced which beliefs the nurses shared during the interviews.

Direction for Future Action

Nurses need guidance with the interpretation and application of recommendations for practice. For example, minimizing the dose of an opioid, or “starting low” as nurses described in our study, is a noted strategy to decrease the risk of the adverse effects of opioids (Jitpakdee & Mande, 2014). However, if this strategy is interpreted as cause to only administer opioids as a last resort for severe acute pain or not to increase an opioid dose when pain continues to be unalleviated, children are at risk for poorly controlled pain and the negative consequences that ensue. Similarly, nurses need guidance in differentiating risks among patients, such as the increased risk of tolerance and physical dependence in patients on prolonged infusions of short-acting opioids, as opposed to children receiving intermittent doses over less than 72 hours (Anand et al., 2010).

Interventions are needed to help PICU nurses balance the risks of unrelieved pain in children with the potential adverse effects of opioid administration. To do so requires appreciation of the negative consequences of both, and accurate knowledge of practices that minimize risks. Targeted educational interventions have demonstrated some improvements in pediatric nurses’ pain beliefs (Ellis et al., 2007; Johnston et al., 2007; Le May et al., 2009; Vincent et al., 2011), pain assessment practices (Habich et al., 2012; Johnston et al., 2007), and pain management practices (Johnston et al., 2007; Le May et al., 2009; Vincent et al., 2010). Vincent, Wilkie, and Wang’s (2011) intervention, specifically targeting nurses’ faulty beliefs, resulted in significant improvements not only in nurses’ beliefs and pain management practices, but also children’s pain intensity. The intervention could serve as a model for a PICU-specific educational intervention.

The presence of divergent and conflicting responses among PICU nurses suggests that they do not equally apply beliefs to all circumstances and has implications for methods in which pain beliefs are captured. When measured without the context of a patient scenario, instruments may capture general beliefs, but may not accurately represent how a nurse would approach all patient populations. For example, some nurses expressed the belief that children with sickle cell disease are able to provide more accurate pain reports due to the frequency with which they experience pain. These divergences may represent areas wherein nurses’ knowledge, attitudes, and/or past experiences conflict. Future studies are needed to simultaneously assess and compare nurses’ pain beliefs for children of multiple ages, developmental levels, communicative abilities, and diagnoses. These areas of convergence and divergence of beliefs are important for educators, clinicians, and researchers to better understand, as they are insights into when nurses are more likely to stray from evidence-based practices. They also provide insight into clinical situations where more guidance and/or evidence is needed to assist nurses in the appropriate management of pain.

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References

- Ajzen I. The theory of planned behavior. *Organizational behavior and human decision processes*. 1991; 50(2):179–211.
- American Academy of Pediatrics. Committee on Psychosocial Aspects of Child Family Health Task Force on Pain in Infants, Children, and Adolescents. The assessment and management of acute pain in infants, children, and adolescents. *Pediatrics*. 2001; 108(3):793–797. [PubMed: 11533354]
- Anand KJ, Willson DF, Berger J, Harrison R, Meert KL, Zimmerman J. ... Eunice Kennedy Shriver National Institute of Child Health and Human Development Collaborative Pediatric Critical Care Research Network. Tolerance and withdrawal from prolonged opioid use in critically ill children. *Pediatrics*. 2010; 125(5):e1208–1225. DOI: 10.1542/peds.2009-0489 [PubMed: 20403936]
- Chidambaran V, Olbrecht V, Hossain M, Sadhasivam S, Rose J, Meyer MJ. Risk predictors of opioid-induced critical respiratory events in children: Naloxone use as a quality measure of opioid safety. *Pain Medicine*. 2014; 15(12):2139–2149. DOI: 10.1111/pme.12575 [PubMed: 25319840]
- Coffman S, Alvarez Y, Pyngolil M, Petit R, Hall C, Smyth M. Nursing assessment and management of pain in critically ill children. *Heart & Lung*. 1997; 26(3):221–228. [PubMed: 9176690]
- Creswell, JW.; Plano Clark, VL. *Designing and conducting mixed methods research*. 2. Los Angeles, CA: Sage; 2011.
- Curley MAQ, McDermott B, Berry P, Hurley J, MacKey C, McAleer D, Alsip C. Nurses' decision making regarding the use of sedatives and analgesics in pediatric ICU. *Heart & Lung*. 1992; 21(3): 296–296.
- Ellis JA, McCleary L, Blouin R, Dube K, Rowley B, MacNeil M, Cooke C. Implementing best practice pain management in a pediatric hospital. *Journal for Specialists in Pediatric Nursing*. 2007; 12(4): 264–277. DOI: 10.1111/j.1744-6155.2007.00121.x [PubMed: 17956374]
- Fishbein, M.; Ajzen, I. *Predicting and changing behavior: The reasoned action approach*. New York, NY: Psychology Press; 2010.
- Habich M, Wilson D, Thielk D, Melles GL, Crumlett HS, Masterton J, McGuire J. Evaluating the effectiveness of pediatric pain management guidelines. *Journal of Pediatric Nursing*. 2012; 27(4): 336–345. DOI: 10.1016/j.pedn.2011.06.002 [PubMed: 22703680]
- Hsieh HF, Shannon SE. Three approaches to qualitative content analysis. *Qualitative Health Research*. 2005; 15(9):1277–1288. [PubMed: 16204405]
- Hughes R, Huby M. The application of vignettes in social and nursing research. *Journal of Advanced Nursing*. 2002; 37(4):382–386. DOI: 10.1046/j.1365-2648.2002.02100.x [PubMed: 11872108]
- Jitpakdee T, Mande S. Strategies for preventing side effects of systemic opioid in postoperative pediatric patients. *Paediatric Anaesthesia*. 2014; 24(6):561–568. DOI: 10.1111/pan.12420 [PubMed: 24809837]
- Johnston CJ, Gagnon A, Rennick J, Rosmus C, Patenaude H, Ellis J, ... Byron J. One-on-one coaching to improve pain assessment and management practices of pediatric nurses. *Journal of Pediatric Nursing*. 2007; 22(6):467–478. [PubMed: 18036467]
- Joint Commission on Accreditation of Healthcare Organizations. *Approaches to pain management: A guide for clinical leaders*. Oakbrook Terrace, IL: Joint Commission Resources; 2003.
- LaFond CM, Van Hulle Vincent C, Corte C, Hershberger PE, Johnson A, Park CG, Wilkie DJ. PICU nurses' pain assessments and intervention choices for virtual human and written vignettes. *Journal of Pediatric Nursing*. 2015; doi: 10.1016/j.pedn.2015.01.022
- LaFond CM, Van Hulle Vincent C, Lee S, Corte C, Hershberger PE, Johnson A, ... Wilkie DJ. Development and validation of a virtual human vignette to compare nurses' assessment and intervention choices for pain in critically ill children. *Simulation in Healthcare*. 2015; 10(1):14–20. DOI: 10.1097/SIH.0000000000000061 [PubMed: 25514587]

