

A qualitative analysis of how parents assess acute pain in young children

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Abstract

An accurate and comprehensive pain assessment is crucial for adequate pain management in pre- and early verbal children during painful medical procedures. This study used an inductive approach to explore the processes involved in parental pain assessment and to develop a new model of Parental Assessment of Acute Child Pain. Participants were 19 parents of children aged under 3 years who had previously or were potentially about to experience an intravenous cannula or nasogastric tube insertion. Parental affect regulation, while witnessing their child in acute pain/distress, appeared to be critical to the processes involved in assessing their child's pain.

Keywords

affect regulation, assessment, grounded theory, parent, pediatric pain

Introduction

Acute pain is a common occurrence in young children's lives. Due to historically poor pain assessment and limited understanding of pediatric pain, children's pain is systematically under-assessed and subsequently undertreated with some routine medical procedures in infants commonly performed without pain interventions (Bauchner, 1991; Blount et al., 2006). Younger children are particularly vulnerable during a painful medical event given that their immature central nervous system results in them experiencing pain more intensely than adults (Byrne et al., 2001). Given that pain in infants can have adverse immediate, short-term and long-term effects upon the infant (Mathew and Mathew, 2003), the accurate assessment of pain is therefore crucial for appropriate pain management in young children (Mathew and Mathew, 2003; Prkachin et al., 2007). Such accurate assessment can guide decisions about the timeliness of interventions, as well as the appropriate selection of pharmacological and non-pharmacological interventions (Mathew and Mathew, 2003).

Child pain assessment is challenging because pain is a subjective phenomenon (Merskey et al., 1979). Self-report is the gold-standard; however, infants and pre-verbal children cannot meaningfully engage in such methods (McGrath, 1990). In practice, clinicians rely on observational (behavioral) pain tools using their clinical experience and knowledge to make an assessment (Hodgins, 2002; Von Baeyer and

Spagrud, 2007; Walsh et al., 2008). Clinical judgment is considered more objective and accurate in providing a pain assessment (Hadjistavropoulos et al., 1997; Manne et al., 1992) than self-report in young children. However, such judgments are complex due to the need to consider the individual characteristics of the child (e.g. Ranger and Campbell-Yeo, 2008), family systemic information (see Kerr, 2002), and relevant contextual information for a valid pain assessment of that particular child (Cohen et al., 2006; Pasero and McCaffery, 2005). Given the complexity of these judgments, they are open to human error. Moreover, not all available information is necessarily incorporated into the decision-making process with evidence that behavioral information (especially facial expression) may be attended to more than procedural or contextual information concerning whether or not there had been tissue damage (Hadjistavropoulos et al., 1997). In addition, different factors appear to comprise clinical judgments about the genuineness of pain versus the intensity of pain (Martel et al.,

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2011). As such, operationalizing pain using observational measures may not capture the vagaries of a child's pain expression and potentially contribute to the inconsistencies evident in the assessment of child pain (Bauchner, 1991). The inclusion of parents' or caregivers' observations and judgments may therefore provide a better pain assessment than that based solely on a clinician's observation and judgment (Jylli and Olsson, 1995; Kazak et al., 1995).

There is good reason to better understand the processes involved in parental judgments of acute pain in young children. Parents know their child's typical pain reactions and are privy to valuable contextual and systemic information (Chambers et al., 1996). A child's behavioral expressions could reflect coping style, socialization, temperament, development, reactions to the situation, and family and socio-cultural expectations and models (Byrne et al., 2001; Chambers et al., 2002; Chen et al., 2000; Craig, 1978; Craig et al., 1996; Miller and Newton, 2006) which clinicians could misinterpret. While parents are more familiar with their child's typical pain reactions, there is still variability in parents' ability to accurately assess the pain of their young child. While some studies show that parents are more accurate than clinicians, other studies show that parents still underestimate and overestimate pain in verbal children (Chambers et al., 1998; Jylli and Olsson, 1995; Kazak et al., 1995; Voepel-Lewis et al., 2005). Similarly, while some studies show that parent and child (verbal) pain ratings correspond, other studies show discrepancies (Bellman and Paley, 1993; Bennett-Branson and Craig, 1993; Chambers et al., 1998; Manne et al., 1992; Miller and Newton, 2006). Research has investigated the role of individual child characteristics in explaining these inconsistencies (Larochette et al., 2006; Vervoort et al., 2008), but there has been little research examining the mechanisms governing parental perceptions and interpretations.

Given that the inclusion of parental judgments could improve assessments of pain in young children if combined with observational assessments made by clinicians, and given the variability in accuracy in parental pain assessments, there is a need to better understand the decision-making processes utilized by parents in assessing acute pain in young children. As there are few formal tools available to assist parents in assessing their child's pain (e.g. Reid et al., 1995), a better understanding of these processes may assist in the development of tools to improve the validity and reliability of parental judgments of acute pain in young children.

This study aims to examine parental pain assessment in an effort to address current research limitations and explore factors contributing to and influencing parental assessments of acute pain in young children. This study will use an inductive methodology to explore parental perceptions about (a) the key processes involved in a parent making judgments about their child's pain, (b) what influences a parent's assessment, and (c) the mechanisms responsible for a helpful or unhelpful parental assessment.

