PSYCHOLOGICAL PREDICTORS OF CHILDREN'S PAIN AND PARENTS' MEDICATION PRACTICES FOLLOWING PEDIATRIC DAY SURGERY

by

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Abstract

Despite the increasing acceptance of biopsychosocial models of pain and multidisciplinary treatments for pain, relatively little is known about the specific psychological variables and social processes related to postoperative pain in children, especially in an outpatient setting. The present study examined demographic, medical, and psychological predictors of children's pain and parents' administration of pain medication. Two hundred and thirty-six families with children aged 2 to 12 undergoing day surgery participated in the study. This included a subset of 100 children aged 6 to 12, who were asked to complete self-report measures of anxiety, expected pain, coping style, and pain. Parents of all children completed measures of expected pain, expected benefit from medication, perspective taking, and negative attitudes towards analgesics. Parents and school-aged children completed pain diaries on the day of surgery and two days following surgery. The prevalence of clinically significant pain was somewhat lower than in previous studies, but both pain and undertreatment (parents who gave less than the recommended amount of pain medication) remained common. Predictors of pain were examined by multiple regression, using data from the subset of 100 children aged 6 to 12. More intense pain was related to more invasive surgery, a constellation of analgesic-related variables (more doses of analgesia given, the use of a regional block, the use of local infiltration), high anxiety, high expectations of pain, and a tendency to cope with pain by acting out and catastrophizing. Predictors of dosing were examined by multiple regression, using data from the entire sample of 236 children. Parents gave more medication when their children had invasive surgery and high levels of pain, when they expected a lot of pain, and when they were relatively unconcerned about the

negative effects of pain medication. In each case, the psychological variables, entered as a block, were significant predictors of pain even after controlling for demographic and medical variables. Health care providers should be aware of psychological factors predicting pain, as they may help to identify families that are at "high risk" for pain and undermedication. In addition, the variables identified in this study are appropriate targets for further research on psychological factors that cause, mediate or contribute to pain processes, and as such may contribute to the development of theoretical models of pain and pain management.

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Pediatric surgery is often completed on an outpatient basis, in order to economize and minimize children's separation from parents and exposure to the foreign and sometimes frightening hospital environment (Kotiniemi, Ryhanen & Moilanen, 1996). After the immediate control of pain in the post-anesthetic recovery unit, postoperative pain management is generally left to parents, with brief instructions from hospital staff as guidance. While there is considerable individual variability in children's experience of pain and parents' adherence to therapeutic guidelines, existing data suggest that a high proportion of children experience pain for several days following surgery (Finley, McGrath, Forward, McNeill, & Fitzgerald, 1996), and that parents are often reluctant to provide analgesic medication, even when they recognize that their child is uncomfortable (Finley et al., 1996). The latter finding is surprising, given that the majority of parents have been advised to administer acetaminophen (e.g., Children's Tylenol™), a relatively innocuous drug which has no significant side effects in therapeutic doses, and does not provoke tolerance, physical dependence or addiction (Berde, 1989). Inadequate postoperative analgesia has a number of undesirable consequences, including unnecessary suffering, delayed recovery (Kiecolt-Glaser, Page, Marucha, MacCallum, & Glaser, 1998; Kotiniemi, Ryhanen & Moilanen, 1997; Sutters & Miaskowski, 1997), and fear and distrust of health care providers (Ross, Bush & Crummette, 1991). It is important, therefore, to ensure that pain is managed appropriately following day surgery.

Pediatric pain exists within a system which includes children, parents, health care professionals and larger societal structures. Because of children's relative vulnerability, parents and other adults play an important role in interpreting and acting to relieve children's pain. An accurate understanding of pediatric pain requires attention to both the child and the adults involved in treating his or her pain. Several models have been formulated in an attempt to describe psychological influences that may account for the observed variability in the child's subjective pain experience (e.g., McGrath, 1990), but they have only rarely been applied to the postoperative setting. The unfamiliar and frightening experience of day surgery provides an opportunity to test the generalizability of such models. Despite the implicit presence of parents in psychosocial models of pediatric pain, little is known about psychological factors affecting their decisions regarding pain medication. Building a model that could account for the variability seen in adherence to analgesic protocols would provide a basis for education and other interventions aimed at improving parents' management of postoperative pain.

In summary, explication of the variables which influence children's pain and parents' pain management practices has implications for biopsychosocial theories of pediatric pain as well as current clinical practice. In this study, children's postoperative pain and parents' postoperative medication practices were studied in relation to demographic, medical, and psychological variables. It was hoped that the information obtained could be used in future to identify families who would be most likely to benefit from special attention and instruction regarding pain management.

The prevalence of postoperative pain in children

Prior to the 1990s, there was a relative lack of attention to children's pain following outpatient surgery. This was worrying since economic pressures had caused an increase in the invasiveness of procedures performed on an outpatient basis (e.g., Elder, Hladky, & Selzman, 1995). However, the last ten years have seen a flurry of studies of after-discharge pain (Bartley & Connew, 1994; Bennett-Branson & Craig, 1993; Fell, Derrington, Taylor, & Wandless, 1988; Finley et al., 1996; Grenier, Dubreuil, Siao & Meymat, 1998; Jolliffe, 1997; Knight, 1994; Kokinsky, Thornberg, Ostlund & Larsson, 1999; Kokki & Ahonen, 1997; Kotiniemi, Ryhanen, Valanne et al., 1997; Lee & Sharp, 1996; Munro, Lauder, Voepel-Lewis & Tait, 1999; Romsing, Hertel, Harder & Rasmussen, 1998; Sutters & Miaskowski, 1997; Tan, May & Cunliffe, 1994; Tree-Trakarn and Pirayavaraporn, 1985; Warnock & Lander, 1998).

In the above studies, the percentage of children experiencing some degree of pain post-operatively has ranged from 16% (Munro et al., 1999) to 92% (Tree-Trakarn & Pirayavaraporn, 1985). The dramatic variability in estimates likely reflects variation in the surgical procedures studied, the management instructions given in different settings, and the level of pain that the authors considered significant enough to report. The most reliable figure is probably the median of these studies, which falls at 69%. Thus, more than two-thirds of the children studied appeared to suffer pain at some point in their recovery. Mean pain scores have generally been at or below the midpoint of whatever rating scale is used, ranging from less than 2 on a 0 to 6 scale (Knight, 1994) to 5 on a 0 to 10 scale (Bennett-Branson & Craig, 1993). Large individual differences in pain reports have been found and some children were even reported to experience no pain during recovery (Finley et al., 1996). Parents' estimates of their children's pain are generally correlated with the scores supplied by children themselves. However, overall, parents tend to underreport children's pain experience (Chambers, Reid, Craig, McGrath, & Finley, 1998). Thus, the subjective nature of pain makes it preferable to include child self-report measures whenever possible. Behavioural observation measures would also add to the validity of these measures of pain, but they are costly and difficult to implement in large samples.

Finley et al. (1996) conducted a cross-sectional prospective study of day surgery in children ranging from 2 to 12 years of age. Parents were asked to complete a diary in which they recorded pain ratings on the day of surgery and the two days immediately after surgery. Pain was found to decrease with time over the day of surgery and the two following days. Some surgeries were more painful than others, with myringotomies (insertion of tubes in the ears) causing minimal discomfort, and more invasive procedures such as tonsillectomy, circumcision, and strabismus repair resulting in clinically significant pain (defined by the authors as a rating of 3 cm or more on a 10 cm visual analogue scale) in about one half of the children. Unfortunately, no child report measures of pain were obtained in this study.

Warnock & Lander (1998) studied children aged 5 to 16 who underwent outpatient tonsillectomy. Families were contacted by phone each evening in the week following the procedure, and parents were asked whether their children had experienced pain and what analgesic medications were given. Children were also called to the phone and asked to give pain ratings. Tonsillectomy was found to be associated with intense or moderately intense pain for around 3 days, declining gradually over the rest of the week.

An assessment tool developed by Chambers, Reid, McGrath & Finley (1996) had parents indicate the presence or absence of a variety of specific behavioural indicators, such as "eats less than usual," and used the total score as an indicator of pain. The measure developed, the Postoperative Pain Measure for Parents (PPMP), was internally consistent and strongly related to child report of pain, the type of surgery, and the amount of time that had passed since surgery. This research supports global ratings by children and proxy ratings by parents, by identifying observable changes in their behaviour indicative of pain. In summary, global ratings provided by parents and children and scores on a behavioural rating scale suggest that, while pain is not inevitable, clinically significant levels of pain are common sequelae of pediatric outpatient surgery.

Pharmacological management of postoperative pain in children

Recommended practices

Children undergoing day surgery typically receive intra- operative anesthesia and analgesia, and remain in the hospital until they meet set criteria. For instance, the child must be awake, display stable vital signs, and his or her discomfort must be managed with oral analgesia

(British Columbia's Children's Hospital, 1993). The length of a child's stay in the post anesthetic care unit varies with the procedure performed, but one recent study found a mean duration of 48 minutes (Gilbert et al., in press). Increasingly, postoperative pain is managed with intra-operative regional analgesic techniques such as regional blocks and wound infiltration with local anesthetic. These methods provide excellent pain relief for six to twenty-eight hours (Berde, 1989). However, pain may increase once the child is at home and regional management techniques have worn off.

Children who are admitted to the hospital following major surgery often receive opioid analgesics to manage their pain. However, the "minor" procedures which are conducted as day surgeries are most often managed with acetaminophen alone, or less commonly, with a combination of acetaminophen and codeine. Although acetaminophen can cause liver toxicity if given in excess amounts (Heubi & Bien, 1997), the dosage at which it is effective is much smaller than the dosage at which it is toxic (Berde, 1989). At the therapeutic dosage, it has no significant side effects, nor is there development of tolerance, physical dependence, or addiction (Jackson, MacDonald & Cornett, 1984). The traditional recommended dosage is 10-15 mg/kg at 4 hour intervals, with a safe upper limit of 90 mg/kg/24 hours (Penna, Dawson & Penna, 1993; Temple 1983). However, recent research has suggested that traditional doses may actually be insufficient for effective pain control, even when given consistently (Romsing, 1996; Romsing et al., 1998).

Acetaminophen has generally been prescribed on a *pro re nata* (*prn*) or "as needed" schedule. However, this is considered problematic by many experts, as it encourages children to exaggerate pain behaviour in order to receive relief (Mather & Mackie, 1983; McGrath & Unruh, 1987) and fosters the parental propensity to hold off until it is "really needed." Instead, it is currently recommended that analgesics be given at regular intervals in order to maintain constant serum levels and preempt pain (Broadman, 1999; Finley et al., 1996; Hamers, Abu-Saad, van den Hout, & Halfens, 1998; Tobias, 1997). The use of "fixed interval dosing" instructions has been found to increase the amount of analgesic that parents actually administer (Romsing et al., 1998). An optimal dosing regimen would consist of 4 to 6 doses per day, depending on the child's sleeping patterns.

Codeine, as a weak opioid, can be associated with side effects, including nausea and constipation. Codeine is also associated with the eventual development of tolerance and physical dependence in cases of long-term administration. However, these generally become a concern only after the medication is given for 5 to 14 days (Koren & Maurice, 1989; Tobias, 1997) and can easily be managed by tapering the drug dosage before discontinuing it. There is no evidence that opioid dependence associated with postoperative pain management leads to substance abuse or addictive behaviour disorders (Porter & Jick, 1980). Codeine should also be given at regular intervals rather than *prn*, for the same reasons that apply to acetaminophen. In children, it is generally prescribed in doses of 0.5 to 1.0 mg/kg (McCaffery & Pasero 1999; Southall, 1997). If pain is intolerable, this dosage can be increased in the absence of side effects, up to 5 mg/kg (Koren & Maurice, 1989). Should problematic side effects arise, the most appropriate course of action is to switch to acetaminophen alone and continue giving it regularly.

Actual practices

Parents' recall of discharge instructions has suggested that the majority are told to give medication "if necessary" (Finley et al., 1996). Examination of parents' administration of analgesic drugs reveals a pattern of undermedication. Available studies (Fell et al., 1988; Kokki & Ahonen, 1997; Kotiniemi, Ryhanen, Valanne et al., 1997; Munro et al., 1999; Sutters & Miaskowski, 1997; Warnock & Lander, 1998) suggest that 20 to 49% of children receive no pain medication, and 23 to 97% receive less than the recommended number of doses. While children have historically received less pain medication than adults (e.g., Eland & Anderson, 1977; Schechter, Allen & Hanson, 1986), a recent study found that 32% of adults took no pain medication following day surgery, despite a high prevalence of pain (Beauregard, Pomp, & Choiniere, 1998). The undermedication in adults was attributed to fears of addiction and side effects expressed by many of the patients studied. This suggests that currently, children and adults are undertreated to a similar degree.

In the study conducted by Finley et al. (1996), 49 % of parents gave no pain medication on the day after surgery, while 66 % of parents gave no medication two days after surgery. Even when parents rated their child's pain as significant, 13 % administered no pain medication and 47 % gave fewer than 4 doses on the day after surgery. Four to six doses are recommended for children in pain (Penna et al., 1993). Similar proportions were seen two days after surgery. It appears that some parents administered insufficient doses of pain medication, even when they knew that their children were in pain.

Finley et al. (1996) went on to gather preliminary information on the beliefs that underlie parents' reservations about pain medication. Parents in their study were asked to respond to forced-choice questions regarding their attitudes toward acetaminophen. The majority of parents agreed or strongly agreed that acetaminophen is a pain medicine that can be used without much worry, and that it is generally safe to give children the amount of medicine that is recommended for their age. However, a significant proportion of parents expressed concern that children who have to take pain medication regularly for pain may learn to use drugs to solve other problems. Many felt that pain medications should be used as a last resort and did not agree that it makes sense to give children pain medicine before the pain starts if we know they are going to have pain. This is contrary to the preemptive practice currently recommended by health practitioners such as Tobias (1997). A qualitative study by Gedaly-Duff and Ziebarth (1994) provided further evidence that mothers may be reluctant to administer pain medications to young children because of concerns about drug addiction.