- Latimer MA, Ritchie JA, Johnston CC. Individual nurse and organizational context considerations for better knowledge use in pain care. *Journal of Pediatric Nursing*. 2010; 25(4):274–281. DOI: 10.1016/j.pedn.2009.03.004 [PubMed: 20620808]
- Le May S, Johnston CC, Choinière M, Fortin C, Kudirka D, Murray L, Chalut D. Pain Management Practices in a Pediatric Emergency Room (PAMPER) Study: Interventions with nurses. *Pediatric Emergency Care*. 2009; 25(8):498–503. DOI: 10.1097/PEC.0b013e3181b0a0af [PubMed: 19633588]
- Manworren RC. Practice applications of research. *Pediatric nurses' knowledge and attitudes survey regarding pain*. *Pediatric Nursing*. 2000; 26(6):610–614. [PubMed: 12026363]
- Manworren RC. Development and testing of the Pediatric Nurses' Knowledge and Attitudes Survey Regarding Pain. *Pediatric Nursing*. 2001; 27(2):151–158. [PubMed: 12962251]
- Mattsson JY, Forsner M, Arman M. Uncovering pain in critically ill non-verbal children: Nurses' clinical experiences in the paediatric intensive care unit. *Journal of Child Health Care*. 2011; 15(3): 187–198. DOI: 10.1177/1367493511406566 [PubMed: 21828165]
- Ostlund U, Kidd L, Wengstrom Y, Rowa-Dewar N. Combining qualitative and quantitative research within mixed method research designs: A methodological review. *International Journal of Nursing Studies*. 2011; 48(3):369–383. DOI: 10.1016/j.ijnurstu.2010.10.005 [PubMed: 21084086]
- Pederson C, Bjerke T. Pediatric pain management: A research-based clinical pathway. *Dimensions of Critical Care Nursing*. 1999; 18(3):42–51.
- Pederson C, Matthies D, McDonald S. A survey of pediatric critical care nurses' knowledge of pain management. *American Journal of Critical Care*. 1997; 6(4):289–295. [PubMed: 9215426]
- Schechter NL. Pediatric pain management and opioids: The baby and the bathwater. *JAMA Pediatrics*. 2014; 168(11):987–988. DOI: 10.1001/jamapediatrics.2014.1441 [PubMed: 25200481]
- Simons J, Moseley L. Influences on nurses' scoring of children's post-operative pain. *Journal of Child Health Care*. 2009; 13(2):101–115. DOI: 10.1177/1367493509102468 [PubMed: 19458166]
- Stanley M, Pollard D. Relationship between knowledge, attitudes, and self-efficacy of nurses in the management of pediatric pain. *Pediatric Nursing*. 2013; 39(4):165–171. [PubMed: 24027950]
- Twycross A. Managing pain in children: Where to from here? *Journal of Clinical Nursing*. 2010; 19(15–16):2090–2099. DOI: 10.1111/j.1365-2702.2010.03271.x [PubMed: 20659190]
- Van Hulle Vincent C, Wilkie DJ, Szalacha L. Pediatric nurses' cognitive representations of children's pain. *The Journal of Pain*. 2010; 11(9):854–863. DOI: 10.1016/j.jpain.2009.12.003 [PubMed: 20418172]
- Vincent C, Gaddy EJ. Pediatric nurses' thinking in response to vignettes on administering analgesics. *Research in Nursing & Health*. 2009; 32(5):530–539. [PubMed: 19504564]
- Vincent C, Wilkie DJ, Wang E. Pediatric nurses' beliefs and pain management practices: An intervention pilot. *Western Journal of Nursing Research*. 2011; doi: 10.1177/0193945910391681