Methods

Participants and data collection

A total of 19 participants (9 mothers, 2 fathers, 4 mother-father pairs) participated in 15 interviews. In all instances when both a mother and father were present, the mother provided a vast majority of the data, although the source of information was considered in the data analysis. Participants were aged between 24 and 41 years ($M=31.13$; standard deviation (SD)= 5.78). The infant or young child referred to in the interviews was aged between 2 months and 3 years ($M=1.26$; $SD=0.94$). See Table 1 for participant identification codes and further demographic and medical information.

Both the Mater Children's Hospital and the University of Queensland of Technology ethics committees granted ethical approval before data collection commenced. Participant recruitment occurred over 18 months of weekly visits to a children's hospital emergency department, from approximately 4:00 p.m.–8:00 p.m. in order to maximize contact with likely participants. Families presenting to the triage nurse's station with an acutely dehydrated child were approached to participate. Upon presentation, the participant's child received a course of oral rehydration to trial in the department waiting room. If oral rehydration failed, a participant's child may have required an intravenous cannula (IV) or nasogastric (NG) tube insertion for rehydration purposes. This participant group was selected due to these procedures being two of the most painful and highly distressing procedures in the emergency department for young children (Babl et al., 2008). To be included as participants, parents were also required to be able to communicate comfortably in English, be aged over 18 years, and have a child aged 3 years and under.

Fifteen participants were recruited from the emergency department. Four participants were recruited from the community for theoretical sampling purposes, as per grounded theory methodology. That is, these four community parents were interviewed to test the emerging hypothesis that parents' responses are consistent in both acute medical and non-acute or non-medical pain settings. To ensure the two subsamples were similar, the community sample involved parents of children (aged 3 years and under) who had previously presented to an emergency department with acute dehydration and undergone an intravenous cannula (IV) or nasogastric (NG) tube insertion procedure. Community participants provided similar descriptions to those interviewed in the emergency department and were able to provide descriptions that are more elaborate, presumably because they were not currently in a distressing situation. The process of data collection was determined by the evolving theory (Strauss, 1987). Sampling continued until the data reached saturation, whereby no new themes or processes emerged (Strauss and Corbin, 1990).

After written consent was obtained, semi-structured interviews were conducted face-to-face for approximately 30–45 minutes. Inductive methodologies aim to collect data

Table 1. Participant demographics.

| ID code | Sex | Age | Number of children | ED visits (last 12 months) | Child age | Number of procedures (parent) | Number of procedures (child) |
|-----------------|---------|---------------------------|---------------------------|----------------------------|----------------------------------|---|---|
| 1 | F | 34 | 2 | 2 | 1 ^a (M), 3 | 1, 1 | 0, 1 |
| 2 | M and F | 27 (F) | 1 | 1 | 1 ^a (F) | 10, 0 | 0, 0 |
| 3 | F | 37 | 4 | 1 | 2 ^a (M), 3, 6, 8 | 0, 0 | 0, 0 |
| 4 | M and F | 41 (F) | 2 | 1 | 1 ^a (M), 12 | 0, 0 | 8, 0 |
| 5 | M and F | 41 (F) | 4 | 2 | 6mo ^a (M), 11, 12, 15 | 2, 0 | 0, 0 |
| 6 | M | 32 | 2 | 3 | 1 ^a (M), 2 | 0, 0 | 1, 1 |
| 7 | M | 34 | 4 | 2 | 2mo, 2 ^a (F), 4, 5 | 0, 0 | 1, 0 |
| 8 | F | 34 | 2 | 1 | 3 ^a (M), 9 | 4, 0 | 1, 0 |
| 9 | M and F | 26 (F) | 1 | 2 | 3 ^a (M) | 5, 0 | 10, 2 |
| 10 | F | 33 | 2 | 2 | 2 ^a (F), 4 | 0, 0 | 10, 10 |
| 11 | F | 27 | 3 | 4 | 3 ^a (F), 8, 10 | 10, 0 | 10, 3 |
| 12 ^b | F | 24 | 1 | 3 | 8mo ^a (F) | 3, 0 | 0, 1 |
| 13 ^b | F | 24 | 3 | 7 | 7mo, 2 ^a (M), 3 | 6, 0 | 2, 1 |
| 14 ^b | F | 25 | 2 | 3 | 7mo, 2 ^a (F) | 3, 0 | 1, 0 |
| 15 ^b | F | 28 | 2 | 0 | 2mo ^a (M), 2 | 0, 0 | 1, 1 |
| | | 31.13 (mean) 5.78 (SD) | 2 (median) 1–4 (range) | 2 (median) 1–7 (range) | 4.17 (mean) 4.09 (SD) | 0 _{total p} (median) 0–10 (range) | 1 _{total p} (median) 0–10 (range) |

SD: standard deviation; M: male; F: female; ED: emergency department; total *p*: total acute procedures.

Prior personal and child experiences with intravenous cannulation and nasogastric tube insertion reported as (IV, NG).

Mean and standard deviation for child age reported for the child referred to in the interviews.

^aChild under 3 years referred to in interview.