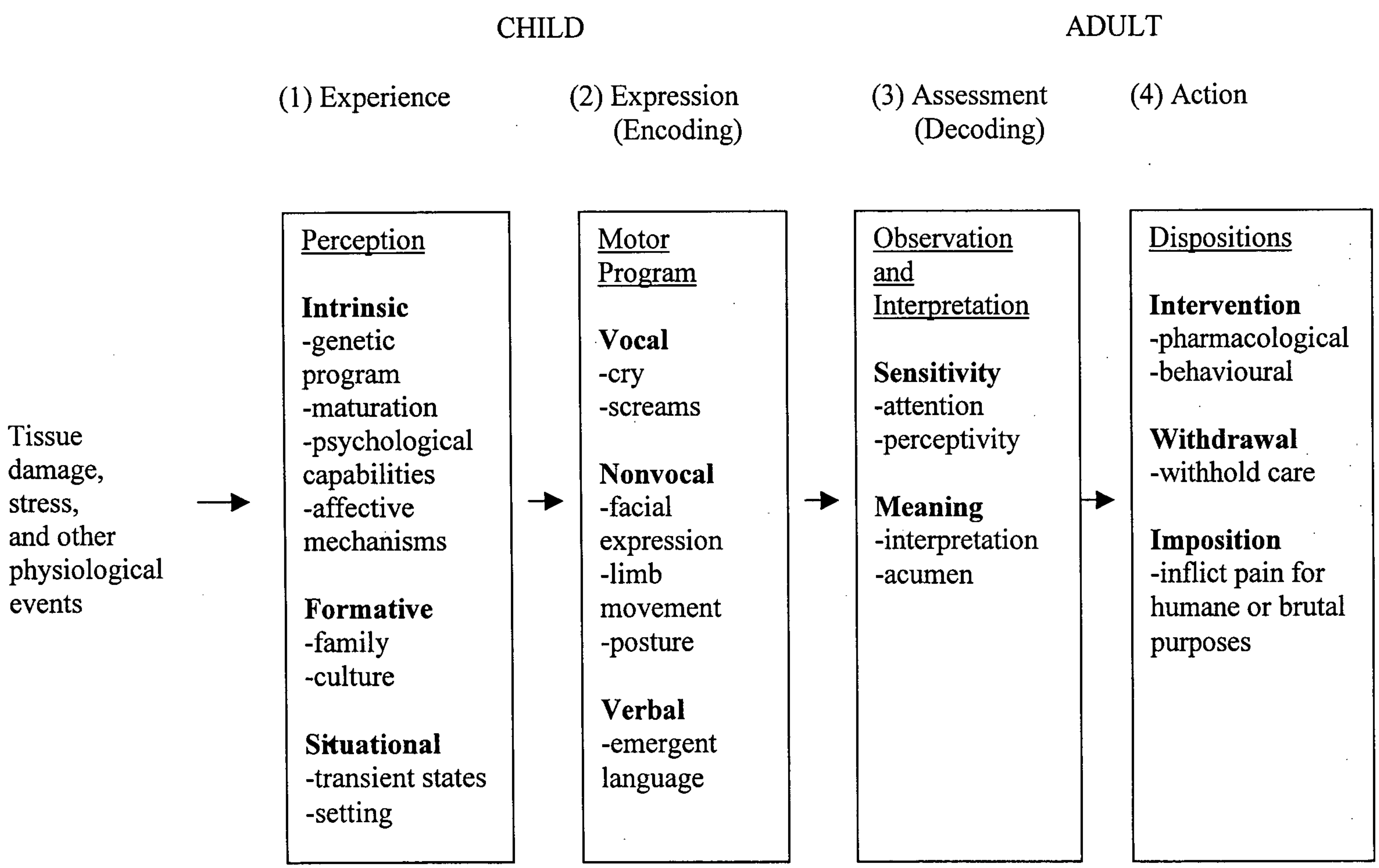
Chambers, Reid, McGrath, Finley and Ellerton (1997) attempted to change parents' attitudes and increase their administration of pain medication by the provision of a pain education booklet, entitled Pain, Pain Go Away: Helping Children With Pain. In a randomized trial, parents who received the pain education booklet rather than more general materials expressed more positive attitudes toward acetaminophen. However, changes in their medication practices were minimal.

Psychosocial models of pediatric pain

In the heyday of the biomedical model, pain was believed to be directly related to the degree of tissue damage. Little weight was accorded to psychosocial factors such as thoughts, emotions, and social context. However, new theories and the accumulation of research data have led to recognition of the importance of psychological and social factors (e.g., Wall & Melzack, 1999).

According to McGrath and McAlpine (1993), "two psychological perspectives are important when considering pain in children. The first is the psychology of the child who has pain. The second involves the psychology of the adults (including parents and health care workers) who have responsibility for the child in pain" (p. S2). Both of these perspectives are accommodated within the communication model of children's pain proposed by Craig, Lilley and Gilbert (1996). The communication model (see Figure 1 on page 9) includes four components: Experience, Expression, Assessment, and Action. The first two components refer to psychological processes within the child: the child's subjective experience of pain and the child's outward expression of pain. A set of interactive biological, psychological and social

Figure 1. A Communication Model for Understanding Children's Pain (Craig et al., 1996).



forces affects each of these stages, and theory and research regarding these influences are prominent within the study of pediatric pain. Less attention has been directed toward the other two components of the communication model, which focus on psychological processes within adult caregivers. In the assessment stage, the adult decodes the child's expression of pain, which entails perceiving the relevant cues and reaching a conclusion about their meaning. Once the adult has inferred that the child is in pain, he or she must choose whether or not to intervene, and how to do so. Obviously this model is an oversimplification, neglecting such complexities as feedback loops among the components and the child's own resources and active strategies for relieving pain. However, it is clearly valuable in illustrating the systemic and contextual nature of pediatric pain. In this spirit, this investigation focused on both sides of the communication equation by attempting to predict both children's self-report of pain following day surgery and parents' administration of analgesic medication.

Predicting the child's experience of pain

All current models of pain experience can trace their ancestry to the gate control model of pain proposed by Melzack and Wall (1965). According to gate control theory, pain sensation is not a direct representation of noxious information. At the level of neural physiology and the level of subjective experience, pain is a complex and interconnected web of powerful influences including thoughts and feelings. Models specific to children have rarely made reference to biological levels of explanation, but the field is replete with diagrams of the psychological and social forces impinging on the child's subjective pain experience.

These forces are said to include: (a) situational factors such as the type and duration of the pain stimulus, and the degree to which the child has control over the stimulus (McGrath, 1990; Zeltzer, Barr, McGrath, & Schechter, 1992); (b) cognitive factors such as negative expectations and the perceived meaning of pain (McGrath, 1990; McGrath & McAlpine, 1993;

Palermo & Drotar, 1996; Varni et al., 1996); (c) emotional factors such as anxiety and frustration (Craig et al., 1996; McGrath, 1990; Palermo & Drotar, 1996); (d) learning factors, including previous pain experience, family modeling of pain behaviour and coping, and the child's repertoire of coping strategies (Craig et al., 1996; McGrath, 1990; McGrath & McAlpine, 1993; Varni et al., 1996; Zeltzer et al., 1992); (e) social factors such as family environment, socioeconomic status, and culture (Bush & Iannotti, 1990; Craig et al., 1996; McGrath, 1990; Varni et al., 1996; Zeltzer et al., 1992); and (f) factors such as developmental level, gender, and temperament (Craig et al., 1996; Lilley, Craig & Grunau, 1997; McGrath, 1990; Zeltzer et al., 1992), which are themselves constellations of biological, psychological and social variables.

Similar models have stimulated influential lines of research in adult samples and are now well supported by empirical research (see Kiecolt-Glaser et al., 1998 for the application of a biopsychosocial model to post-operative pain and surgical recovery in adults). In children, most of these influences have been documented in studies of acute procedural pain (e.g., Jay, Ozolins, Elliott, & Caldwell, 1983) and chronic recurrent pain (e.g., Wallander & Varni, 1992). There has been little empirical investigation of prolonged procedural pain occurring outside the hospital environment.

As discussed above, a large number of psychosocial variables has been theorized to predict pain, and it is difficult to reduce this to a subset that covers the important constructs while remaining practically and statistically manageable. The following potential predictors were identified on the basis of their importance, as indicated by previous research and theory: child age and gender, invasiveness of surgery, doses of pain medication given, anticipatory anxiety, expected pain, and coping. These variables were selected for two reasons. First, they provided reasonable coverage of the 6 domains listed above: situational (invasiveness of surgery, analgesic techniques used), cognitive (expected pain), emotional (anxiety), learning (coping), social (doses of pain medication given by parents), and complex organismic variables (age and gender). Second, several had been found to be predictive of pain in related studies (age, gender, anxiety). Further details are given for individual variables.

Predictors of postoperative pain

Age. Age, as a rough index of developmental level, is likely to be associated with many components of the pain response: the perception of pain, the understanding of pain, the ability to communicate pain, and the ability to cope with pain (McGrath, 1990). Children younger than 7 years consistently display more behavoural distress in response to painful procedures than do older children (Bournaki, 1997; Jay et al., 1983; Katz, Kellerman, & Siegel, 1990). Younger children also report more pain from needles (Fradet, McGrath, Kay, Adams, & Luke, 1990; Goodenough et al., 1999; Lander & Fowler-Kerry, 1991). A recent investigation has suggested that age effects are most closely associated with the sensory intensity of pain, rather than the emotional unpleasantness of the experience (Goodenough et al., 1999). Age differences are generally smaller when distress is measured by self-report (Rudolph, Dennig, & Weisz, 1995), and there are mixed results regarding the relationship between age and postoperative pain (Leikin, Firestone, & McGrath, 1988; Palermo & Drotar, 1996).

Gender. In general, girls report more pain and anxiety and display more overt distress in medical settings (reviewed in Rudolph et al., 1995; Unruh, 1996). In the post-operative context, girls have been found to report greater levels of pain (Bennett-Branson & Craig, 1993). However, many researchers have not found gender differences (e.g., Lander, Fowler-Kerry, & Hill, 1990), and it is difficult to separate differences in pain perception from differences in the willingness to report pain (Bennett-Branson & Craig, 1993). Goodenough et al. (1999) have shown that gender differences in children's pain are more closely related to the emotional unpleasantness of pain than they are to the sensory intensity of pain.

Invasiveness of surgery. While the physical attributes of a noxious stimulus are not the sole determinants of subjective pain, certain procedures are consistently associated with more pain than are others, from the mild pain of myringotomies to the more severe pain of tonsillectomies, circumcisions, and orchidopexies (Finley et al., 1996). This is assumed to reflect the invasiveness and degree of tissue damage associated with a given procedure. However, it remains possible that there are distinct psychological and social implications of different procedures, and that these implications contribute to the observed consistency in pain responses.

It would be possible, although time-consuming, for surgeons to measure the exact amount of tissue damage. Unfortunately, pain receptors, or nociceptors, are not equally distributed in skin, muscles, joints, bone and viscera, which results in extreme differences in subjective experience even when the volume of tissue excised is similar (Raja, Meyer, Ringkamp, & Campbell, 1999). Investigators have typically settled for a physician's rating of the pain associated with a certain procedure, but it should be recognized that this entails a certain circularity, and a failure to truly operationalize the construct. Furthermore, the statistical significance of any measure of invasiveness is largely dependent on the range of procedures sampled.

Not surprisingly, then, results have been somewhat inconsistent. In some studies the type of surgery has previously been found to predict physical recovery, but not functional recovery or pain (Bennett-Branson & Craig, 1993; Palermo, Drotar, & Lambert, 1998). However, Reid, Chambers, McGrath, and Finley (1997) classified procedures into a no-low pain group or a moderate-high pain group, with respect to the mean pain level reported in a previous study. In a second study, with an independent patient population, the group undergoing "moderate to high pain" procedures did indeed experience more pain.

Total doses of analgesics administered. Analgesic medication has an obvious influence on the perception of pain. However, its impact as a predictor is confusing because of a bi-directional relationship between analgesic administration and pain when p.r.n. schedules are used. There is a logical basis and empirical support for both a positive and a negative relationship. That is, a greater amount of analgesia has been associated with less pain (Palermo & Drotar, 1996), suggesting that the medication is accomplishing its purpose. At the same time, other investigators have found that a greater amount of analgesia was associated with more pain (Reid et al., 1997; Tesler, Wilkie, Holzemer, & Savedra, 1994). Children who experienced and expressed significant discomfort received more analgesics. It was difficult, therefore, to make specific predictions regarding the association between doses of analgesic medication and degree of pain for this study.

Anxiety. Anxiety is defined here as a negative emotional state associated with the anticipation of personal danger or misfortune. It is often mentioned as an emotional factor associated with pain (e.g., Chapman & Turner, 1986). Anxiety appears to actually inhibit pain in short-term emergency conditions where pain behaviour would be maladaptive (for instance, it would be considered maladaptive to stop and rest a sprained ankle when running from a bear), a phenomenon known as "stress-induced analgesia" (Frenk, Cannon, Lewis, & Liebeskind, 1986). However, this phenomenon is generally short-lived. In other situations, anxiety is generally associated with increased levels of pain (see Craig, 1999 for further discussion of this complex relationship).

Anxiety has been found to predict the degree of pain experienced by adults undergoing oral surgery (Martelli, Auerbach, Alexander, & Mercuri, 1987), and children undergoing venipuncture and intravenous cannulation (Bournaki, 1997; Goodenough et al., 1999; Lander et al., 1996). Chambers, Finley, McGrath, & Walsh (1999) found that a child's state anxiety prior to surgery was related to postoperative pain. In contrast, trait anxiety (the characteristic tendency to experience anxiety across diverse situations), was not related to children's postoperative pain. Palermo and Drotar (1996) found a simple VAS rating of anticipatory anxiety to be highly correlated with postoperative pain (r=.57) in children, and anxiety was the best predictor of pain in a regression equation. However, the same investigators (Palermo et al., 1998) later found a negative correlation between anxiety and postoperative pain when anxiety was assessed in relation to 12 surgery-related stimuli (e.g., "spending the night in the hospital"), of which only one item addressed anxiety about pain. Children who are anxious regarding other aspects of the situation may actually have less pain after surgery because their attention is focused elsewhere. This is consistent with experimental research suggesting that the effects of anxiety may work by maintaining intense attention to pain: Arntz, Dreessen, and Merckelbach (1991) found that adults who were anxious about a spider in the testing room reported less pain in response to a cold pressor test. Regardless of the mechanism of effect, previous research has suggested that a simple global rating of anxiety made specific to the situation at hand is the best available predictor of children who will suffer significant postoperative pain.

Expected pain. Expectation of pain is only one of many cognitive variables that affect pain perception through a complex cluster of influences. Indeed, expected pain may summarize a host of other cognitions, such as appraisal of the threat of surgery, memory for past experience, and self-efficacy. Expectations may have a direct impact on pain perception, or, like anxiety, expectations may focus attention on discomfort. In any case, adults who hold more positive expectations for recovery from surgery have been found to experience less disability, faster healing, and less pain (George, Scott, Turner, & Gregg, 1980; Scheier & Carver, 1989, 1992). Palermo and Drotar (1996) did not find a significant relationship between such expectations and postoperative pain, but this may reflect a small sample and low power. Gilbert (1996) found that, among children undergoing cardiac surgery or cardiac catheterization, negative expectations about functional recovery and postoperative pain were related to higher scores on a composite measure of pain and other indices of physical recovery. However, the size of the correlation did not reach statistical significance, perhaps because of the small size of the sample.

Emotion-focused coping. A focus on coping strategies acknowledges that the child has an active role in facing the challenge of surgery and postoperative pain. Characteristic tendencies to problem solve actively, distract oneself mentally, or to vent emotions without check have been described as "vital intervening factors" in predicting pediatric pain perception and pain behaviour (Varni et al., 1996). Generally, dividing coping along two dimensions, approach vs. avoidance (Roth & Cohen, 1986) and problem-focused vs. emotion-focused (Lazarus & Folkman, 1984) seems to be the most parsimonious way of capturing relevant differences. This results in a 4 cell typology including problem-focused approach strategies such as active problem-solving, emotion-focused approach strategies such as positive self-statements, problem-focused avoidance coping such as distraction, and emotion-focused avoidance strategies such as rumination The term “emotion-focused avoidance” can be confusing; it refers to a tendency to avoid regulating or self-soothing in the presence of negative emotions such as fear and anger.

Cluster analysis of the self-reports of children coping with pain has supported a three-fold structure consisting of approach coping, distraction (related to problem-focused avoidance), and emotion-focused avoidance (Reid, Gilbert, & McGrath, 1998). Whereas the effectiveness of approach coping and problem-focused coping appears to depend on the type of stressor, emotion-focused avoidance seems more generally maladaptive, and is associated with depression, anxiety and negative affectivity (Reid et al., 1997). The most well known example of an emotion-focused, avoidant coping strategy is catastrophizing, in which an individual dwells on pessimistic thoughts about pain such as "I can't stand it anymore" or "It's never going to stop." Catastrophizing appears to worsen pain in adults (e.g., Jacobsen & Butler, 1996; Lester, Lefebvre, & Keefe, 1996).

With respect to children, Bennett-Branson and Craig (1993) found that more frequent use of behavioural coping strategies and less frequent catastrophizing predicted less pain following surgery. In a study by Reid et al., (1997), self-report of coping strategies for pain in general did not predict postoperative pain and adjustment. However, children's retrospective reports of the ways in which they had coped with postoperative pain were significantly related to pain and adjustment. Specifically, self-reports of low levels of emotion-focused avoidance and high levels of distraction were related to lower levels of pain. The theoretical importance of coping warrants further investigation of the predictive value of emotion-focused avoidance assessed preoperatively.