HIGHLIGHTS

- Nurses' beliefs regarding critically ill children's pain was described and compared
- Most beliefs were consistent with effective pain management practices
- Inaccurate beliefs included pharmacokinetics and use of behavior to verify pain
- Divergent and conflicting beliefs related to the legitimacy of a child's pain report
- Nurses believe unrelieved pain is harmful but also concerned about use of opioids

Table 1

Nurse Demographics (N = 40)

Variable	N	%
Gender		
Female	37	92.5
Male	3	7.5
Ethnicity and Race	3	7.5
White/ not Hispanic or Latino	31	77.5
Asian	5	12.5
White/ Hispanic or Latino	2	5
African-American/ Hispanic or Latino	1	2.5
Hawaiian-Pacific Islander	1	2.5
Nursing Education		
Diploma	1	2.5
Associate Degree	1	2.5
Baccalaureate	32	80
Masters	6	15
Ages of Children Most frequently Cared for in PICU [*]		
Less Than 1 Year	5	16.1
1 to 3 Years	14	45.2
4 to 9 Years	10	32.3
10 to 15 Years	2	6.5
Number of Children in Pain Cared for Per Week in Past 3 Months		
None	0	0
1 – 5	23	57.5
> 5	17	42.5

Note.

^{*} N = 31.

Nine nurses chose all of the age groups and therefore could not be included in analysis for this item.

Table 2

Nurses' Responses to the PBPQ Total Beliefs Items, with 1 "Strongly Disagree" and 6 "Strongly Agree"

PBPQ Total Beliefs Item	Range	Mean (SD)
Legitimacy of Self-report (Assessment)		
Observable vital sign changes not relied upon to verify report	1 – 6	3.55 (1.34)
Child receiving sedatives can experience severe pain	4 – 6	5.65 (.58)
Child may sleep in spite of severe pain	1 – 6	4.23 (1.37)
Child younger than 8 years can reliably report pain intensity	3 – 6	5.18 (.87)
Observable behavioral changes not relied on to verify report	1 – 6	3.25 (1.45)
Most accurate judge of child's pain intensity is the child	3 – 6	5.02 (.89)
Most accurate judge of child's pain intensity is not the nurse	2 – 6	4.62 (1.27)
Use of Analgesics (Pain Management)		
Respiratory depression rarely occurs	1 – 6	2.2 (1.26)
Addiction, physical dependence, tolerance are not alike	2 – 6	5.05 (1.24)
Not a real danger of addiction	1 – 6	4.48 (1.47)
Likelihood of opioid addiction	2 – 6	4.7 (1.32)
Not a real danger of deep sedation	1 – 6	3.13 (1.24)
Not a real danger of physical dependence	1 – 5	2.68 (1.37)
Not a real danger of tolerance	1 – 6	3.13 (1.34)
Increased dosages of morphine provide increased relief	1 – 6	4.13 (1.45)
After initial dose, adjust doses to child's response	1 – 6	5.15 (1.00)
Give analgesics around the clock on a fixed schedule	1 – 6	4.15 (1.44)
Should not only give analgesics when child asks	2 – 6	4.43 (1.11)
Should not only give analgesics when nurse determines moderate to severe pain	1 – 6	4.68 (1.31)
Opioids plus non-opioids more effective pain relief	3 – 6	5.28 (.82)
Nonpharmacological methods alone not effective to relieve moderate/severe pain	1 – 6	3.78 (1.37)
Multiple points on pain pathway for pain relief strategies	4 – 6	5.55 (.68)
Effects of Unrelieved Pain		
Harmful physiological and psychological effects	3 – 6	5.53 (.68)
Immune system changes can lead to death	1 – 6	3.68 (1.54)
Cardiopulmonary changes (hypoxemia and pneumonia)	1 – 6	4.72 (1.2)
Gastric stasis and paralytic ileus	1 – 6	4.18 (1.36)
Changes in CNS, increased sensitivity to pain	2 – 6	4.23 (1.19)