^bParticipants interviewed external to children's emergency department.

from participants based on the complexities of their lived experiences (Charmaz, 2006). Deductive research methodologies have dominated the pediatric pain field (Fassinger, 2005), and so inductive methodology was selected in order to generate new hypotheses to tests empirically. A grounded theory methodology was used in this study in order to inductively develop a new model to help explain the processes involved in parental assessment of acute pain in young children. The interviews were conversational in tone, and the interview consisted of open-ended questions to explore participants' perceptions and experiences of pain identification and assessment in their young child. Hypothetical and past painful events were asked about (medical, and in subsequent interviews, non-medical) to explore both implicit and explicit parental processes and factors. Throughout the interviews, parents were asked and prompted to comment on acute pain, rather than illness or ongoing pain. The starting questions used in these interviews are listed in Table 2 below.

Data analysis

Interviews were recorded and transcribed verbatim. Transcriptions were entered into a qualitative analysis software program (ATLAS.ti version 6). Data analysis continued with the reading and re-reading of the textual data. Using open coding, phenomena in the data were identified, categorized, and described through systematic consideration of every comment made by each participant to find similar concepts. Open coding was followed with the process of axial coding whereby already identified codes (categories or processes and properties) were related to each other, and finally selective coding, which involved the selection of a core category and relating all other categories to that core category (Charmaz, 2006; Strauss and Corbin, 1990).

Coding involved constant comparative methods (Charmaz, 2006). Negative case analysis, disconfirming evidence, or discrepant data were used to extend on and

Table 2. Interview Schedule.

| Interview schedule |
|---|
| 1. In your experience, what is the best way to help your child cope with pain? Why? |
| 2. If your child were to undergo the intravenous cannula or nasogastric tube insertion, how would you help them cope with the pain and distress? Why? |
| 3. How do you think you came to help your child cope in this way? |
| 4. Is there anything that makes it easier or harder to help your child cope? How so? |
| 5. Is there anything or a past event that influenced the way you help your child cope? How so? |

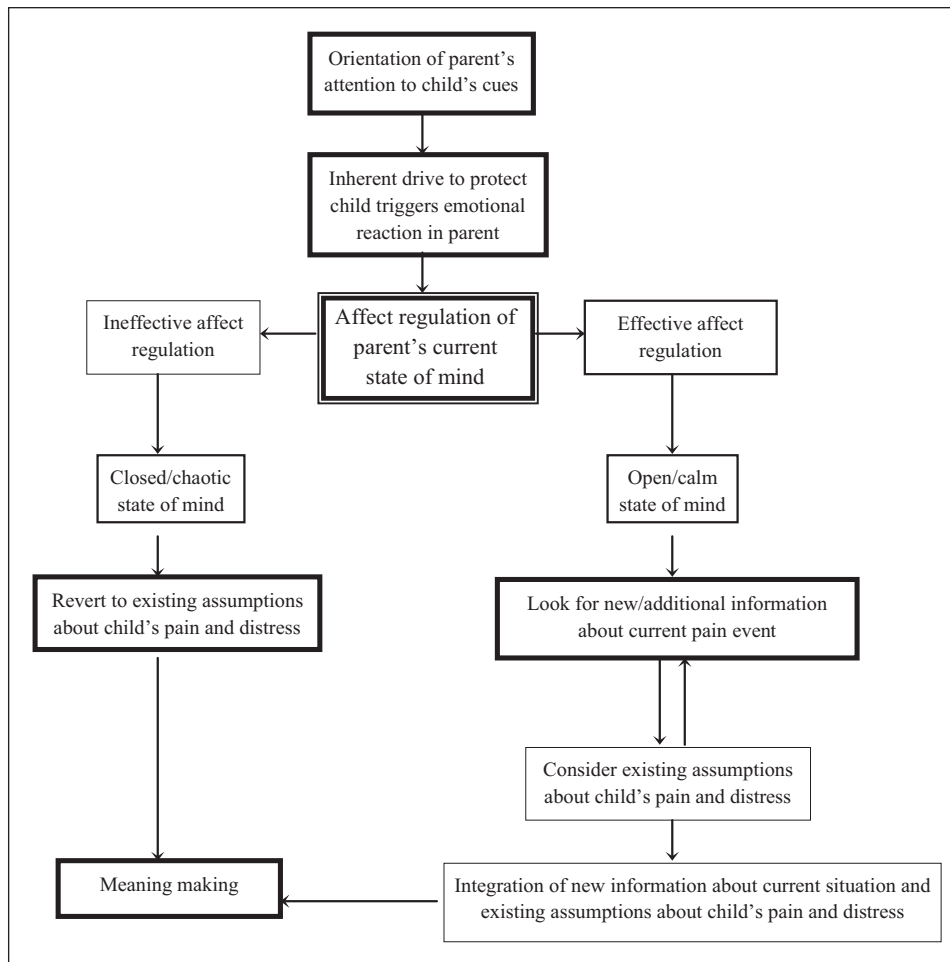


Figure 1. A model of Parental Assessment of Acute Child Pain.

redefine the theory (Glaser, 1978). Memos detailed the rationalizations underlying the coding and categorization processes. Emerging concepts were referenced in subsequent interviews to clarify the relationships between and within categories or processes in this particular group of parents.

To ensure data reliability, the primary researcher conducted all interviews. Hypothetical and past painful events were asked about with the aim of exploring both implicit and explicit parental assessment processes, and leading questions were avoided (Kvale, 1996). Memos and field notes containing observations during the interviews were kept. Field notes were transferred to memos as necessary. Coding integrity was considered through research supervisor and peer reviews of the transcripts and frequent discussions of coding processes.