Multivariate prediction of postoperative pain. Several previous investigations have used multiple regression analyses to predict the degree of postoperative pain in children. Multiple regression is a particularly important approach in this area, because of the fact that the predictors tend to be intricately related. For instance, a child's level of anxiety is likely related to the amount of pain that he or she expects to have after surgery, which in turn is likely related to the child's understanding of the type of surgery. Multiple regression allows researchers to examine the relative contributions of variables despite intercorrelations, and lessens the danger of oversimplifying the complex multidimensional nature of the processes involved.

Bennett-Branson and Craig (1993) assessed the effect of demographic variables and child coping variables on a composite pain factor following pediatric surgery. High levels of pain were predicted by female gender, infrequent behavioural coping, high levels of catastrophizing and low self-efficacy. Palermo and Drotar (1996) examined the following predictors of children's self-report of pain on the day of inpatient surgery: age, total analgesics administered, anticipatory anxiety, expected pain from surgery and expected helpfulness of pain medication. Age, analgesics administered, and anticipatory anxiety were significant predictors of postoperative pain. In a subsequent study, Palermo et al., (1998) found that anxiety and the total number of goal-directed coping strategies predicted postoperative pain. However, as mentioned previously, there was a negative relationship between anxiety and pain in this study.

Gilbert (1996) examined the role of prior psychosocial adjustment, coping, and expectations for recovery in predicting short-term medical recovery (a composite measure combining self-reported pain and other variables related to physical recovery). Coping and expectations, entered as a block, accounted for a substantial but non-significant proportion of the variance. The failure to reach statistical significance is most likely related to small sample size. Reid et al. (1997) considered surgical severity (no-low pain vs. moderate-high pain), emotionality, medication doses and coping (approach, distraction, and emotion-focused avoidance) as predictors of post-operative pain. High levels of pain were predicted by being a member of the moderate-high pain surgical severity group and by high levels of emotion-focused avoidance coping.

One goal of this study was to clarify and extend earlier findings, with a specific focus on outpatient procedures. The predictors of interest were demographic variables (age and gender), medical variables (severity of surgery and analgesics administered), anticipatory anxiety, expected pain and an emotion-focused coping style.

Predicting parental responses to children's pain

The communication model of children's pain (Craig et al., 1996) asserts that parents play an important role in assessing pain and intervening to relieve pain. Parents' familiarity with children's temperaments, typical behaviours, and previous reactions to pain gives them an important advantage as judges (Reid, Hebb, McGrath, Finley, & Forward, 1995). There is confusion over the accuracy of parents' assessments of pain in children, with some researchers reporting good agreement (e.g., Miller, 1996; Schneider & Lo Biando-Wood, 1992) and others suggesting parental underestimation (Bellman & Paley, 1993). This difference of opinion has been shown to stem from varying, and often inadequate, analytic approaches: child and parent report of pain tend to be highly correlated, but children usually report higher absolute levels of pain than parents report on their behalf (Chambers et al., 1998).

Parents take responsibility for administering pain medication, and intervene in many other ways in order to alleviate pain. For example, they may treat pain with ice packs, heating pads or massage; soothe children by rocking and singing; coach children to use coping methods such as deep breathing and imagery; or distract children with music, toys, video games and television (Kuttner, 1996; McGrath, Finley & Ritchie, 1994). In this study, a thorough description of psychosocial comfort measures was obtained, but prediction focused on pharmacological pain management as an outcome. This was not intended as a slight to psychosocial interventions. Unfortunately, at present, certain complexities related to the various ways in which parents provide comfort for their children are not well understood. For instance, strategies may be highly personal, age-related differences in the strategies used are not clearly defined, some strategies are not distinctly different from parents' typical behaviour toward their children (e.g., hugging, rocking), and it is difficult to prescribe "optimal practices."

A range of management strategies is available to parents. Factors influencing parents' decisions about whether to intervene and how to do so have not been investigated in detail. However, physicians and nurses' decision making processes have been more widely studied.

Models of medical decision-making

According to current knowledge about pain and its negative impact on the child, as well as the minimal risks associated with the pain medications recommended for outpatient surgery, the optimal decision would be to follow a regular schedule and provide analgesia every four hours (Broadman, 1999). If parents must follow a *prn* schedule, the single salient factor should be the level of the child's pain. However, the reality of decision making is such that even experts are likely influenced by relatively extraneous or incidental factors (Schmidt, Norman, & Boshuizen, 1990), and the general population is vulnerable to a number of different heuristics and biases that may compromise judgment (Tversky & Kahneman, 1974).

At one time, it was thought that medical experts used predictable mental decision trees and a Bayesian approach to diagnosis and treatment. This has generally proved not to be the case (Mellers, Schwartz, & Cooke, 1998). Current views emphasize cognitive psychology, suggesting that expert decisions are more similar to scripts, prototypes and similarity judgments than structured flow charts (Schmidt et al., 1990). Consequently, factors which actually convey little relevant information, may make an individual patient more or less similar to a prototypic "patient with pain" or "patient requiring medication" and thus have a significant effect on decision making. For instance, medical residents attribute less pain to attractive individuals than to unattractive individuals (Hadjistavropoulos, Ross, and von Baeyer, 1990). Age and gender may have similar effects, eliciting stereotypic expectations which may lead caregivers to discount individuals' reports of pain and alter the delivery of analgesics. Stereotypic expectations may also differ according to the gender of the parent responsible for care.

Other influences may have more intrinsic relation to the patient's pain experience and the appropriate intervention, but still reflect a heuristic or "short-cut" (see Tversky & Kahneman, 1974). The traditional notion of pain as an invariant linear function of the degree of physical injury suggests that parents may also use the invasiveness of the surgery to determine appropriate analgesic practice. More directly, the amount of pain reported or displayed by the child is assumed to have a large impact on pain management.

Another heuristic concerns the relative weighting of gains and losses. According to Tversky and Kahneman (1974), in certain situations individuals are likely to minimize losses to a greater extent then they are likely to maximize gains, particularly if the loss could come from a positive action on their part. For instance, Ritov & Baron (1990) identified an "omission bias." They found that parents were more concerned about causing their child's death due to the fatal side effects of a vaccine, than they were concerned about reducing the child's probability of contracting a disease by administering a vaccine. This was true even though the death rate from the disease was much higher than the death rate from side effects of the vaccine. Parents seem to dread doing any harm to their child as a result of their own action. This may magnify the decision weight given to the perceived risks of administering analgesics (e.g., side effects, addiction), and motivate parents to avoid the risks by doing nothing, even at the cost of increased pain.

Since the decision in question is made in the context of the recommendations of doctors and nurses, research in the area of adherence and/or compliance may be relevant. Theories such as the health belief model (HBM; Becker, Haefner, & Maiman, 1977), the theory of reasoned action (TRA; Fishbein & Ajzen, 1975) and the theory of planned behaviour (Ajzen & Madden, 1986) have been developed in order to predict individuals' adherence to a wide variety of medical recommendations, including medication administration and lifestyle changes. These models highlight various cognitive processes related to adherence, including perceived susceptibility to an illness or symptom (expected pain), beliefs concerning the benefits of adherence (expected benefit from pain medication) and beliefs concerning barriers to effective treatment (attitudes about side effects and other negative aspects to pain medication).

The theoretical models discussed above were generally developed to predict individuals' decisions about their own medication intake or health-related behaviour. In order to address decisions made by a parent on behalf of a child, interpersonal variables were also considered. Two components of empathy, perspective-taking and empathic concern, were included as measures of the parent's sensitivity to the child's experiences and point of view following surgery.

In this study, parents' administration of analgesic medication was predicted from child age and gender, parent gender, invasiveness of surgery, degree of pain experienced, parents' a priori expectations for the degree of postoperative pain and the helpfulness of pain medication, parents' empathy, and parents' attitudes toward analgesic medication. The relative absence of previous research and a comprehensive theoretical model meant that some of these influences were chosen on the basis of logic and clinical intuition. Although the regression analyses used do not permit causal inferences, they represent a first step toward the development of a model of parental decision making by identifying variables deserving of further study.

Predictors of analgesic administration

Age. Decision-making has frequently been explored through the use of vignettes about patients with pain, in which one or more patient characteristics are varied while others are held constant. Nurses are then asked to rate the amount of pain experienced by the patient and state how they would intervene.

In one such vignette study, pediatric nurses stated that they would administer stronger pain medication to older children (Burokas, 1985), and it is does appear that infants receive fewer and weaker medications for pain (Schechter et al., 1986). When asked directly, pediatric nurses list age (independent of weight) among the factors that they consider in making decisions about pain management (Burokas, 1985; Gadish, Gonzales & Hayes, 1988; Gonzales & Gadish, 1990). Parents may react in a similar fashion, with a greater tendency to medicate older children. Parents and nurses may be more concerned about the safety and suitability of medications for younger children, although there is little basis for such a worry. Alternatively, it may be easier to use psychosocial strategies such as rocking and cuddling, with younger children.

Gender. Gender is an intriguing variable. Western culture appears to be less tolerant of male displays of weakness or vulnerability (Fuchs & Thelen, 1988), a bias which may lead caregivers to ignore displays of pain in boys. However, the literature does not provide unequivocal support for this notion. A majority of nurses working with adult patients stated that men and women differed in pain perception, but the direction of difference was not consistent (McCaffery & Ferrell, 1992). That is, some nurses felt that women experienced more pain and some nurses felt that men experienced more pain. In vignette studies, gender has not been found to influence pediatric nurses' responses (Burokas, 1985). On the whole, these findings do not lead to any straightforward prediction regarding the effect of gender on parents' pain relief decisions.

Parent gender. There have been no systematic investigations of the effects that parents' or nurses' gender may have on pain management decisions. Recent data have suggested that mothers tend to underestimate children's pain, whereas fathers' ratings are closer to those of their children (Craig & Chambers, 1999).

Invasiveness of surgery. Nurses have attributed more pain to children with severe diagnoses, even when factors such as the child's expression of distress were held constant (Hamers, Abu-Saad, van den Hout, Halfens, & Kester, 1996). Adult and pediatric nurses have consistently included type and invasiveness of surgery as an influence on pain management decisions (Burokas, 1985; Cohen, 1980; Gadish et al., 1988; Powers, 1987). Bush, Holmbeck and Cockrell (1989) found that the “seriousness” of a surgery, as rated by experts, was the most powerful predictor of the analgesics that children received. Parents' choices may also be guided by the invasiveness of the procedure their child experienced.

Parent judgments of pain. The amount of pain reported or displayed by the child would seem to be an obvious predictor of pain medication given, and it ranks highly among the influences listed by nurses (Burokas, 1985; Cohen, 1980; Gadish et al., 1988). However, it is mentioned less frequently than factors with more indirect or tenuous links to appropriate decisions such as the type of surgery. Foster and Hester (1990) failed to find systematic relationships between nurses' ratings of children's' pain and the choice to medicate. In contrast, Chambers et al. (1997) found significant positive relationships between parents' assessments of pain and their administration of medication. As described previously, the relationship between pain report and medication is difficult to sum up, because of the confound inherent in p.r.n. schedules of administration.

Expectations. Pediatric nurses cite "how much pain the patient should have" (Burokas, 1985) and "nurse's anticipation of child's pain" (Powers, 1987) among factors to be considered in pain management. Parents may develop expectations for children's postoperative pain based on personal experience with surgery, or knowledge of their child's typical patterns of behaviour. Parents who do not expect their children to have significant pain following surgery may be less likely to intervene with pain medication. The perceived benefit of medications is also believed to affect parents' management practices (Bush & Iannotti, 1990).

Empathy. Although little empirical evidence is available, it is possible to speculate about the effect of individual differences in empathy. Parents who report a greater tendency to use perspective taking skills in order to see a situation from another's point of view (a cognitive component of empathy), or a greater tendency to feel sympathy or distress on behalf of the less fortunate (an emotional component of empathy), may place more value on pain relief.

Attitudes about analgesic medication. Parents' lack of knowledge or fears about analgesic medication are believed to contribute to the problem of undermedication (Finley, 1996). Significant numbers of parents endorse negative attitudes and beliefs about pain medication, such as "children who have to take pain medicine regularly for pain may learn to use drugs to solve other problems," (Finley et al., 1996), "acetaminophen works best if used as little as possible," and "acetaminophen works best if saved for when the pain is quite bad," (Forward, Brown, & McGrath, 1996). All of the mothers studied by Gedaly-Duff and Ziebarth (1994) expressed worries about drug addiction.

Forward et al. (1996) developed a questionnaire to assess parents' attitudes to the use of acetaminophen for children's pain, including questions about side effects, tolerance, addiction, and an increased risk of drug abuse. Mothers who demonstrated more positive attitudes about acetaminophen were more likely to state that they would administer medication when their children had pain, and would give the medication when at lower levels of pain. Similarly, parents with fewer negative attitudes to pain medicine gave more doses of analgesics to children recovering from day surgery (Chambers et al., 1997). Attitudes were expected to predict the administration of pain medications in the present study.

Summary

According to the available evidence, children experience significant levels of pain as they recover from day surgery. Parents are reluctant to administer pain medication even when they know that their child is in pain. It was hoped that the identification of children who were likely to have pain and parents who were likely to undermedicate would facilitate educational interventions. In addition, these circumstances provided data relevant to psychosocial models of pain, with attention to both children's experience of pain and parents' decisions to administer medications.

A major goal of this study was to predict the level of children's pain on the basis of child age and gender, invasiveness of surgery, analgesia administered, anticipatory anxiety, expected pain, and an emotion-focused coping style. In addition, the number of doses of pain medication administered by parents were predicted on the basis of child age and gender, parent gender, invasiveness of surgery, the degree of pain the parent judged the child to be in, parental expectations about pain and pain medication, tendency toward empathy, and attitudes about analgesic medication.

Method

Participants

Participants were recruited among families who had children aged 2 to 12 years undergoing genitourinary, orthopedic, general, plastic or dermatological surgery, on an outpatient basis, at The British Columbia's Children s Hospital (BCCH). The surgery classes listed above were chosen because previous research has shown they were associated with postoperative pain ranging from mild to severe (Finley et al., 1996). On a more practical note, it was necessary to exclude patients having ear, nose and throat procedures such as tonsillectomies and myringotomies because this population was already targeted for an unrelated research study.

Children and families were excluded if they did not speak and read English; if the children had a developmental difficulty; chronic illness involving the central nervous system; or took chronic analgesics or central nervous system medications. Families were also excluded if the parent accompanying the child to the hospital was not the person with primary caregiving responsibilities during the child's recovery.

In all, 559 families meeting the recruitment criteria were approached to participate. Of these, 318 (57%) consented to participate. Of this initial sample, 236 (74%) returned completed questionnaires and diaries. Seventy-one families (22%) did not return their diaries and 11 families (4%) returned incomplete diaries. Overall, the final sample represented 42% of the population approached. This represents a lower degree of participation than in similar studies (e.g., Chambers et al., 1998; Finley et al., 1996; Kokinsky et al., 1999; Reid et al., 1997; Romsing et al., 1998; Tan et al., 1994). This lower participation rate is attributed to organizational factors at BCCH preventing contact with families before the day of surgery, and to the complexity of the study protocol.

Analyses were conducted to determine whether "consenters" differed from "non-consenters" in age, gender, or severity of surgery. The children of nonconsenting families were, on average, older (t=2.44, p<.05) and having a less severe surgical procedure (χ^2=4.27, p<.05). Analyses were also conducted to determine whether "completers" differed from "non-completers" on demographic, medical or psychological information collected before they left the hospital. "Noncompleters" were of lower SES (t=2.90, p<.01) and were more likely to have a native language other than English (χ^2=5.07, p<.05).