Table 3

Range of Responses, Frequency, and Percent of Correct Responses to PBPQ Opioid Kinetics Items

Opioid Kinetics Item	Range	Correct Responses <i>N</i> (%)
Intravenous Morphine Peak (<i>n</i> = 39)	30 sec – 1 hour	16 (41)
Intravenous Morphine Duration (<i>n</i> = 40)	30 min – 4 hours	27 (67.5)
Intravenous Hydromorphone Peak (<i>n</i> = 40)	1 min – 3 hours	20 (50)
Intravenous Hydromorphone Duration (<i>n</i> = 40)	15 min – 4 hours	12 (30)
Intravenous Fentanyl Peak (<i>n</i> = 40)	30 sec – 2 hours	26 (65)
Intravenous Fentanyl Duration (<i>n</i> = 40)	20 min – 3 hours	30 (75)

Table 4

PBPQ Total Beliefs Items with Corresponding Qualitative Descriptive Codes

PBPQ Beliefs Item (<i>M</i> , <i>SD</i>)	Corresponding Belief Codes (nurses with code identified)	Code Description	Example Quote
Observable vital sign changes not relied on to verify report (<i>M</i> = 3.55, <i>SD</i> = 1.34)	Pain Assessment: Vital signs changes expected with pain (<i>n</i> = 11) Pain management: vital sign changes guide intervention choice (<i>n</i> = 2)	Describes belief that changes in vital signs expected with pain Describes belief that treatment is more necessary when vital signs increase	"So usually I base pretty high pain with some sort of vital sign changes."
Child may sleep in spite of severe pain (<i>M</i> = 4.22, <i>SD</i> = 1.36)	Nurse Beliefs: Behavior-sleeping Sleep possible (<i>n</i> = 3) Sleep incongruous (<i>n</i> = 3)	Describes beliefs regarding sleep and the ability to experience pain.	"or they'll be sleeping and wake up—what's your pain? 'Ten' or 'eight,' you know what I mean? So you know it can't possibly be that"
Observable behavioral changes not relied on to verify report (<i>M</i> = 3.25, <i>SD</i> = 1.45)	Nurse beliefs: Use of behavior to verify pain assessment (<i>N</i> = 19) Use of behavior to manage pain (<i>N</i> = 11)	Describes behaviors expected to be observed when a child is reporting pain	"Because I think of ten, the worst pain you've ever had in your entire life, you're not hungry, you're not going to want to eat, you're not going to want to get out of bed. You're curled up in a ball. So I feel like eight is pretty close to that. You're crying, you're not smiling. Like no way you're smiling. You're an eight."
Most accurate judge of child's pain intensity is the child (<i>M</i> = 5.03, <i>SD</i> = 0.89)	Nurse Beliefs: Child accurate (<i>n</i> = 19) Nurse Beliefs: Child unreliable (<i>n</i> = 17)	Supports the child's pain rating as accurate Describes why children are often unreliable reporters of pain	"I always take what the patient says as their pain." "But I do think that kids tend to – a lot of times they'll be playing videogames and they'll say it's an eight. So it seems like it's not that reliable an indicator."
Respiratory depression rarely occurs (<i>M</i> = 2.20, <i>SD</i> = 1.26)	Nurse Beliefs: Respiratory depression concern (<i>n</i> = 4)	Describes concerns regarding administering morphine and respiratory depression	"so that's the one thing I would be worried about is respiratory depression"
Not a real danger of addiction (<i>M</i> = 4.48, <i>SD</i> = 1.47)	Nurse Beliefs: Sickle cell and drug seeking (<i>n</i> = 6)	Mentions drug seeking in context of sickle cell diagnosis and administration of opioids	"like, are you really in pain or, like, are you just chasing the drugs?"
Not a real danger of deep sedation (<i>M</i> = 3.13, <i>SD</i> = 1.24)	Nurse Beliefs: Sedation concern (<i>n</i> = 7)	Describes concerns regarding administering morphine and risk of over sedation	"I wouldn't want to snow him and put him out basically"
Not a real danger of tolerance (<i>M</i> = 3.13, <i>SD</i> = 1.34)	Nurse Beliefs: Medication tolerance (<i>n</i> = 3)	Describes concern of patient developing tolerance to morphine	"plus they get tolerant to it (morphine) kind of quick"
Harmful physiological and psychological effects (<i>M</i> = 5.53, <i>SD</i> = 0.68)	Nurse Beliefs: Unrelieved pain is harmful (<i>n</i> = 4)	Describes the need to relieve the child's pain to prevent harmful consequences	"I think for their wellbeing and their healing I think they need to be comfortable"