Results

Grounded theory analysis of the 15 interviews yielded six key processes, which seemed to best encapsulate participants' experiences of assessing their young child's pain and

distress. Through the axial and selective coding phases of our analyses, we formulated a proposed model of Parental Assessment of Acute Child Pain, depicted in Figure 1. As illustrated, the model proposes that the six key stepped-processes (differentiated as bolded boxes) occur quickly and sequentially from when a child first behaviorally expresses pain and distress to when a parent has made an assessment as to how much pain and distress the child is in (i.e. making meaning of current painful event). As the analysis progressed, the process of affect regulation of a parent's unpleasant emotions (differentiated as the double-lined box in Figure 1) became the assigned selective code in explaining the current results. To follow is an austere description of the proposed model as explicated from participants' descriptions. Each process within the model will be presented in order and supported with participant quotes.

Orientation of a parent's attention to the child's cues

It was apparent from participant descriptions that the first process occurring in the assessment of pain is a parent's

attention becoming automatically and acutely focused on the child's overt pain and distress behaviors. Participants referred to cues that instinctively drew their attention to the child as being in pain. The intensity of the child's overt behaviors may moderate the degree to which a parent attends to the cues. Participants most often referred to the cue of a particular cry that is clearly discernable as a pain scream or cry. Participants described the pain cry as having a different tone and higher volume and furor than the child's other cries:

Her cry would be different than when she's just upset or hungry or tired. If she's really hurting, it will be more high pitched. If she's banged her head hard it's more of a loud intense cry and then I know straight away [that she's in pain]. (Participant 13)

Other than a pain scream or cry, the cues most explicit, effective, and efficient in creating such engagement of a parent's attention were the "pain face" and the child's attempts at physical proximity. Participants generally described the pain face as "squashed," contorted, or stereotypical for a distressed child:

When he turns around you'll see a wide open mouth, clenched hands, crushed eyes tightly closed and big tears, and the big cry. (Participant 14)

The following excerpt further illustrated the quality of the child's pain cry and face. This participant also referred to her child seeking prolonged physical proximity and closeness to her mother when she was in pain and distressed:

With low pain it's the "something's not right" whinge. With high pain, it's instant. Her face will contort and she'll scream straight away and you know she's badly hurt herself. She ran into the edge of my cupboard. That was a big pain and she came straight to me ... She likes being hugged and close to me and she doesn't like being put down [when in pain]. (Participant 13)

Inherent drive to protect child triggers emotional reaction in parent

Once a parent's attention has focused on the child and the child's overt pain and distress cues, the second key process transpires consequent to the first. Based on participant's descriptions, once they perceived these acute distress cues, they experienced an overwhelming sense of needing to protect the child. It appeared that this activation of the parent's instinctual drive to protect their child then rouses an acute emotional reaction. All participants described unpleasant emotional experiences that are difficult to bear, after their attention was oriented to the child's overt behavioral cues. Participants referred to an array of emotions ranging from sadness, guilt, and frustration to helplessness, and a strong desire to get the child physically close to them as quickly as possible.

Participants felt particularly emotional during acute medical procedures because the nature and process of this event unequivocally confronted their primary protective instinct. One participant described her emotional experience when her son was explicitly telling her that he was in pain. Feeling helpless as a parent further compounded her difficult experience:

He's looking at me and telling me it hurts. It's horrible. It's hard when you can't do a lot. I just try to pretend that I'm not scared but it is scary. It's scary as in I know it's going to hurt and I can't do anything but it has to be done so I try not to show I'm terrified. (Participant 10)

We found that a parent tended to experience a greater intensity of distress when unable to protect the child from imminent pain such as in acute medical procedures, or if the child has explicit tissue damage or bodily signs of injury. A participant recalled a painful event she did not witness in which her son displayed unusual cues. This participant's emotional experience and protectiveness were less intense during the event, but the graphic bodily signs of injury may have contributed to her feelings of sadness and potential guilt, as the parent, for not watching over him:

My friend's son chucked a door on his finger but he didn't cry or anything. There was blood everywhere. He didn't seem to be in pain but started vomiting. It was more shock. It was really horrible [for me]. I was sad that I wasn't watching him. (Participant 8)

Affect regulation of unpleasant emotions

Interview responses reflected that following the activation of a parent's drive to protect the child, and the unpleasant emotional state that ensues, affect regulation becomes necessary. Participants explicitly and indirectly referred to engaging in processes to manage their emotional reactions to their child's acute pain, with the aim of making a rational assessment, and subsequently responding in a situationally appropriate, helpful, and protective manner. We observed that affect regulation occurred on a continuum ranging from maladaptive or ineffective to adaptive or effective.