Descriptive data on the 236 families who completed the study are presented in Table 1 (p.28). The preponderance of boys and of younger children is typical of children who undergo day surgery. The children in the study had a mean of 1.6 previous surgeries (SD=1.8). A variety of surgical procedures was performed within each type of surgery.

Overall, the most common procedures were circumcisions (14%), inguinal hernia repairs (9%), removal of wires and/or pins (8%), and cystoscopies (7%). The surgeries varied considerably in invasiveness and degree of tissue damage. Examples of the more invasive procedures performed are osteotomy, the sawing or cutting of a bone, and orchidopexy, in which an undescended testis is mobilized, brought down to the scrotum and stitched in place (Dorland's Illustrated Medical Dictionary, 1994). An example of one of the least invasive procedures performed is manipulation and casting, an orthopedic procedure in which a joint is forcibly moved beyond its active limit of motion, and then a cast is applied to hold it in place. This increases the range of motion in children with club feet or other orthopedic anomalies (Dorland's Illustrated Medical Dictionary, 1994).

Only those children between the ages of 6 and 12 years were asked to complete self-report measures. This age group was specified because they have the developmental capacity to provide reliable self-report data yet they generally depend on their parents to make decisions about the administration of pain medication. Children in this age group made up 42% of the overall sample, resulting in a sample size of 100 for the prediction of children's pain scores. The full sample of 236 families was available for the prediction of parents' medication practices.

Procedure

Data were collected in three stages.

Stage 1: The Day of Surgery

Families were approached by hospital staff when they checked in at the surgical day care

Table 1. Sample Characteristics

Child's Age		M= 6.1 years, SD=3.1
Parent's Age		M=36.3, SD=5.7
Socioeconomic Status (Hollingshead & Redlich, 1958)*		M=2.4, SD=1.0 Median=2 Range from 1 to 5
Child's Gender	Male	161 (68%)
	Female	75 (32%)
Accompanying Parent	Mother	207 (88%)
	Father	29 (12%)
Child's Ethnic Background	White	181 (77%)
	Asian	27 (11%)
	First Nations	5 (2%)
	East Indian	5 (2%)
	African	2 (1%)
	Other	16 (7%)
Type of Surgery	Genitourinary	101 (43%)
	Orthopedic	72 (31%)
	General	29 (12%)
	Plastic	28 (12%)
	Dermatological	6 (2%)

N=236.
*The index ranges from 1 to 5. Lower numbers indicate higher social status. A score of 2 is consistent with a business manager or lesser professional with partial college training.

unit the morning of their scheduled surgery. They were given an information sheet describing the purposes and procedures of the study and asked to inform nursing staff whether they were willing to be approached by a researcher and hear more about the study. If they agreed to be approached, the researcher provided more detailed information about the study and obtained informed consent from parents and assent from children (see Appendix I).

Prior to surgery, children aged 6 to 12 were asked to complete the following psychological measures:

1) Child report of anxiety and expectations for postoperative pain (Palermo & Drotar, 1996)

2) Pain Coping Questionnaire (Reid et al., 1998).

Children were given printed copies of these measures but items were read aloud by the researcher, who also recorded answers. At this time, children were also familiarized with the pain diaries and trained in the use of the pain rating scale. This phase of data collection took approximately ten minutes, and fit within the routine waiting time prior to surgery.

While the child was in the operating room, all parents were asked to complete the following measures:

1) Demographic checklist

2) Parent report of expectations (Palermo & Drotar, 1996)

3) Two subscales taken from the Interpersonal Reactivity Index (Davis, 1983)

4) Telephone appointment form.

Parents were also trained to complete the pain diaries and medication records at this time. Parents were then provided with a package to take home consisting of an instruction sheet, a copy of the telephone appointment form, a child's pain diary, a parent's pain diary, a medication record, a copy of the Attitudes to Pain Medication scale (Forward et al., 1996), a checklist of psychosocial management strategies, and a self-addressed, stamped envelope.

When children returned to the recovery section of the surgical day care unit after their surgery, and nurses gave parents instructions regarding at-home care, the researcher recorded instructions verbatim. These instructions were later coded to indicate the medication and schedule of administration recommended. Instructions regarding the size of dose were not coded. However, the routine practice on this unit was to advise patients to give the dose recommended on the bottle (which is given by age in the case of a non-prescription medication and by weight in the case of a prescription medication). Nurses recommended specific doses only if parents appeared unsure or asked specific questions. Following discharge, a chart review was conducted to obtain information on the type of surgery and any analgesic medication used before, during or after the child's surgery.

Stage 2: The Immediate Postoperative Period

Pain diaries and medication records were completed on the day of surgery and the first two days after surgery. Parents rated their child's pain on the Faces Pain Scale (Bieri, Reeve, Champion, Addicoat & Ziegler, 1990) for four intervals: between breakfast and lunch, between lunch and supper, between supper and bedtime, and between bedtime and breakfast. Children used the Faces Pain Scale (Bieri et al., 1990) to rate their pain for the same intervals. Parents were instructed to complete their ratings before reminding their children to fill out their diaries, and to try to avoid influencing their children's ratings. Parents completed medication records each time that pain medication was given. A researcher telephoned each family at an appointed time on the first day after surgery to remind them to keep up with the diaries and records.

Stage 3: One Week Following Surgery

A telephone interview was conducted with parents at an appointed time on the seventh postoperative day. Parents were asked open-ended questions about the following:

1) formal and informal contact with the medical system because of their child's pain and discomfort,

2) general satisfaction with day surgery, and

3) general satisfaction with postoperative pain management.

They then were asked to complete the Attitudes to Pain Medication Scale (Forward et al., 1996) and a checklist of psychosocial management strategies, which were both measures included in their take-home package. Finally, they were reminded to mail back their completed packages. Families who did not return their diaries within two weeks received up to three telephone reminders.

From a methodological standpoint, it might have been preferable to give the attitudes measure prior to surgery, along with the other psychological predictors. In this way all predictors would have been administered prospectively. However, the items included a number of negative statements about pain medication, and there was concern that prospective administration could lead to significant reactive effects in parents' medication practices.

Measures

Measures Completed by Children

Child report of anxiety and expectations (Palermo and Drotar, 1996). Children aged 6 to 12 rated their anticipatory anxiety and expected pain on graphically presented vertical rating scales ranging from 0 to 10. The anticipatory anxiety question read "How anxious or nervous are you about your surgery?" with "Really anxious and nervous" and "Not anxious or nervous" as top and bottom anchors. The expected pain scale read "How much pain do you think you will have from your surgery?" with "The worst possible pain" and "No pain" as anchors. See Appendix II for a copy of this measure.

Pain Coping Questionnaire (Reid et al., 1998). This 49-item checklist had children rate how frequently they use a variety of coping strategies when they were hurt or in pain. Children completed this measure prior to surgery with respect to how they generally cope with pain. The measure has good internal consistency and shows concurrent validity with other coping measures. Reliability is also good, with internal consistencies ranging from 0.87 to 0.89 on the three factor scores (Reid et al., 1998). The "emotion-focused avoidance" factor score was chosen as a predictor of children's pain. In this sample, this factor had an internal reliability of 0.77 (Cronbach's alpha). This factor score includes two clusters. One reflects internalizing or catastrophizing, a tendency to concentrate on negative thoughts about pain, its meaning, and its likely duration. The second reflects externalizing, or acting out in response to pain, a tendency to act in a hostile or explosive fashion in response to pain. Together, these coping styles are considered to represent "strategies in which emotions are freely expressed and strategies that reflect a lack of effort to regulate feelings when in pain." Emotion-focused avoidance has been shown to be related to increased pain in two standardization samples (Reid et al., 1998). Although the concept of externalizing is relatively new, catastrophizing is well established in the psychological literature as a predictor of pain in both children and adults (e.g., Bennett-Branson & Craig, 1993; Jacobsen & Butler, 1996; Lester et al., 1996).

Faces Pain Scale (Bieri et al., 1990). Children's ratings were made by selecting one of seven faces depicting expressions of pain. The scale was anchored with the words "no pain" and "worst possible pain." This scale is widely used in pain research with children as young as four (Goodenough, Addicoat et al., 1997) and has been shown to be reliable and valid for the assessment of acute pain. The highest pain score over the two days after surgery was used as the dependent variable in the prediction of children's pain, since it was thought to be a relevant target for intervention (a child's worst pain), and to show the greatest statistical variability, which improves the power of a regression analysis. The mean pain score over the two days (according to parents' ratings) was used as an independent variable in the prediction of parents' medication practices because it was more consistent in time frame with the dependent variable (i.e., both were an additive measure of data collected over the entire two day period). In any case, the two measures were highly correlated ($r=.86$, $p<.001$ for parents; $r=.91$, $p<.001$ for children) so that the outcome is unlikely to differ as a result of these choices. Data from the day of surgery were not included in order to reduce the impact of intra-operative analgesic techniques such as regional blocks and infiltration with local anesthetics.

On the Faces Pain Scale (Bieri et al., 1990), which ranges from 0 to 6, a score of 3 or higher is considered to represent a clinically significant degree of pain, and a score of 5 or higher is considered to represent severe pain. These cutoffs are based on a study by Gauthier, Finley & McGrath (1998), in which children were interviewed following surgery and asked which score on the scale represented "a medium amount of pain" and which represented "a lot of pain." Mean responses were 3.2 and 4.8. Children were also asked which score represented pain for which they would want "a pill to help make the pain go away." The mean response was 3.2.

Measures Completed by Parents

Demographic Checklist. Parents provided basic demographic data, such as their gender, age, ethnic background, first language, occupation, and education, and their child's age and gender. Socioeconomic status was calculated using the Hollingshead Two Factor Index (Hollingshead & Redlich, 1958).

Parent report of expectations (Palermo and Drotar, 1996). Parents completed the same vertically presented 0 to 10 rating scales as their children with reference to their expectations of their children's pain ("How much pain do you think your child will have from surgery?"), and an additional scale which addressed their expectations of the helpfulness of analgesics ("How helpful do you think pain medication will be for taking away your child's pain?"). When administered to children, this measure has been found to be highly correlated with postoperative pain. See Appendix III for a copy of this measure.

<u>Parent report of empathy</u> (Davis, 1983). Parents responded to two 7-item subscales from the Interpersonal Reactivity Index (IRI). These items represent two of four subscales developed to measure different dimensions of empathy. Perspective Taking is a measure of cognitive empathy, or the ability to see things from another's point of view. Empathic Concern is a measure of emotional empathy, or the tendency to feel distress when confronted by others who are troubled or less fortunate. Higher scores on these scales indicated a more empathic response. The construct validity of the subscales has been supported by factor analysis, their concurrent validity is supported by their relationships to other measures of empathy, and their internal reliability and test-retest reliability are satisfactory.

<u>Faces Pain Scale</u> (Bieri et al., 1990). Parents also completed this scale. Parents' estimates of their children's mean pain over the two days after surgery were used as a predictor of parents' medication practices, because children's self-reports were not available for participants aged 2-5 years. As described above, this scale is widely used and has ratio properties and good test-retest reliability.

<u>Medication Record</u>. This measure was completed each time the child received a dose of analgesic medication. Parents recorded the date and time, type or brand, amount, and person giving the medication. The number of standard doses given over the two days following surgery served as the dependent variable for the prediction of parents' medication practices.

Attitudes to Pain Medication Scale (Forward et al., 1996). On this scale, parents rated their agreement with statements concerning addiction, drug abuse, side effects, tolerance and stoicism. The subscales have reasonable internal reliability. Total scores have been found to predict mothers' tendency to medicate for common childhood pains and the level of pain at which mothers were willing to give medication (Forward et al., 1996). The sum of scores on all five subscales was used as a predictor of parents' medication practices. This summary measure had an internal reliability of 0.87 (Cronbach's alpha) in this sample. Higher scores indicated a more positive attitude toward pain medication.

Checklist of Psychosocial Management Strategies. This measure was derived from a review of the existing literature on techniques that parents and nurses use to comfort children in pain (Bauchner, Vinci & May, 1994; Beyer, Clegg, Foster & Hester, 1992; Denyes, Neuman & Villaruel, 1991; McCready, MacDavitt & O'Sullivan, 1991; McGrath et al., 1994; Neff & Douthit, 1990; Pederson & Harbaugh, 1995). Parents indicated whether they used 21 means of helping their children feel less bothered by pain (see Appendix IV).

Measure Completed by the Researcher

Medical Chart Review. A researcher reviewed the child's medical chart upon discharge and extracted information on the type of surgery, and any analgesic medication used before, during or after the child's surgery. Because theories and investigations of pre-emptive analgesia (Woolf & Chang, 1993) suggest that aggressive analgesic treatment during surgery (even while the child is under the influence of anesthesia) can reduce post-operative pain, the use of regional block techniques and infiltration of the wound with local anesthetics were used as predictors of children's pain.

Invasiveness Ratings. The amount and type of tissue damage associated with different surgical procedures can range considerably. The degree of pain experienced by the average patient is related to the severity of the surgery (Reid et al., 1997), although individual differences are both common and large. Although expert ratings of invasiveness lack operational specificity, they are simple and allow a rough control for the degree of tissue affected during surgery.

Three experienced anaesthetists were asked to rate each of the procedures as "expected to result in mild pain" or "expected to result in moderate to severe pain." All three agreed in 84% of cases. Where there was disagreement, the majority opinion was used. The resulting invasiveness rating was used as a predictor of both children's pain and parents' medication practices. Similar ratings have been used in previous research (Palermo et al., 1998)

Analysis

All analyses were done using SPSS for Windows, version 8.0. A small amount of missing data was present in the data set. Families who returned incomplete pain diaries were eliminated from the analyses. Diaries were considered incomplete if a child or parent had not completed at least half the pain ratings on each day, or if a parent had not completed the medication record. Thus a relatively strict standard was held in regard to the dependent variables. However, in order to retain as representative a sample as possible, participants remained in the analyses if they had not completed one of the predictor measures. In these cases, the sample mean was substituted for the missing data (Tabachnick & Fidell, 1996). Percentages of missing data were as follows: 11% of responses to the Pain Coping Questionnaire, 6% of children's Faces Pain Scale ratings, 2% of responses to the parent report of anxiety and expectations, 3% of responses to the Interpersonal Reactivity Index, 7% of parents' Faces Pain Scale Ratings, 3% of parents' report of unscheduled contact with the health care system, 3% of parents' satisfaction ratings, 7% of responses to the Attitudes to Pain Medication Scale, 7% of responses to the Checklist of Psychosocial Management Strategies.

Descriptive data were computed for discharge instructions provided by hospital staff regarding analgesia and pain management, mean levels of pain for each day, the number of children reporting a clinically significant amount of pain for each day, analgesics given, psychosocial management strategies used by parents, unscheduled contact with the medical system as a result of pain, and parents' satisfaction with their children's pain management.

Child-reported pain was predicted from demographic, medical, and psychological variables. Pearson product-moment correlation coefficients were calculated to describe the unidimensional relationship between each predictor and the dependent variable. Hierarchical multiple regression was used to delineate relationships among these variables. The outcome measure was child-reported pain as measured by the maximum Faces Pain Scale score on the two days following surgery. Decisions regarding the order of entry of variables were made on a conceptual basis. Basic demographic and historical variables were entered on the first step. Medical variables were entered on the second step and psychological variables on the final step, as it was desirable to determine their effects over and above those of demographic and medical contributors.

The prediction of parents' medication practices from demographic, medical, and psychological variables was also carried out using hierarchical multiple regression, following the calculation of bivariate correlations. In this case, the outcome measure was the total number of doses of analgesic administered across the two days following surgery. The order of entry of variables followed the same conceptual rationale as for the first regression. Again, demographic and historical variables were entered in the first step, medical variables were entered in the second step, and psychological variables were entered in the third and final step. The contribution of predictors within blocks was presented as standardized regression coefficients (standardized β) from the final step of the analysis (i.e., the unique, unshared contribution of each variable controlling for all other variables in the regression model).

Results

Descriptive Data

Unless otherwise noted, descriptive data are presented for the entire sample of 236 children aged 2-12.

Discharge Instructions

Discharge instructions were routinely administered by nurses, and sometimes supplemented by physicians. Three percent of parents were given no instructions regarding pain medication. Sixty-two percent of parents were instructed to administer acetaminophen alone. One percent of parents were told to give their children naprosyn. Thirty-four percent of parents were advised to give acetaminophen with codeine. Of this group, 47% were given a prescription for a liquid elixir containing 8 mg of codeine and 300 mg of acetaminophen per 5 ml. Forty-four percent were prescribed tablets containing 30 mg of codeine and 300 mg of acetaminophen (a Tylenol #3™ or equivalent), 5% of children were prescribed tablets containing 15 mg of codeine and 300 mg of acetaminophen (a Tylenol #2™ or equivalent), and 5% were told to give tablets containing 8 mg of codeine (a Tylenol #1™ or equivalent). The last medication is available over the counter in Canada.

With respect to the recommended schedule of medication, 10% of parents were told to give medication on a *prn* basis. That is, the words "if needed," "if he/she needs it" or "if necessary" were used in the course of the instructions. The vast majority of parents (87%) were told to use a regular schedule (e.g., to give medication every 4 hours whether or not the child was complaining of pain). Three percent of parents were given no information about the type of schedule to use.

Pain Levels

Table 2 presents mean pain levels by day on the Faces Pain Scale, as well as maximum pain levels over the entire three day period, according to parents. This data is presented for the entire sample. Table 3 (p. 40) presents the same data for the subgroup of children aged 6 to 12 according to their own self-report, and their parents' report. Pain levels were highest on the day of surgery and fell steadily until the second day after surgery, when they leveled out near the bottom of the pain scale.

Table 2. Daily Pain Levels and Maximum Pain Levels for the Entire Sample

All scores refer to the Faces Pain Scale (Bieri et al., 1990), which ranges from 0-6.

Mean pain according to all parents (N=236)	Mean	SD
Day of surgery	1.8	1.5
Day after surgery	1.2	1.2
Second day after surgery	0.7	1.0
Maximum pain levels according to all parents	Mean	SD
(N=236)	2.5	1.8

Within the subgroup of 100, for which both parent-report and child-report data was available, parents' ratings were close to those of their children. Parent-child agreement was measured in several ways, according to the recommendations of Chambers et al. (1998). Pearson's correlations ranged from 0.47 to 0.90 across the 9 intervals measured, and all of the correlations were significant ($p<.001$). When comparing mean scores, parents' ratings were significantly different from those of their children for the first interval only ($t=2.4$, $p<.05$). Parents slightly underestimated their children's pain when it was most severe. Kappa was computed for child and parent ratings of maximum pain across the three day period. The obtained kappa statistic was 0.26, representing a statistically significant ($p<.001$) but poor level of agreement. This finding is consistent with that of Chambers et al. (1998), suggesting that it is difficult for parents to judge the subjective state of their children with accuracy.

Table 3. Daily Pain Levels and Maximum Pain Levels for Children Aged 6 to 12

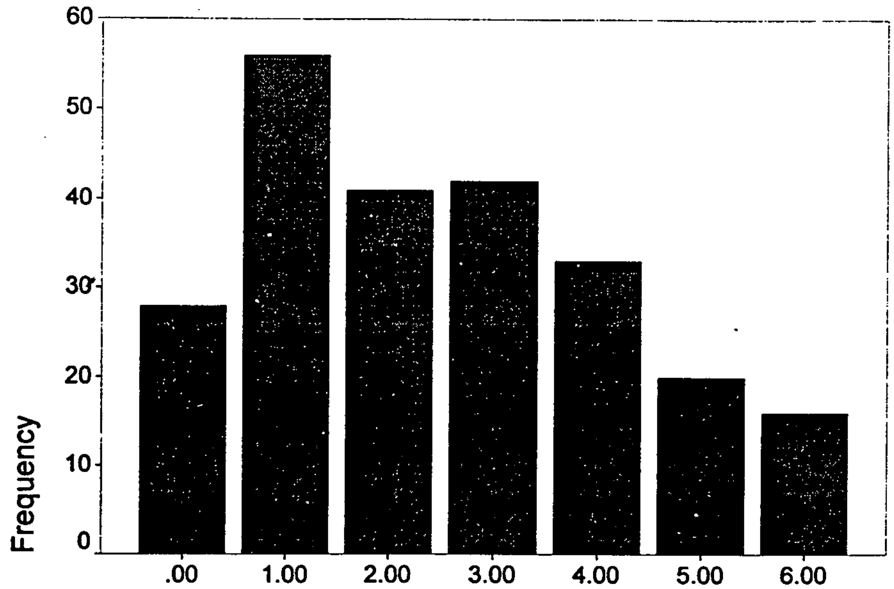
All scores refer to the Faces Pain Scale (Bieri et al., 1990), which ranges from 0-6.

Mean pain according to children aged 6 to 12 (n=100)	Mean	SD
Day of surgery	2.3	1.7
Day after surgery	1.4	1.3
Second day after surgery	0.7	1.0
Maximum pain levels according to children aged 6 to 12 (n=100)	**Mean**	**SD**
	3.1	1.8
Mean pain according to the parents of children aged 6 to 12 (n=100)	**Mean**	**SD**
Day of surgery	2.0	1.5
Day after surgery	1.4	1.2
Second day after surgery	0.8	1.0
Maximum pain levels according to the parents of children aged 6 to 12 (n=100)	**Mean**	**SD**
	2.7	1.6

Figure 1 (p. 41) represents the distribution of maximum pain scores in all children studied, based on parents' reports. According to parents, 47% of children experienced clinically significant pain at some point in their recovery, and 16% experienced severe pain at some point in their recovery.

Figure 2. Frequency Distribution of the Maximum Pain Reported for Each Child for the Entire Study Period According to Parents (N=236)

All scores refer to the Faces Pain Scale (Bieri et al., 1990), which ranges from 0-6.



In summary, mean pain levels were highest on the day of surgery and decreased thereafter. At no time was the mean pain level in the range of clinically significant pain. However, analysis of children's maximum pain over the entire three day period revealed that clinically significant pain occurred in roughly half the children at some point. There was substantial variability in pain reports, particularly with respect to the maximum pain reported.

Analgesics Administered

The mean number of doses per day was 1.5 on the day of surgery (SD=1.1), 2.2 on the day after surgery (SD=2.1), and 1.3 on the second day after surgery (SD=1.7). On every day, the mean number of doses given was considerably below the recommended number of 4 to 6. It was also of interest to know whether parents who did give their children medication gave unreasonably small doses. Parents who gave no medication at all were excluded from these calculations; for parents who did administer medication, the total dose given to each child (in mg/kg) was divided by the number of doses given to that child. The mean size of single doses of acetaminophen and codeine given was 11.8 mg/kg (SD=4.3) and 0.7 mg/kg (SD=0.3) respectively. This represents the low end of the range typically accepted in the pediatric community, and falls below the range currently recommended at this institution.

To compare the results of this study with those of Finley et al. (1996), frequency of dosage was analyzed for the subset of children whose parents rated them as having clinically significant pain (Day 1, n=73; Day 2, n=41). The results revealed that even when parents judged their children to be in clinically significant pain, 11% were given no medication on the day after surgery. Another 34% were given 1 to 3 doses of pain medication. On the following day, 10% of children judged to be in clinically significant pain were given no medication, and another 51% were given 1 to 3 doses. Thus if undermedication is defined as receiving less than the recommended doses of medication despite clinically significant pain, 45% of children were undermedicated on the day after surgery and 61% of children were undermedicated on the second day after surgery.

Psychosocial Management Strategies Used

In response to the 22 item questionnaire, parents reported using a mean of 13.9 psychosocial comfort measures (SD=4.1) to relieve their children's pain. Table 4 shows the number of parents reporting each comfort measure.

Table 4. Number of Parents Endorsing Comfort Measures

Comfort Measure	Number of Parents Who Used It
Talk softly or soothingly	211 (89%)
Hold and/or cuddle	208 (88%)
Read books or encourage child to read	204 (86%)

Comfort Measure	Number of Parents Who Used It
Help child to find a comfortable position	185 (78%)
Encourage child to think about pleasant things	179 (76%)
Play games with child	173(73%)
Explain pain and how the body works	172 (73%)
Encourage child to play with toys	170 (72%)
Encourage child to watch TV	166 (70%)
Stroking, rubbing or massage	163 (69%)
Encourage child to talk about special place or activity	163 (69%)
Tell stories to child	156 (66%)
Help child to use imagination in other ways	153 (65%)
Encourage child to listen to music	137 (58%)
Rock child	128 (54%)
Encourage child to play with friends	120 (51%)
Help child to use relaxation strategies	118 (50%)
Sing to child	105 (45%)
Help child to use deep breathing or rhythmic breathing strategies	50 (21%)
Encourage child to play video games	47 (20%)
Use heat or cold packs	22 (9%)
Offer child a pacifier	21 (9%)

N=236

The most frequently mentioned were "talk softly and soothingly to child," which was reported by 89% of parents, "hold and/or cuddle child," which was used by 88% of parents, and "read books or encourage child to read," which was used by 86% of parents. These percentages are high, which may reflect the fact that some of the items listed were not specific to pain and may have been used by parents to soothe children who are cranky, tired, or upset as well as children who are experiencing physical pain.

Unscheduled Contact with the Health Care System

Twenty-three parents (10%) reported making an unscheduled call or visit to their surgeon, family physician, the surgical day care unit or the emergency room because of difficulty managing their child's pain. Fifteen parents (6%) reported making an unscheduled call or visit for another reason, such as excessive swelling or uncontrolled vomiting. Pain was the most common cause of unscheduled contact with the health care system.

Consumer Satisfaction

Parents' mean satisfaction with day care surgery in general was 8.9 out of a possible 10 (SD=1.5). Parents' mean satisfaction with pain management was 8.7 out of 10 (SD=1.8). Parents were highly satisfied with their treatment at the hospital, both generally and specifically in terms of pain management.

The Prediction of Children's Pain

This analysis was carried out on the subgroup of children aged 6 to 12 (n=100), in order to utilize their self-report of pain, anxiety, expected pain and coping style. The dependent variable was the maximum pain reported over the two days following surgery. The independent variables were: (1) the child's age in months, (2) the child's gender, (3) the invasiveness of the procedure as categorized by the anaesthetists, (4) whether or not codeine was prescribed, (5) whether or not a regional block was used, (6) whether or not local anesthetic was used, (7) the total number of doses of pain medication given by parents on the two days following surgery, (8) the child's rating of anxiety, (9) the child's rating of expected pain, and (10) the child's score on the Emotion-Focused Avoidance scale from the Pain Coping Questionnaire. Means and standard deviations for each of these variables are listed in Table 5 (p. 46).

The regression analysis was conducted using a combination of standard and hierarchical strategies. Predictors were entered in a series of blocks, with the order of entry of each block specified. Demographic variables (Child Age, Child Gender) were entered as the first block, then medical variables (Invasiveness, Codeine, Regional Block,
Local Anesthetic, Total Doses) as the second block, then psychological variables (Anxiety, Expected Pain, Emotion-Focused Avoidance) as the third block. This strategy provides information on the extent to which psychological variables predict the dependent variables over and above the effects of basic demographic and medical variables. Within each block, the order of entry of variables was not specified.

Data were screened with respect to the assumptions of multiple regression. Emotion-Focused Avoidance was found to be significantly positively skewed. As a result, a logarithmic transformation was applied in order to improve normality, linearity and homoscedasticity (Tabachnick & Fidell, 1996).

Bivariate Correlations

Pearson product-moment correlations were calculated between all pairs of variables in the analysis. The results are presented in Table 6 (p. 47). All but the demographic variables show significant positive correlations with the dependent variable.

Regression Analysis

The results of the regression analysis are presented in Table 7 (p. 48). Prediction was non-significant based on demographic variables alone. However, the inclusion of medical

Table 5. Descriptive Statistics for the Prediction of Children's Pain

Continuous Variables	Mean	SD
Maximum Pain	2.5	1.8
Child Age (in months)	111.4	25.4
Total Doses	3.7	3.8
Anxiety	4.3	2.8
Expected Pain	3.7	3.0
Emotion-Focused Avoidance	19.0	5.8
Emotion-Focused Avoidance (log)	1.3	0.1
Categorical Variables		
Child Gender	Female: 39	Male: 61
Invasiveness	Mild: 47	Moderate to Severe: 53
Codeine	Yes: 54	No: 46
Regional Block	Yes: 29	No: 71
Local Anesthetic	Yes: 34	No: 66

n=100

Table 6. Bivariate Correlations in the Prediction of Children's Pain

	Pain	Age	Gen.	Inv.	Cod.	Block	Loc.	Dos.	Anx.	Exp.	EFA
Pain	1.00	.12	.09	.20*	.21*	.19*	.24**	.57***	.21*	.24**	.23*
Age		1.00	.21*	.02	.27**	.06	.12	.22*	.16	.20*	.20*
Gen.			1.00	-.19*	-.00	-.29**	.03	-.04	.11	.02	-.00
Inv.				1.00	.30**	.43***	.34***	.37***	.12	.06	-.07
Cod.					1.00	.15	.37***	.23**	.28**	.28**	.27**
Block						1.00	-.27**	.45***	.11	.19*	.02
Loc.							1.00	.16	-.00	-.00	-.12
Dos.								1.00	.20*	.12	.11
Anx.									1.00	.27**	.47***
Exp.										1.00	.21*
EFA											1.00

n=100

Note. Gen. = Child's Gender
Inv. = Invasiveness of Surgery
Cod. = Prescription of Codeine
Block = Use of a Regional Block
Loc. = Use of a Local Anesthetic
Dos. = Total Number of Doses Administered by Parents
Anx. = Anxiety
Exp. = Expected Pain
EFA = Emotion Focused Avoidance (log)

*=p<.05.**p<.01.***p<.001.

Table 7: Blocked Hierarchical Multiple Regression Analysis: The Prediction of Children's Pain

Block	R^2 Change	F Change	Standardized β
Demographic Variables	.02	0.86	
Age			-.12
Gender			.13
Medical Variables	.35	10.15***	
Invasiveness			-.06
Codeine			-.05
Regional Block			.06
Local Anesthetic			.24*
Total Doses			.53***
Psychological Variables	.06	3.20*	
Anxiety			-.02
Expected Pain			.16
Emotion-Focused Avoidance (log)			.20*
		R^2=.43	
		Adjusted R^2=.36	
		R = 0.66***	

n=100

Note. Standardized betas are from the final block of the regression equation, and reflect the unique contribution of the variable controlling for other variables in the regression model. *=p<.05. **=p<.01. ***=p<.001.

variables did result in significant predictive power, accounting for 35% of the variance (F Change = 10.15, p<.001). The addition of psychological variables increased predictive abilities significantly, over and above the effect of the medical and demographic variables, accounting for an additional 6% of the variance (F Change = 3.20, p<.05). The final regression equation accounted for 43% of the variance in pain levels. The contribution of predictors within blocks was presented as standardized regression coefficients (standardized β) from the final step of the analysis (i.e., the unique, unshared contribution of each variable controlling for all other variables in the regression model). According to these calculations, significant independent contributions to the prediction of children's pain were made by the number of doses of pain medication given, the use of local anesthetic, and the child's tendency to use emotion-focused avoidance as a coping strategy. There was a trend (β=.16, p<.10) toward a significant independent contribution for the child's expected pain.