We found that predisposing and current contextual factors influenced participants' ability to effectively regulate the unpleasant affect in any one painful event. Specifically, a parent's general affect regulation capacities, sense of parental self-efficacy, tendency to catastrophize, the parent's age, experience with children, and experience in painful and/or medical events can predispose a parent to either ineffective or functional emotion regulation during a painful event. It seemed that a parent who had reasonably effective emotion regulation capacities, tended not to catastrophize, was older, and had higher parental self-efficacy and more experience with children and/or painful

events was likely to be less distressed and achieved a more calm, present, and open state of mind. The following quote illustrated an example of when a parent who becomes overwhelmed with unpleasant emotions:

I'd have to go outside [the procedure room] ... it's too hard see[ing] him crying in pain. I would cry and cry. It would be very sad looking at him just crying ... You feel hopeless. (Participant 2)

Another participant explained how her ability to manage emotionally during her child's pain has improved due to the passing of time and experience. The process remains difficult for her nonetheless:

It's distressing. I went through it with my daughter. I couldn't go to the treatment room, [dad] had to because I couldn't cope. I might cope with it better now 10 years later. [If I didn't have that previous experience] I'd be very emotional. Now, I think you should try to contain your emotions ... [instinct could take over] because I remember doing that with [daughter], but you have to [contain it] because the way you're feeling rubs off on them. (Participant 4)

One participant was an adult emergency department nurse. She described being better able to manage her emotions when her child is in pain because of her experience in acute medical situations. She described a process of affect regulation in which she avoids catastrophizing, acknowledges her emotions, and engages in a level of detachment. Her negative affect does not govern her state of mind and responses:

I don't get too distressed because I'm good with that stuff. I feel bad for her but I don't think she has a horrible life-threatening ailment. I'm sure I would panic if it was a major injury. In my job, I go on autopilot and crisis resolve and think about things more later. I'd probably be the same if something bad happened with her. Being emotional doesn't help. (Participant 2)

Ambiguity and uncertainty within the context of a painful event further challenged participants' capacity for affect regulation during that particular event. We found that even a parent inclined toward more effective affect regulation would find it difficult to achieve a calmer state of mind if the cause of the child's behaviors is ambiguous, the pain and distress are prolonged (i.e. continual emotion regulation may not be sustainable), or the behavior itself is vague and obscure. The following quote is from an interview with a father who described the dilemma of not knowing what is wrong with his child. The ambiguity means that he is unable to address the pain; he feels that he has failed in his parental responsibility to protect his child. As with most participants, this father referred to language as the preferable and clearest pain cue that is mostly unavailable to children under the age of 3 years:

It affects us more when you don't know what's wrong and it's not getting addressed. There are times you don't see the stimulus of the pain. They just start crying, and you know that's a pain cry. It's difficult because you can sense they're in pain but they can't tell you so, it's harder to diagnose what's the matter. (Participant 6)

From participant descriptions, it was apparent that when a parent is unable to manage their negative affect, the parent's state of mind could become chaotic or closed off. A participant recounted an occasion during which her child fell and was acutely distressed. Her emotional reactions seemed to consume her, and she was unable to think rationally or take in any situational information. Consideration of relevant information about that event may have disconfirmed her catastrophic thinking about her daughter's physical state. The following quote highlighted how her mind became disorganized and insular:

She fell really hard couple of weeks ago. I don't know why but it seemed her elbow was in a weird position and I was crying and she was crying ... but I was upset and I'm trying to not be upset ... I grabbed her and I don't know, I didn't think properly. I don't even know what I was doing. I just freaked out completely and had a mind blank. She was fine. (Participant 14)

The affect regulation stage was the selective code in our proposed model. We found that dependant on a parent's state of mind following an attempt at affect regulation, they progress to the final stage in our model via different pathways.

Looking for more information about current pain event

It was evident from participant accounts that once a parent is better emotionally regulated and has a relatively clear and open state of mind, they progress to the next step in our proposed model. These parents have the resources available to clearly observe and think rationally and commence the process of gathering further information about the current pain event (depicted on the right side in Figure 1). Our findings suggested two primary means of acquiring additional information. Contingent on the child's current behavior cues and the environmental information available to the parent at the time, the parent may employ a systematic and/or mentalizing-type method for this purpose.

The systematic process was evident in the methods participants described in gathering information. This process tended to involve critical analysis of objective information through contextualized guessing and hypothesis testing. Contextualized guessing involved a parent exploring the immediate environment surrounding the child and looking on the child's body for any evidence explaining the child's overt pain and distress behaviors. Subsequently, parents guess about the particulars of the painful event, as illustrated in the following quote:

We find where he is first, look around him to see if he has pulled something on him or stuck his hand in somewhere he shouldn't. We look at his body, check for anything obvious. (Participant 5)

Participants resorted to guessing based on the immediate environment when it was their only choice, for example, when a child's behavioral pain cues are unclear. A young child or infant was perceived as displaying more indistinct distress cues as compared to a toddler who may attempt to use singular words, particularly related to pain. A participant discussed the need for guessing due to the lack of meaningful language expressed by her son:

He can't tell me he's in pain so, I have to look at it all and guess if it's pain or something else ... No [nothing makes it easier], you still have to guess. (Participant 1)

Participants described a process of hypothesis testing, which seemed to involve a parent consciously making a list of potential causes of the child's overt distress behaviors and sequentially exploring the evidence for and against each option. One less experienced parent-participant reported preferring this systematic approach, and we assumed she could only employ such a cognitively engaging method if she was emotionally composed. She described this process in the following quote:

When she was a newborn I'd make a list in my head of things that could make her cry and be that upset. I'd start at the top and work down to figure it out and she stopped crying. (Participant 13)