The Prediction of Parents' Medication Practices

All 236 families in the study were targeted for this analysis. The dependent variable was the total number of doses of pain medication given over the two days following surgery. The independent variables were: (1) the parent's gender (2) the child's age in months, (3) the child's gender, (4) the invasiveness of the procedure as categorized by the anaesthetists, (5) the child's mean pain score for the two days following surgery, (6) the parent's rating of expected pain, (7) the parent's rating of expected benefit from pain medication, (8) the parent's score on perspective-taking, (9) the parents' score on empathic concern, and (10) the parent's total score on attitudes toward pain medication. Means and standard deviations for each of these variables are listed in Table 8 (p. 51).

Once again the regression analysis was conducted using a combination of standard and hierarchical strategies. Predictors were entered in a series of blocks, with the order of entry of each block specified. Demographic variables (Parent Gender, Child Age, Child Gender) were entered as the first block, then medical variables (Invasiveness, Mean Pain) as the second block, then psychological variables (Expected Pain, Expected Benefit from Medication, Perspective Taking, Empathic Concern, Attitudes to Pain Medication) as the third block. Again, within each block, the order of entry of variables was not specified. This process allows specification of the impact of psychological variables over and above the effect of demographic and medical variables.

Data were screened with respect to the assumptions of multiple regression. Univariate outliers were defined as any score with a standardized value greater than 3.3; multivariate outliers were defined as any score with a statistically significant Mahalanobis distance (Tabachnick & Fidell, 1996). One univariate outlier and one multivariate outlier were identified and deleted, resulting in a final sample size of 234. Mean Pain was significantly positively skewed, and Expected Benefit from Medication was significantly negatively skewed. As a result, a square root transformation was applied to Mean Pain and a reflected logarithmic transformation was applied to Expected Benefit from Medication, in order to improve normality, linearity and homoscedasticity (Tabachnick & Fidell, 1996).

<u>Bivariate Correlations</u>

Pearson product-moment correlations were calculated between all pairs of variables in the analysis. The results are presented in Table 9 (p. 52). The following variables were significantly related to the dependent variable: Child Gender, Invasiveness, Mean Pain, Expected Pain, and Attitudes to Pain Medication.

<u>Regression Analysis</u>

The results of the regression analyses are presented in Table 10 (p. 53). Prediction was significant when only demographic variables were entered, accounting for 4% of the variance (<u>F</u>

Table 8. Descriptive Statistics for the Prediction of Parents' Medication Practices

Continuous Variables	Mean	SD
Total Doses	3.5	3.5
Child's Age (in months)	73.3	37.0
Mean Pain	0.9	0.9
Mean Pain (square root)	0.8	0.6
Expected Pain	5.0	2.1
Expected Benefit from Medication	7.9	2.1
Expected Benefit from Medication (reflected log)	0.4	0.3
Perspective Taking	19.7	4.3
Empathic Concern	22.9	4.0
Attitudes to Pain Medication	99.8	16.0
Categorical Variables		
Parent Gender	Female: 208	Male: 28
Child Gender	Female: 76	Male: 160
Invasiveness	Mild: 106	Moderate to Severe: 130

n=234

Table 9. Bivariate Correlations in the Prediction of Parents' Medication Practices

	Dos.	Par.	Age	Gen.	Inv.	Pain	Exp.P.	Exp.M	Per.	Emp.	Att.
Dos.	1.00	.07	.10	-.13*	.34***	.64***	.36***	-.01	.08	.05	.18**
Par.		1.00	.05	-.03	-.04	-.01	.01	-.09	.10	.29***	.12*
Age			1.00	.15**	-.08	.21***	-.01	-.04	-.01	-.06	-.15**
Gen.				1.00	-.37***	.01	-.16**	.00	.00	-.10	-.05
Inv.					1.00	.18**	.35***	-.09	-.01	-.03	.05
Pain						1.00	.29***	.06	-.07	-.0 3	-.02
Exp.P							1.00	-.13*	-.15*	-.01	.04
Exp.M								1.00	-.09*	-.08	-.13*
Per.									1.00	.44***	.06
Emp.										1.00	.13*
Att.											1.00

n=234

Note. Dos. = Total Doses
Par. = Parent's Gender
Gen. = Child's Gender
Inv. = Invasiveness of Surgery
Pain = Mean Pain (square root)
Exp.P. = Expected Pain
Exp. M. = Expected Benefit from Medication (reflected log)
Per. = Perspective Taking
Emp. = Empathic Concern
Att. = Attitudes toward Pain Medication

*=p<.05. **p<.01. ***p<.001.

Table 10: Blocked Hierarchical Multiple Regression Analysis: The Prediction of Parents' Medication Practices

Block	R^2 Change	F Change	Standardized β
Demographic Variables	.04	2.91*	
Parent's Gender			.05
Child's Age			.03
Child's Gender			-.05
Medical Variables	.44	96.30***	
Invasiveness			.17**
Mean Pain (square root)			.58***
Psychological Variables	.06	6.82***	
Expected Pain			.15**
Expected Benefit from Medication (reflected log)			.03
Perspective Taking			.14**
Empathic Concern			-.02
Attitudes Toward Pain Medication			.17***
		R^2=.54	
		Adjusted R^2 =.51	
		R = 0.73***	

n=234
Note. Standardized betas are from the final block of the regression equation, and reflect the unique contribution of the variable controlling for other variables in the regression model.
*=p<.05, **=p<.01,***=p<.001

= 2.92, $p < .05$), and gains in predictive power were seen with the entry of each of the other blocks. Medical variables accounted for 44% of the variance (F Change = 96.30, $p < .001$). Once again, the addition of psychological variables increased predictive abilities significantly, over and above the effect of the medical and demographic variables. Psychological factors accounted for an additional 6% of the variance in parents' medication practices. The final regression equation accounted for 54% of the variance in pain levels. Again, the unique contribution of each variable, controlling for all other variables in the regression model, was presented in the form of a standardized regression coefficient (standardized β). Significant independent contributions to parents' medication administration were made by the parent's rating of the child's pain level, the invasiveness or severity of the surgical procedure, the parent's expected pain, the parent's ability to take another's perspective, and the parent's attitudes toward analgesics.

Discussion

Medication prescription and teaching of parents in this study were found to be considerably more aggressive than in previous research (e.g., Finley et al., 1996). Children in this study were more likely to be prescribed stronger medication (codeine) and nurses' instructions emphasized scheduled dosing and a preemptive style of pain management, as recommended by current authorities (e.g., Zacharias & Watts, 1998). This contrasts with the data of Finley et al. (1996), in which only 4% of children were prescribed codeine, and 68% of parents were told to use acetaminophen "if necessary." In part, these improved practices may reflect the impact of previous studies, as this institution sponsors frequent pain education seminars for nurses. However, it may also reflect an important methodological difference, as instructions were recorded directly, rather than from parents' recall. The fact that parents' actual practices were more consistent with "as needed" administration than with pre-emptive doses, may have introduced some retrospective bias into parents' reports of instructions in the Finley et al. study.

In keeping with these aggressive pain management practices, pain levels were lower than those identified in previous research. Only half the children in this study experienced clinically significant pain at some point in their recovery. The median proportion of children in significant pain in previous studies was approximately two-thirds (Bartley & Connew, 1994; Bennett-Branson & Craig, 1993; Fell et al., 1988; Finley et al., 1996; Grenier et al., 1998; Jolliffe, 1997; Knight, 1994; Kokinsky et al., 1999; Kokki & Ahonen, 1997; Kotiniemi, Ryhanen, Valanne et al., 1997; Lee & Sharp, 1996; Munro et al., 1999; Romsing et al., 1998; Sutters & Miaskowski, 1997; Tan et al., 1994; Tree-Trakarn and Pirayavaraporn, 1985; Warnock & Lander, 1998). Furthermore, mean pain levels were low in this study, falling under the cutoff considered to represent clinically significant pain. Although the temporal course of pain in individual children was not examined in detail, the combination of (a) a relatively high prevalence of "worst pain" in the clinically significant range and (b) low mean levels of pain suggests that pain, though common, did not persist for long.

Despite the improvements found in prescription practices and pain levels, there was little evidence that parents' adherence to medication instructions has improved. This may indicate that it is the addition of codeine to treatment regimens that reduced pain, rather than the improvement in instructions given to parents. Parents continued to undertreat their children for pain, at levels comparable to previous studies (Fell et al., 1988; Finley et al., 1996; Kokki & Ahonen, 1997; Kotiniemi et al., 1997; Munro et al., 1999; Sutters & Miaskowski, 1997; Warnock & Lander, 1998).

For instance, on the day after surgery, 11% of children judged by their parents to be in clinically significant pain were given no medication at all. Another 34% were given 1 to 3 doses, well below recommendations. These results are similar to those of Finley et al. (1996), in which, on the day after surgery, 13% of children judged to be in clinically significant pain received no medication, and another 39% received 1 to 3 doses.

Undertreatment was most evident in terms of the number of doses given per day rather than the size of doses given. The mean number of doses administered per day ranged from 1.3 to 2.2 over the three day period, whereas the recommended number was 4 to 6 (Penna et al., 1993). The mean size of doses administered was 11.8 mg/kg of acetaminophen and 0.7 mg/kg of codeine, whereas the recommended dosages are 10-15 mg/kg for acetaminophen (Penna et al., 1993) and 0.5 to 1.0 mg/kg (McCaffery & Pasero 1999; Southall, 1997).

Interestingly, recent data suggest that adults also undermedicate their own pain following day surgery (Beauregard et al., 1998). Parents appeared more comfortable providing psychosocial support to their children, using an average of 14 strategies to soothe and distract their children. Psychosocial care can make a large difference in controlling children's pain, and certainly psychosocial methods are well-supported in the treatment of children's acute procedural pain (e.g., Kazak, Penati, Brophy & Himelstein, 1998; Pederson, 1996) and children's chronic pain (Sanders, Shepherd, Cleghorn & Woolford, 1994), but this has rarely been studied in the home setting.

Pain was the most common cause of unscheduled contact with the health care system, resulting in calls or visits to the surgeon, family physician, surgical day care unit or emergency room in 10% of patients. In one case, a child was taken to the emergency room of a suburban hospital because his pain was uncontrollable. There his pain was managed with IV morphine. This is an extreme case, and the vast majority of children undergoing the procedures currently handled on an outpatient basis do not require potent opioids such as morphine. However, it is worth noting that these medications are available to children recovering from surgery as inpatients, but not to children recovering from surgery as outpatients. The controls necessary to supervise the administration of these stronger medications at home are much more complicated for providers to manage.

Despite the relatively common occurrence of post-operative pain, parents expressed high levels of satisfaction with day care surgery in general and pain management in particular. Mean ratings approached 9 out of 10 in both categories. This so-called "high pain high satisfaction paradox" (Hester, Miller, Foster & Vojir, 1997) is relatively common in acute pain research (Gordon & Ward, 1995), suggesting that most people view pain as an inevitable consequence of injury and/or medical treatment.

Uncontrolled pain has serious costs. Recent data suggest that postoperative pain slows physical recovery and healing by decreasing immune function and delaying behaviours necessary to recovery, such as eating, drinking, walking, and breathing deeply (Kiecolt-Glaser et al., 1998; Sutters & Miaskowski, 1997). Regression analyses revealed the integral nature of psychological variables to both the experience of pain and its treatment. Although medical variables accounted for a good deal more of the variance in children's pain reports, the emotions, beliefs, and characteristic ways of coping of children and their parents did have a significant effect, and since they can be altered, they may be the keys to improving pain management and ultimately reducing pain.

In school-aged children, more intense pain followed more invasive surgery, and was related to a constellation of analgesic-related variables (more doses of analgesia given, the use of a regional block, the use of local anesthetic), high anxiety, high expectations of pain, and a tendency to cope with pain by acting out and catastrophizing. Across all ages of children studied, parents gave more medication when their children had invasive surgery and high levels of pain, when they expected a lot of pain, and when they were relatively unconcerned about the negative effects of pain medication. In each case, the psychological variables, entered as a block, were significant predictors of pain even after controlling for demographic and medical variables.

Implications for Theory

This study has shown that psychological models of pain are easily generalized to the postoperative setting. The results were entirely consistent with theory. Children's pain was shown to be related to three psychological variables: children's anxiety, expected pain, and coping style.

It was surprising that there was no relation between children's age and gender and the degree of pain expressed. Age and gender effects may have been stronger had an observer's rating of pain been used instead of child self-report. The relationship between such demographic variables and pain may be very sensitive to setting, measure, and type of pain, since the literature is characterized by mixed results.

Children who had more invasive surgeries did indeed report more pain. Anaesthetists were able to estimate the discomfort likely to follow a given procedure with accuracy. Again, caution is warranted regarding the interpretation of this variable, because of the subjective nature of the ratings, and the unproven assumption that they represent the number of pain receptors activated. As for the four variables that referred to medication (the prescription of codeine, the use of a regional block, the use of local anesthetic, and the total number of doses of pain medication given), they were all positively correlated with pain -- although the prescription of codeine and the use of a regional block contributed little predictive power independent of the other variables entered. The positive correlations present a paradox: how could more pain medication and pain management techniques be associated with more pain? However, in the context of the positive correlations between all four of the medication variables and invasiveness, it is probable that children who faced more invasive procedures were more likely to have had more pain *and thus* more pain medication. This provides further support for the statement that parents were medicating in response to pain, rather than adhering to the recommended pre-emptive schedule of pain management.

However, a recent study found more pain following the use of one of the analgesic techniques described above (wound infiltration with local anesthetic or "freezing"; Warnock & Lander, 1998). In this case, the investigators suggested that parents' early administration of analgesics was predictive of their later administration of analgesics. If their children did not feel pain until late evening on the day of surgery, it was harder for parents to overcome various fears about pain medication than it was for children who had been in pain since they awoke in the hospital. It is possible that parents choose a strategy and find it difficult to deviate from it despite later changes in children's pain.

The positive direction of the correlation between pain and the total number of doses of medication administered was also meaningful. This relationship suggested that parents used a de facto *prn* approach, and gave more medication to children who expressed more pain. In support of this conclusion, examination of the subset of children who were never judged to be in pain (all pain ratings were zero) revealed that most received very little pain medication. It was not the case that children who did not report pain were very well medicated. Rather, their parents ceased to give pain medication as soon as their child stopped complaining of pain. This finding is consistent with that of Chambers et al. (1997). Once again, this provides evidence of the discrepancy between nurses' instructions and parents' actions.

Children who were more anxious before their surgery reported more pain after their surgery. Anxiety, an emotional state, is a complex variable. The mechanism through which it increases pain is not entirely known, and may occur through physical means, such as endocrine and immune function (Kiecolt-Glaser et al., 1998) or by increasing attention to pain, making negative thoughts more salient, and interfering with effective coping strategies (Arntz et al., 1991).

Children who expected more pain when interviewed prior to surgery also reported more pain after surgery, as predicted but not shown by Palermo and Drotar (1996). The larger sample size and corresponding increase in statistical power in the present study likely explain the difference in results. Indeed, the univariate correlation between expected pain and actual pain was identical in the two studies. However, when combined with other variables in the regression analysis, expected pain was not a significant independent predictor of actual pain. The relationship between expectations and pain may bear a complex relationship to other variables including coping. Anxiety and expectations could reflect accurate knowledge of the invasiveness of the procedure, but in this study, children's responses were not correlated with anaesthetists' estimates of invasiveness.

Children's own report of their tendency to engage in certain maladaptive coping strategies was positively related to their postoperative pain, consistent with the findings of Reid et al. (1997). However, Reid and his colleagues were only able to identify a relationship between coping and pain when they interviewed children after their surgery. The present study strengthens coping theory by finding the same relationship prospectively.

The current data showed that the more children engaged in emotion-focused avoidance in response to pain (by focusing on anger or fear and expressing these emotions freely) the more pain they felt. These strategies may have kept the children's attention focused on pain, replaced more active problem-solving strategies (such as asking for medication or initiating a relaxing activity), or blocked social support from parents, siblings, and friends. Interestingly enough, many parents confided anecdotally that they felt their children were different from their siblings in terms of their tolerance for pain, portraying response to pain as a long-standing trait. This sense may relate to a characteristic coping style, but it also invokes temperament and personality variables as a possible predictor of pain. Conversely, there may be genetic contributions to pain tolerance independent of other psychological variables.

Psychological variables predict acute and chronic pain in clinical settings (e.g., Jay et al., 1983; Wallander & Varni, 1992), and, in this study, at home. Knowledge of factors influencing parents' decisions to take action and administer pain-relieving medication is more limited. The present study is one of the first in this area. Parents were found to give more medication to boys than to girls. This contrasts with the typical finding that girls express more pain than boys. Examination of the matrix of bivariate correlations suggests an intervening factor: gender was negatively correlated with the invasiveness of surgery ($r=.34$, $p<.001$). Thus the boys in this study tended to have more invasive procedures, probably because the genitourinary procedures performed on boys, such as circumcision and orchidopexy, are particularly invasive and painful (Finley et al., 1996). The central nature of invasiveness in this analysis supports future study of a group of children undergoing a single procedure, despite the increased difficulty of obtaining such a sample.

Parents gave more medication to children who had more invasive procedures. As discussed previously, they also gave more medication to children who reported more pain. Over and above these factors, they were influenced by cognitive variables. They gave more medication when their pre-surgical estimates of pain were higher. Parents' expected pain ratings were correlated with the anaesthetists' ratings of invasiveness, suggesting that one reason for this correlation is accurate knowledge of the degree of tissue damage involved in a given procedure. However, the incremental predictive power of psychological variables over and above medical variables makes it possible to suggest that parents are also influenced by their notion of the "right amount of pain" for a given procedure as well as the actual amount of pain expressed by their child.

Surprisingly, the expected helpfulness of pain medication was not related to the number of doses that parents actually gave. Parents' estimates of how helpful pain medication would be in reducing their children's pain were generally very high, with a mean of 7.9 out of 10. Parents seemed to believe that pain medication was effective, but were deterred from using it by other considerations. This emphasis on the perceived risks of analgesic medication has been described previously (Gedaly-Duff & Ziebarth, 1994; Finley et al., 1996; Forward et al., 1996).

Parents who viewed themselves as soft-hearted and easily distressed by another's suffering (that is, high in empathic concern) did not give more doses of pain medication than those who viewed themselves as more impervious to the troubles of others. Parents who rated themselves as having a greater tendency to see things from another person's point of view did not give more doses of pain medication. However, perspective taking appeared more prominent when considering its unique contribution to the prediction of parents' medication practices. The effect of perspective taking may actually be masked by another variable or variables in the equation, and deserves further study.

Parents who held fewer negative attitudes toward pain medication did give more doses of analgesics. Thus, it appears that perceived barriers to pain management in the form of fears of addiction, tolerance, side effects, and drug abuse dissuade parents from giving pain medication regularly (see also Gedaly-Duff & Ziebarth, 1994; Finley et al., 1996; Forward et al., 1996). Parents may also view the use of medication as the loss of an opportunity for their child to use independence and toughness in overcoming pain, as mentioned by Forward and her colleagues (1996).

These data provide a valuable step forward in understanding the predictors of parents' analgesic administration but more research must be done before a true model can be built. In the meantime, rudimentary models of children's pain and parent's administration of pain medication are presented in Figures 3 and 4, on page 65 and 66, respectively. For simplicity's sake, these models are limited to psychological constructs. These models include both variables that were measured in this study (those shown in solid boxes) and those that were not measured but are presumed to be latent (those shown in dotted boxes). This model is consistent with, but more specific than, biopsychosocial models of pediatric pain (McGrath, 1990; McGrath & McAlpine, 1993; Zeltzer et al., 1992) and adherence models (Becker et al., 1977; Fishbein & Ajzen, 1975; Ajzen & Madden, 1986), and integrates theory from the two fields. These models could provide the basis for productive path analysis studies or intervention studies.

The models could also be considered a partial elaboration of the Communication Model developed by Craig et al. (1996). Figure 3 shows the preliminary conceptual model of the factors that cause and maintain children's pain, or what happens within the Experience phase of the Communication Model. In Figure 3, intrinsic factors such as temperament, formative factors such as learning history, and situational factors such as the nature of the pain stimulus are thought to influence a set of psychological processes that are tightly linked: anxiety, expectations of severe pain, and maladaptive coping. These processes are considered the affective, cognitive and behavioural components of a negative response to pain or the prospect of pain. The positive relationship between these processes and the child's perceptions of pain is hypothesized to be mediated by attentional focus, as demonstrated in the work of Arntz et al. (1991). That is, anxiety, expectations of severe pain, and a catastrophizing, externalizing coping style may keep the child's attention riveted on their perceptions of pain. Pain then causes further anxiety, confirms expectations of pain, and exacerbates maladaptive coping, which is most

Figure 3. Preliminary Conceptual Model of Children's Pain

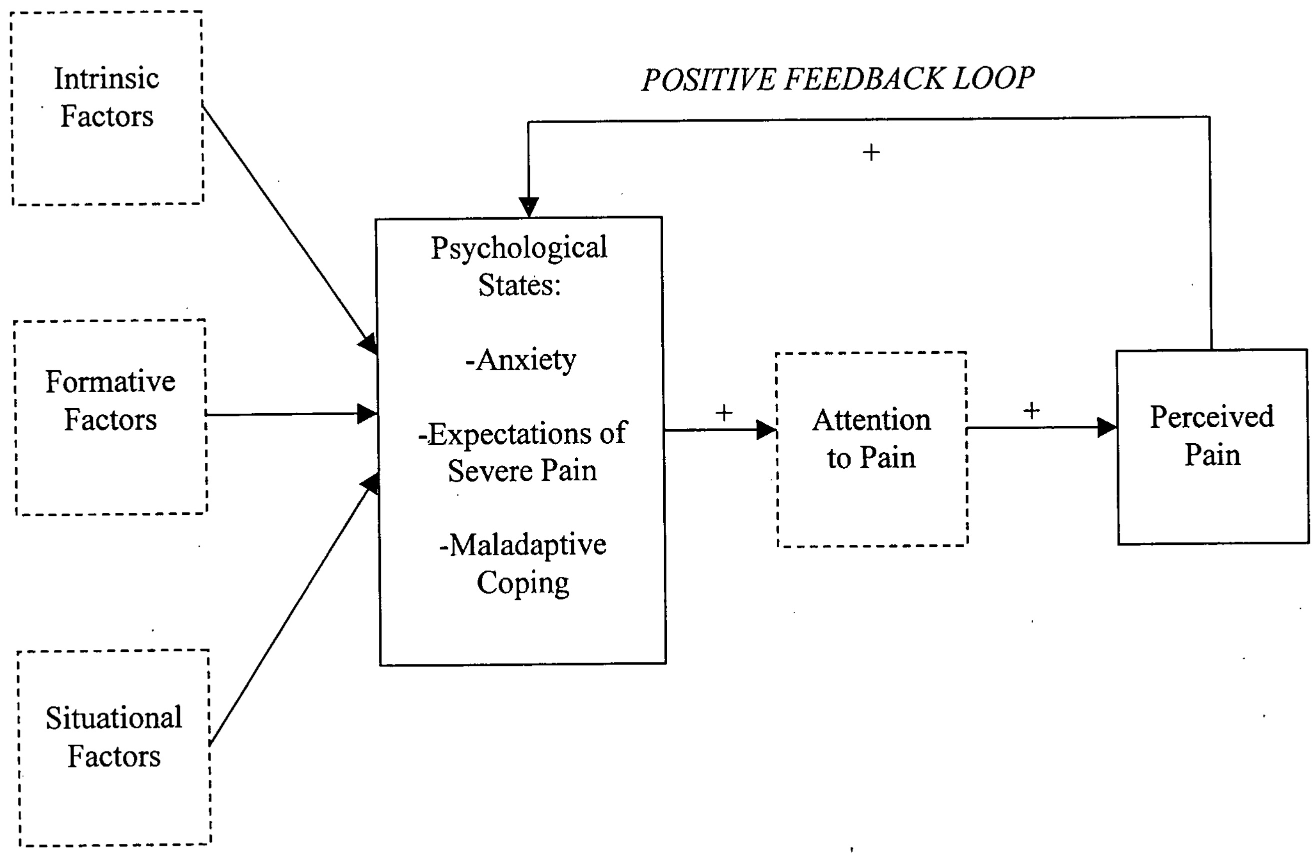
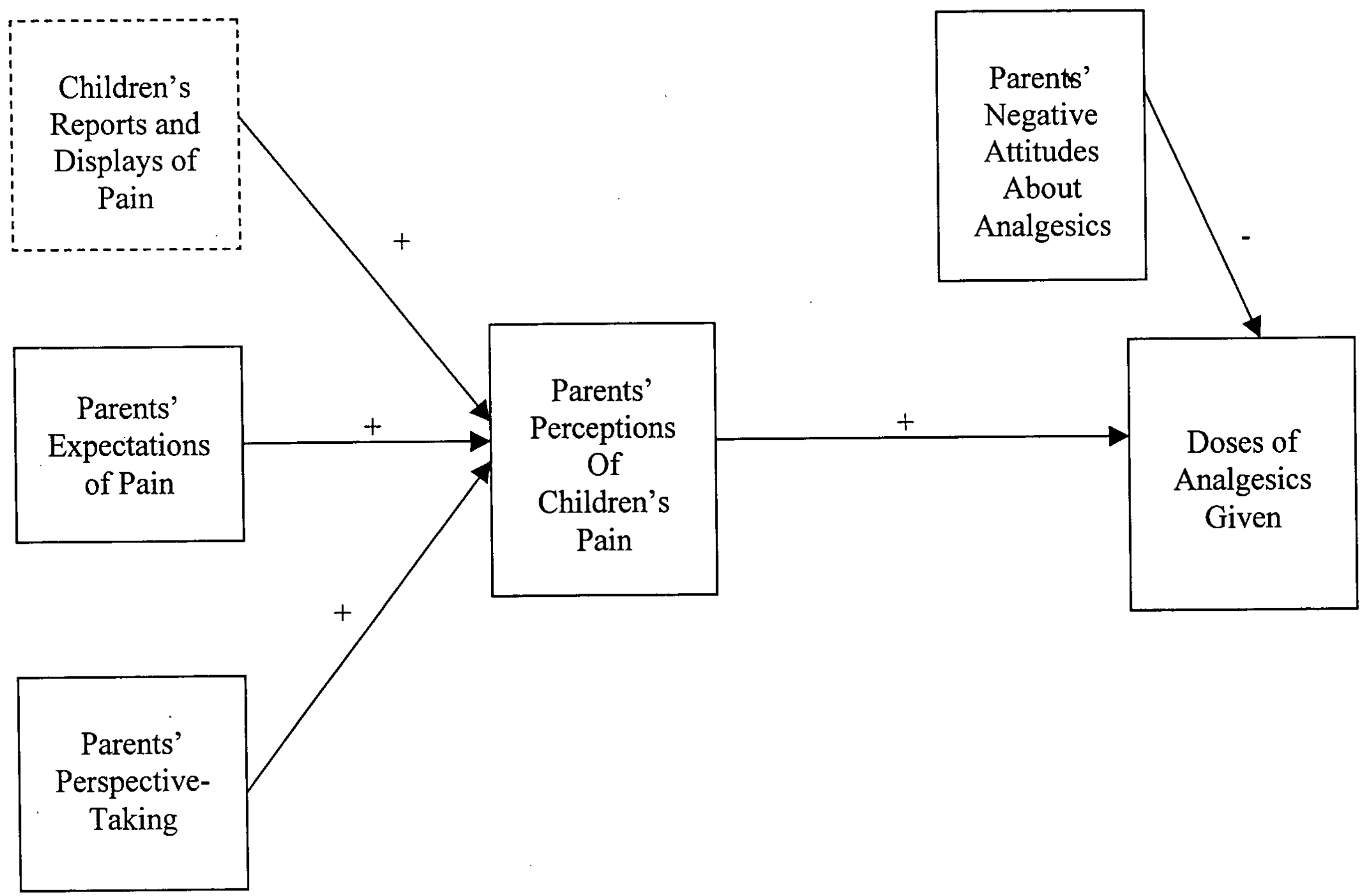


Figure 4. Preliminary Conceptual Model of Parents' Administration of Analgesics



prominent under severe stress. This results in a positive feedback loop, a formulation which is very similar to Clark's cognitive-behavioural theory of panic (19xx). Note that the results of the present study confirm only the positive relationship between the three psychological states and pain, and further research will be necessary to confirm or disprove this model.

Figure 4 represents the Assessment and Action phases of the Communication Model. Within the Assessment phase, three factors influence parents' conclusions regarding their child's pain: how much pain the child is complaining of and/or displaying in pain behaviour, how much pain they expected the child to have based on prior knowledge of the surgical procedure and their child's individual style, and their ability/tendency to try to see things from another's perspective. Conclusions that the child is experiencing significant pain are associated with a willingness to give more analgesics. The mediating role of perceptions of children's pain is proposed because these three processes are of interest only in so far as they predispose the parent to make the judgment that the child is in pain. If a parent did not believe their child's report, expected their child to have pain but later concluded that they did not, or made an effort to see things from their child's point of view but concluded that their child was merely cranky, he or she would not be likely to administer an analgesic medication. Within the action phase, negative attitudes likely compete with conclusions about pain level to determine whether or not the need for analgesia outweighs the feared risks or side effects of analgesia, resulting in a decision to give or not give pain medication. The present data set supports the negative association between attitudes and doses given, and shows relationships between each of the other variables and doses given. The mediating role of parents' perceptions of their children's pain is more speculative.

Implications for Practice

Humanitarian concerns dictate that pain and suffering should be relieved whenever possible. On a practical level, there is growing evidence that pain interferes with the physical process of healing (Kiecolt-Glaser et al., 1998). In pediatric populations, higher levels of pain have been associated with poorer sleep, poorer oral fluid intake, and both short and long-term behavioural problems (Kotiniemi, Ryhanen & Moilanen, 1997; Sutters & Miaskowski, 1997). The following recommendations are offered for alleviating pain and improving parents' medication practices.

The relationship between anxiety, expected pain, coping style, and post-operative pain strongly supports the use of presurgical preparation programs such as those described by Ellerton and Merriam (1994), and Lynch (1994). Although the size of the correlation was not large in comparison with medical variables, psychological responses to the threat of surgery are a much more plausible target for change. In both adult and child populations, presurgical preparation programs have been shown to result in significant improvements in post-operative pain and physical recovery (Ellerton & Merriam, 1994; Kiecolt-Glaser et al., 1998; Lynch, 1994).

The role of expected pain brings up a slightly more complicated issue. Children who expected more pain did indeed report more pain, suggesting that discomfort be minimized when preparing children for their procedures. However, children who are undergoing bilateral ear piercing and underpredict pain when the first ear is pierced have been found to show increased pain and anxiety when the second ear is pierced (von Baeyer, Carlson & Webb, 1997). This is consistent with clinical experience with children undergoing various medical procedures, which suggests that children are quick to notice any discrepancy between what they are told ("just a tickle") and the actual outcome. They generally respond with anger and growing distrust of medical professionals. Furthermore, parents who do not expect pain are likely to underuse pain medication.