Participants referred to thinking about the child's potential thoughts, feelings, and subjective experience to gain further information about the current painful event. We described this as mentalizing-type processes. Participants used various ways to attempt to comprehend what the current painful event might be like for the child, for example, empathy, "parental instinct" (i.e. having a "gut" feeling in seeing the child in pain), or asking the early verbal child about the pain. One participant described the thinking processes his wife engages in when their young children are in pain, which is a good example of mentalizing-type processes:

Their mother relates it back to how she would feel. She wants them to acknowledge the pain, and let them know she knows they are in pain and wants to know how they're feeling now. She tries to understand what it feels like and get a better understanding. (Participant 6)

The participant, who described a hypothesis testing approach as quoted above, provided an alternative explanation to maternal instinct. She described the "gut" feeling rather as a drive to learn more about what her daughter's needs are, particularly when she is upset and crying:

I'd love to say I was born to be a mother and had an instinct for everything. The maternal thing to me is more the drive to learn what she needs. I didn't know what she needed straight away but for as long as she cried I would try work it out. (Participant12)

Reference to existing assumptions about the child's pain

We found that at some point after participants made attempts at regulating their emotional reactions, they moved to engaging in the fifth process identified in our stepped-model: referral to existing assumptions about the child's pain and distress. Unlike less emotionally regulated parents, the better-regulated parents gathered information about the current painful event before considering these existing assumptions. Less emotionally regulated parents tended to revert to existing assumptions in isolation. Depending on a parent's state of mind post the affect regulation stage, the referral to existing assumptions-process would transpire in a different but corresponding way.

Based on the interviews, a parent's existing assumptions appeared to consist of beliefs about how much distress is helpful in a particular pain event and a parent's perception of the child's temperament and general use of behavioral cues. Socio-cultural norms particularly related to gender and participants' previous pain experiences seemed to have shaped their beliefs regarding how much behavioral distress a child should display in a given painful event. One of the participants explained the nature of gender norms and pain-related distress behavior she is aware of in her own family:

We have a problem with the dads in our family. "[Son] you're always crying, you're a boy" but when [daughter] cries, she gets a hug and a big emotional to-do. When he cries, he's told he should be more of a boy and that he's just sooking. (Participant13)

We found that a parent's previous pain experiences can modify their beliefs about pain-related distress expression. In the next quote, the participant described a formative incident when she was young and her grandmother dismissed her blatant distress. Now as a mother, this participant takes particular notice and has a non-judgmental and accepting attitude to her children's overt behaviors in assessing pain and distress:

When I was young I broke my arm playing at my nanna's [i.e. grandmother]. She told me to stop crying and go to bed. I was in real pain. The next day my mum came. My arm was swollen and we went to the hospital. Now I really listen to what my son and her [daughter] are trying to tell me. (Participant 8)

Furthermore, we found that parents had certain beliefs about the child's pain and distress behaviors because of the

quality and quantity of their own pain events as a child. A participant explained that he and his wife had discussions to decide on a consistent approach to pain because they had different pain experiences as children:

My background is different compared to my wife. I have had more tumbles than her ... I grew up on a farm. I've had to deal with it more so we had a different approach to pain. (Participant 7)

Participants described that pre-existing beliefs about a child's actual behavioral expression of physical pain may influence a parent's appraisal of the child's behaviors in the current pain event. A parent's judgment about the child's pain expressions may have a bearing on the outcome of the assessment as illustrated by the following quote. This father alluded to the belief that his children's pain behavior can be unreliable:

The first cue is crying but then you look and think, how much pain are they really in. Is it just a fallen over and wanting sympathy or are they actually hurting. I look at the actual injury and then judge, that'll hurt or that's wouldn't hurt. (Participant 7)

Finally, we observed that parents' perceptions of the child's temperament and general use of cues affected their pre-existing understanding about the child's pain and distress. The first participant quoted next provided thoughts about her daughter's temperament, while the second participant referred to her son's acquired brain injury and his resultant use of cues:

She, 9 out of 10 times is a perfectly calm baby. She's got an even temperament in every aspect of life. The severity of the whole pain thing would depend on their temperament. (Participant 12)

He doesn't show or tell you what's wrong. Sometimes we don't know if he knows what pain is because he'll get pinched and just look at it. When he is playing with the bird and it bites him, he doesn't cry. Normally when he cries, he wants something. It's lots of guessing. (Participant 9)

Meaning making

The final stage and the outcome of our proposed model of parental assessment of pain and distress is the process of meaning-making. From participant descriptions of this process, it likely involved a parent making sense of and coming to some conclusions based on the child's overt behavior and cues, the current situation, the cause and severity of the child's pain versus the distress, and a parent's emotional and cognitive responses to the painful event.

We found that parents' attempts at affect regulation continue to influence pain assessment in the meaning-making phase. For the parent with the open and calm state of mind (depicted on the right side of the model in Figure 1), the

meaning-making process is the result of the *integration* of new information about the current pain event and consideration of existing assumptions about the child. The parent with the closed off and disorganized state of mind *reverts* to existing assumptions without consideration of new and contextually relevant information.

The following excerpt provides an example of the meaning-making process. This quote showed the father thinking about what he already knows about his children's pain tolerance and typical cues. He then compared and integrated this information with his daughter's behavioral cues in the current context and made an assessment only he, as his daughter's father, would be able to:

We know what they are capable of and we know their cues like I can look at her sitting on the bench tonight and making noises. She wasn't in pain but she was protesting and difficult and you might look at that otherwise and think "ah that poor thing, she's hurting" but sure, she isn't feeling too crash hot. But what she was doing is a pure protest; there wasn't anything painful about what was happening at the time, she just didn't want a bar of it. (Participant 7)

Discussion

Through exploring parents' experiences using an inductive approach, we specifically aimed to better understand (a) the key processes involved in how a parent comes to make a judgment about their child's pain, (b) the factors that may influence a parent's assessment, and (c) the mechanisms that may account for a helpful or unhelpful parental assessment. Based on our qualitative analysis, we found there to be six sequential processes involved in these parents' assessment of child pain. We organized these processes into steps to create a proposed Model of Parental Assessment of Acute Child Pain, which reflected participants' experiences of identifying and assessing their young child's pain.

Progression through the model begins with a parent's assessment of child pain, and distress starts once a parent's attention becomes oriented to the child's overt behavioral cues. The intensity of behavioral cues may moderate a parent's attention to the cues. The perception and awareness of the child's pain and distress roused a parent's natural instinct to protect the child, experienced as an unpleasant emotional reaction. The observable severity of the child's injury may determine the strength of this emotional reaction.

The parent's unpleasant emotional state of mind prompts a process of affect regulation. Parental capacity to manage this uncomfortable affect can vary from one painful event to another and may be determined by the parent's general capacity for affect regulation, confidence and self-efficacy as a parent, tendency toward catastrophization, age, experience with children, and experience in painful and/or medical events. Ambiguity surrounding the child's pain and distress behaviors can further challenge a parent's capacity to regulate their emotions during that particular pain event.

A parent who more effectively manages their emotional state is less distressed and can achieve a more open and calm state of mind during the pain event. A parent with a calm state of mind has the cognitive resources available to gather further information from the current environment. The parent who less effectively manages the emotional reaction may experience a more closed off or chaotic state of mind. A parent with a chaotic state of mind who is emotionally dysregulated, or a parent who has withdrawn within themselves and has a closed off state of mind, cannot consider the current painful event in a rational and clear way and reverts to using only existing assumptions about the child. The more regulated parent has the capacity to reference the current contextual and environmental information.

A parent's existing assumptions may relate to perceptions of the child's temperament and general use of behavioral cues. A parent's beliefs about how much distress they considered appropriate for the child to express may also influence a parent's views; gender, cultural norms, and the parent's previous pain experiences could largely shape such assumptions.

The more regulated parent engages in a meaning-making process by integrating new information about the current painful event and existing assumptions about the child's pain and distress. With little reference to contextual information, the less regulated parent makes meaning of pain and distress cues based only on their existing assumptions, potentially resulting in a tenuous and less helpful assessment. On any one occasion of parental pain assessment, affect regulation of a parent's current affective state may be the linchpin process that determines the meaning a parent finally attributes to a child's cues.

Our findings suggested that a parent's assessment of child pain and distress commences with the parent's attention suddenly narrowing to the child's acute behavioral displays of distress. The identified "pain face" cue corresponds with the more specific facial cues commonly used in facial coding measures for infants. Participants appeared to implicitly and automatically code their child's facial expression and "just know" their child was in pain. Such "knowing" was described as developing over time and with experience. Parents may be trained as observers using formal coding systems as an adjunct to clinician observations. For example, parents of children with cognitive impairment (and therefore restricted expressive language) have been shown to be trainable in accurately estimating their child's pain using structured observational pain tools (Voepel-Lewis et al., 2005).

The next step in our model involves the activation of a parent's inherent drive to protect the child upon perceiving their child's cues of pain and distress. Participants' protective instinct was suggested in descriptions of wanting their child to be physically close to them despite the intellectual understanding that the medical procedure would ensure the child's survival. This activation of a protective instinct

provides evidence for the often neglected biological caregiving system, which functions parallel to the attachment system (Bell and Richard, 2000; Bowlby, 1969; George and Solomon, 1999), in the context of acute pain. The caregiving system explores behaviors parents feel compelled to enact when they perceive their child to be in real or potential danger (George and Solomon, 1999), which, for our participants, was palpable in acute medical procedures and acute non-medical events.

The parent's caregiving system is activated when the child's attachment system is activated through a fear response (Bell and Richard, 2000), which appeared to be congruent with our findings. The "pain cry" and the child seeking prolonged physical proximity were other distinctive cues identified by participants. These behaviors are typically exhibited when a child's attachment system is activated and proximity-seeking behaviors emerge (Bowlby, 1972). Research shows that although parent and child behavioral responses to the activation of their respective systems may occur in different ways, there is always some, albeit unclear, attempt at organizing proximity and contact by both child and caregiver (Ainsworth et al., 1978; Bell and Ainsworth, 1972; Britner et al., 2005). Research has only begun to appreciate the role of attachment and caregiver affect in the context of pediatric pain (e.g. Walsh et al., 2008). Based on our findings and the exponential increases of attachment research in the developmental literature, this may be a fruitful avenue for future pediatric research to pursue.

Studies show that self-reported parental anxiety and the parent's perception of the child's experience has a significant negative influence on parental pain reports (Kazak et al., 1995; Manne et al., 1992). These studies concluded that parents tend to focus on their own feelings when making an assessment of child pain resulting in a poor pain report (Kazak et al., 1995; Manne et al., 1992). Our observations are that all parents in this study experienced some level of anxiety when their protective instinct is activated. However, those with poor affect regulation utilized different processes to make meaning of their child's pain. Parents' affective activation, engagement, and regulation influence all facets of parenting (Dix, 1991), and based on our results, this is no different for child pain events. It is therefore possible that an emotionally regulated parent may provide a more holistic and accurate assessment of the child's pain experience for the purposes of treatment decisions.

Our model presents several implications for clinical practice. While there are many observational tools available to assist clinicians in evaluating pain in young children (Von Baeyer and Spagrud, 2007), few have been specifically developed for children beyond infancy but younger than 3 years old, or for use by parents (Chambers et al., 1996; Manne et al., 1992). A parent is more familiar with their child's pain expression and therefore may provide a more representative pain report than a clinician (Jylli and

Olsson, 1995; Kazak et al., 1995; Manne et al., 1992). Previous research shows conflicting evidence about the reliability of parental assessments of pediatric pain (Bellman and Paley, 1993; Bennett-Branson and Craig, 1993; Chambers et al., 1998). As such, there is a need to further understand the cognitive processes involved in these parental judgments. Such developments will assist in better understanding of these conflicting results and to the creation of tools and strategies to improve the reliability and validity of parental assessment of their child's pain. Research has emphasized the complexity of what a child's behavior can reflect during painful event (Jylli and Olsson, 1995; Kazak et al., 1995; Byrne et al., 2001; Chambers et al., 2002; Chen et al., 2000; Craig et al., 1996; Von Baeyer and Spagrud, 2003) decreasing the validity and reliability of clinician judgments about pediatric pain. Few studies have consulted parents (e.g. Chambers et al., 1996) regarding the behaviors and processes involved in a parental assessment. The results of this study may guide the development of structured assessment tools that tap into key processes that facilitate parents in coming to a representative and well-integrated assessment of their child's pain or facilitate clinicians in effectively interviewing parents about a child's pain.

In addition, our proposed model may be useful for clinicians to use as a screening procedure to identify parents with poor affect regulation in order to identify parents who are less likely to produce valid assessments of pain. Clinicians could also identify parents who may need more support or training to improve their abilities to assess, validly and reliably, their child's pain. For example, clinicians could provide parents with psychoeducation or instructions to become more aware of their internal processes. This approach would be particularly relevant to parents with poor affect regulation and who have children with chronic medical conditions. Such insight may allow parents the opportunity to better manage their emotions and improve their ability to assess pain more accurately by integrating the relevant information.

There are limitations in this study. Many of the interview questions asked participants about implicit processes that require a reasonable degree of self-reflection. As such, it is possible that other processes that may have been even more implicit to the parents were not identified in this study yet may still be key to the assessment of pain by parents of children under the age of 3 years. In regard to the current methodology, an index of social class was not included, and this presents a limitation in the descriptions of the current sample. The sample may not have been representative of all social economic groups, and future research is needed to investigate the effect of social class on parental pain assessment processes. Furthermore, few fathers were interviewed, and previous research suggests that fathers have different perspectives and behave differently in the context of child pain. For example, research has shown that fathers tend to

notice fewer behavior pain cues that may be related to their different attitudes about pain (Franck et al., 2010). Participant recruitment was a time-consuming and challenging effort in the children's emergency department. There may have been some self-selection bias by those who agreed to participate, making it unclear how well the findings of this study generalize to all parents of children who may experience procedural pain. In addition, data collection involved almost weekly recruitment sessions during late afternoon and early evening over an 18-month period. However, presentations to the emergency department that require NG or IV insertions can occur at anytime. It was not possible to sample parent presentations from other time periods, and so it is possible that time of presentation (such as 3 a.m. in the morning) may be an extra factor influencing the distress, affect regulation, or other cognitive processes of parents when assessing their child's pain.

Future research may be able to further explore and investigate the predictive significance of the parental, child, contextual, and interpersonal factors in explaining the incongruencies between child-parent pain assessments. Additional quantitative research is also required to validate the proposed model and the relationships between the constructs. For example, research regarding the role of child attachment in responses to pain (e.g. Walsh et al., 2008) has recently emerged, although there is none that we are aware of investigating the effect of attachment on parental assessment of child pain.

Conclusion

The current dominant approach to assessing pain in children under 3 years old is to use observational methods employed by clinicians. While there are some advantages to such methods, it also minimizes the beneficial role of including parental judgments in assessing pediatric pain. This study used an inductive methodology to elucidate parental perceptions on the processes involved in their assessment of pain in children under the age of 3 years. The results of this study indicate that affect regulation in parents is pivotal to their ability to rationally integrate new information with pre-existing beliefs in order to make meaning of the pain cues being exhibited by their child. Future research should further explore the primary processes identified in this study. Examining these processes may progress pain assessment methods to include essential parental judgments of pain in children under the age of 3 years.

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The authors declare that there is no conflict of interest.

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