The best course of action is probably to provide children and their families with accurate estimates of the prevalence of pain, based on the results of studies such as the present one. However, an effort should be made to emphasize the positives and the controllability of the pain. For instance, one might say "Sometimes it doesn't hurt much but sometimes it does. If it does hurt, you can make it better by taking your pain medicine and by trying some of these ideas...." Children could then be introduced to various relaxation, distraction, and problem-solving approaches. Some excellent instructional books are available on the subject, such as Leora Kuttner's (1996) "A Child in Pain."

A striking paradox in this study was the co-occurrence of uniformly high satisfaction levels whether or not children experienced significant levels of pain. This finding has occurred in other areas of pain research (Gordon & Ward, 1995). On the whole, the general public appears to believe that pain is an inevitable consequence of surgery, and seems unaware that recovery free of clinically significant pain is either feasible or appropriate. Pain researchers continue to have a responsibility to distribute their results to the public through pamphlets, books, and responsible media presentations.

Parents' negative attitudes toward analgesic medication were related to their dosing practices, suggesting that there is still a role for improving parent education in this area. Other researchers (Chambers et al., 1997) have found that the provision of a booklet on general approaches to pain management was not sufficient to change parents' behaviours. Effective education is likely to require one-on-one contact between parents and health professionals, an interactive exchange, and information specific to recovery from day surgery. That is, it is probably necessary to ask parents directly about their perceptions of the benefits and barriers to the administration of pain medication, emphasize the contribution of comfort to physical recovery (Gordon & Ward, 1995), and clear up any misconceptions regarding the development of tolerance, addiction, and so on. McCaffery & Pasero (1999) provide an excellent discussion of educating families who fear addiction to pain medication. This would require an increase in the amount of nursing time devoted to pre-discharge teaching. A well-controlled study of the benefits of this time investment could be particularly valuable in making the case for such intervention.

In addition to the quantitative results of this study, a number of anecdotal observations suggested a need for minor changes to current practice. For instance, printed materials given to parents generally do not use the word "pain," but refer to the management of "discomfort." Many of the parents in this study did not see through this euphemism, and were unaware that they had received any printed information on pain management. Parents would likely benefit from more straightforward information regarding the recommended schedule and dosage of analgesics. This may be most effective if made as specific as possible: e.g., "Give 5 ml. of Children's Liquid Tylenol Elixir™ at 6:00 p.m. and 10:00 p.m.," rather than, "Give Tylenol™ as recommended on the bottle every 4 hours." Provision of an explicit medication schedule has been found to improve medication adherence with elderly patients (Esposito, 1995).

The following suggestions may help nurses further refine their teaching practices. Small differences in wording ("you should give Tylenol™ every 4 hours" versus "you can give Tylenol™ every 4 hours") might make a substantial difference in parents' recall of instructions. It was also observed that parents were not always told how long to continue the medication regimen and this may have influenced their management practices. Finally, when children are given a prescription for acetaminophen with codeine, it is important that parents be aware that if they do encounter side effects, they should switch to regular acetaminophen rather than discontinuing medication altogether.

Some parents made anecdotal remarks that suggested barriers not addressed quantitatively in this study. For instance, several medication diaries were returned with the notation, "He won't take the pills!" or "She didn't want any more!" Children sometimes refuse to take medication, particularly if it is unpleasant to the taste or in tablet form. It may be helpful to provide a written handout on tips for getting children to take analgesic medication. The recommendations provided by McGrath, Finley & Turner (1992) provide useful suggestions on encouraging children to take medication.

Some parents also expressed the belief that "pain slows him down - if he didn't have any pain he'd be swinging from the chandelier and tearing his stitches out." Although it has been suggested that part of the evolutionary purpose of pain is to motivate rest and inactivity in the interests of recuperation (Bolles and Fanselow, 1980; Wall, 1979), children are likely to be suffering from the after effects of general anesthesia and be tired and queasy whether or not they have pain. Furthermore, it seems inappropriate to use pain as an alternative to setting appropriate limits on behaviour. It may be necessary to approach this issue directly with parents and help them problem-solve as to how to keep their children settled and quiet.

<u>Limitations of the Study</u>

Interpretation of these results should be tempered by several methodological weaknesses. Ideally, future studies can address and compensate for these difficulties. Perhaps the most salient concern is the representativeness of the sample. Only 57% of the families approached agreed to participate. The parents who did not agree tended to have an older child having a less invasive surgical procedure than those who did agree to take part. Of those who enrolled in the study, 74% returned completed diaries. The parents who did not complete the protocol were more likely to be lower in SES and have a native language other than English. In all, this study reflects less than half the population approached. The analyses on "non-consenters" and "non-completers" does suggest that one reason parents and children eliminated themselves from the sample was the number and complexity of the measures to be completed. The study did require more effort from families with older children (since the children had to do self-report measures) and a lower level of education and a lesser level of familiarity with English could have made enrollment in the study more intimidating. As a result, the study would be complemented by future research involving fewer and faster measures but appealing to a larger segment of the population.

This study was also open to reactive effects. Parents may have treated their children's pain differently when they knew they had to record their actions. They may have overestimated their adherence in completing medication records, or underestimated their child's pain or their attitudes toward analgesics to justify actions they had already taken. Children's pain may have been altered by the act of logging it in a diary. The independent variables of anxiety, expected pain, and coping, and the dependent variable of pain were all child self-report measures related to negative emotional states. It remains a possibility that the tendency to experience negative emotional states is confounded with the willingness to report them, i.e., a bias in response style rather than a true relationship among the constructs. Unfortunately, it is difficult to measure subjective psychological constructs without risking some degree of reactive effects. These may be lessened by including multimodal assessment wherever possible. For example, physiological measures of anxiety are available, as are behavioural measures of pain.

In interpreting the predictive analyses, it is also necessary to remember that, due to ethical and methodological concerns about reactive effects, it was not possible to administer the Attitudes to Pain Medication Scale prospectively. Similarly, ratings of pain and of dosage were intertwined in time, and are not predictors of one another in the temporal sense. All other variables were recorded preoperatively, making conclusions slightly less ambiguous.

Descriptive data on the degree of pain and on parents' medication practices are likely to vary depending on the types of surgical procedures. Since this study was based in part on a convenience sample, and did not include common procedures such as tonsillectomies and myringotomies, the absolute levels of pain and of doses administered may not be representative of the entire population of children undergoing day surgery. However, there is no obvious reason for the *processes* by which psychological variables affect pain and dosage to differ from the general population. It should also be mentioned that this study excluded children who had major surgery and stayed overnight in the hospital, but were discharged home the next day while still extremely vulnerable to pain and requiring analgesic medication. It is not known whether this population experiences similar levels of pain and undermedication, and this is an important area for study. A final caveat concerns the Canadian setting of this study. There are differences between the United States and Canada in the price and availability of some of the medications concerned (i.e., Tylenol #1 ™ and its equivalents, recommended for a small percentage of the children in this study, are available over the counter in Canada but require a prescription in the United States). Such differences may limit the generalizability of these results to American populations. Differences would be expected to lead to more pain and undermedication in the U.S.

Suggestions for Future Research

Several interesting projects arise naturally out of these results. The accumulation of known relationships between psychological variables and pain has provided justification for biopsychosocial models of pain. However, it is still unclear how psychological variables cluster together and interact in affecting pain, and which are the most important foci for research and intervention. This current state of the field suggests a need for integrative theory. The area also seems appropriate for structural equation modeling approaches.

In contrast, very little is known about the factors affecting parents' medication practices. Research is needed with respect to other predictors, and in terms of the similarities and differences between factors predicting adherence in other situations (for instance, giving children an explicitly curative medication rather than symptom-management medication). It would be interesting to know how parents acquire their beliefs and attitudes about pain and pain management, and how they generate an estimate of their child's pain following surgery. Personal experiences, medical knowledge, and familial and cultural influences are likely all part of this process.

The irony of researching pain is that as one's findings spread and affect practice, there is less pain to study. In this study it was necessary to integrate pain ratings over a certain amount of time in order to identify enough pain to predict with statistical certainty. Unfortunately, this results in a blurring of information about the sequence of events, the "trajectory" of poor pain management. For instance, do parents adhere to guidelines once their child has experienced a significant degree of pain or do they still try to "stretch" the interval between doses or use an ongoing *prn* strategy? This is an ideal topic for a qualitative research approach.

This study is an important contributions to our understanding of the complex and multi-faceted nature of pain, clarifying how psychological processes affect both the experience of pain and its treatment within the parent-child dyad. As well, the study of this area can provide important recommendations for improving the clinical management of postoperative pain following day surgery. It is hoped that eventually children will recover from routine surgery without unduly distressing pain, and that achieving pain control during recovery will foster increased personal power in children and their parents.

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Appendix I

Consent Forms

Participant Number ________

Department of Psychology
2136 West Mall
Vancouver, B.C. Canada V6T 1Z4
Tel: (604) 822-2755
Fax: (604) 822-6923

Family Management of Pain after Discharge in Pediatric Day Surgery Patients

Investigators: Christine Lilley, MA, Carolyne Montgomery, MD, Colleen Court, RN, Kenneth D. Craig, PhD, Elizabeth Huntsman, PhD, and Susan Bennett, PhD

Departments of Psychology, Anaesthesia and Nursing at the University of British Columbia and British Columbia's Children's Hospital

Form A: Children aged 2 to 5

Children often go home from the hospital the same day they have an operation. This means that their parents have to help them deal with any pain they may feel. We want to find out whether children have pain after their operations and how parents deal with this pain. This will help us decide what the hospital can do to assist parents and make children feel better.

Christine Lilley, a graduate student in the Department of Psychology at U.B.C., is conducting this study as a graduate thesis. Dr. Kenneth Craig is her faculty supervisor.

If you agree to be in the study, we will ask you to fill out some forms. While your child is in the operating room, we will ask you about your family and about other medical experiences your child has had in the past. We will also ask for phone numbers where we can reach you on the first and seventh day after surgery. Then we will ask you to rate your own feelings about the operation and describe how you help your child with pain.

We will give you a pain diary and a medicine record to take home. These are for the day of surgery and the first two days after surgery. The pain diary is for rating your child's pain and distress four times each day: at breakfast, lunch, supper and bedtime. The medicine record is for recording the time, type and amount of any pain medicine that you give your child.

We will phone you on the day after surgery to see if you have any questions. We will also phone on the seventh day after surgery and ask general questions about how your child is doing and how you feel about day surgery. We will then ask you detailed questions about how you feel about pain medicine and how you helped your child to feel better. The study will take about two and a half hours of your time in total, including filling out forms at home and answering questions over the phone.

We are also asking for your permission to look at your child's medical chart. We will not make any part of your child's chart public. We want to record these facts:
a) type of operation
b) time of operation and time you and your child leave the hospital
c) medicines given
d) whether you are present when your child is anaesthetized and as your child recovers
e) nurses' pain ratings from the recovery room and day care unit
f) whether your child vomits
g) time at which your child first takes liquids and time of first void
h) any instructions you are given for pain management.

Being in this study has no direct benefits to you or your child, but it should not have any harmful effects. Being in this study will not change your child's treatment at British Columbia's Children's Hospital in any way, and it will not interfere with your child's care. You may refuse to answer any question, you may quit the study at any time, or you may decide not to take part without affecting your child's care at the hospital. We will keep the information you give strictly confidential. We will code all forms with numbers; your or your child's name will only appear on the consent form. We will keep all data in a locked filing cabinet at the University of British Columbia. When we publish or present the research, we will use averaged, group data. We will not identify you or your child in any way. We will send you a letter at the end of this study to let you know what we have found.

If you wish more information now or later, you can call Ms. Christine Lilley, research coordinator, at 822-5280 or Dr. Ken Craig, Department of Psychology at 822-3948.

If you have any concerns about your rights or treatment as a research participant, you may contact Dr. Richard Spratley, Director of the U.B.C. Office of Research Services and Administration, at 822-8598.

Date ______________________________

Name of Child ______________________

Name of Parent _____________________

_____ I agree to take part in the research described above, which involves answering questions and keeping records of how my child feels after surgery and what I do to help my child feel better. All my questions have been answered. I have kept a copy of this consent form for my personal records.

_____ I do not agree to take part in the research described above.

______________________   ______________________
signature of parent   signature of witness

Participant Number ______

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Departments of Psychology, Anaesthesia and Nursing at the University of British Columbia and British Columbia's Children's Hospital

Form B: Children aged 6 to 12

Children often go home from the hospital the same day they have an operation. This means that their parents have to help them deal with any pain they may feel. We want to find out whether children have pain after their operations and how parents deal with this pain. This will help us decide what the hospital can do to assist parents and make children feel better.

Christine Lilley, a graduate student in the Department of Psychology at U.B.C., is conducting this study as a graduate thesis. Dr. Kenneth Craig is her faculty supervisor.

If you agree to be in the study, we will ask you and your child to fill out some forms. Before the operation, we will ask your child about his or her feelings and thoughts about the operation and her or his plans for coping with pain. This should take about 12 minutes. While your child is in the operating room, we will ask you about your family and about other medical experiences your child has had in the past. We will also ask for phone numbers where we can reach you on the first and seventh day after surgery. Then we will ask you to rate your own feelings about the operation and describe how you help your child with pain.

We will give you a pain diary and a medicine record to take home. These are for the day of surgery and the first two days after surgery. The pain diary is for you and your child to rate your child's pain and distress four times each day: at breakfast, lunch, supper and bedtime. The medicine record is for keeping track of the time, type and amount of any pain medicine that you give your child.

We will phone you on the day after surgery to see if you have any questions. We will also phone on the seventh day after surgery and ask general questions about how your child is doing, how you feel about day surgery. Then we will ask you detailed questions about how you feel about pain medicine and how you helped your child to feel better. We will ask your child about how he or she coped with pain. The study will take about two and a half hours of your time in total, including filling out forms at home and answering questions over the phone.

We are also asking for your permission to look at your child's medical chart. We will not make any part of your child's chart public. We want to record these facts:
a) type of operation
b) time of operation and time you and your child leave the hospital
c) medicines given
d) whether you are present when your child is anaesthetized and as your child recovers
e) nurses' pain ratings from the recovery room and day care unit
f) whether your child vomits
g) time at which your child first takes liquids and time of first void
h) any instructions you are given for pain management.

Being in this study has no direct benefits to you or your child, but it should not have any harmful effects. Being in this study will not change your child's treatment at British Columbia's Children's Hospital in any way, and it will not interfere with your child's care. You may refuse to answer any question, you may quit the study at any time, or you may decide not to take part without affecting your child's care at the hospital. We will keep the information you give strictly confidential. We will code all forms with numbers; your or your child's name will only appear on the consent form. We will keep all data in a locked filing cabinet at the University of British Columbia. When we publish or present the research, we will use averaged, group data. We will not identify you or your child in any way. We will send you a letter at the end of this study to let you know what we have found.

If you wish more information now or later, you can call Ms. Christine Lilley, research coordinator, at 822-5280 or Dr. Ken Craig, Department of Psychology at 822-3948.

If you have any concerns about your rights or treatment as a research participant, you may contact Dr. Richard Spratley, Director of the U.B.C. Office of Research Services and Administration, at 822-8598.

To be filled out by parent:

Date ______________________________

Name of Child ______________________

Name of Parent ______________________

_____ I agree to take part in the research described above, which involves answering questions and keeping records of how my child feels after surgery and what I do to help my child feel better. All my questions have been answered. I have kept a copy of this consent form for my personal records.

_____ I do not agree to take part in the research described above.

________________________ ________________________

signature of parent signature of witness

To be filled out by child:

______ I understand that I will answer questions about my operation and how I feel after I go home.

____
signature of child

Appendix II

Child Report of Anxiety and Expectations

1) How anxious or nervous are you about your surgery?

10 Really anxious or nervous
9
8
7
6
5
4
3
2
1
0 Not anxious or nervous

2) How much pain do you think you will have from your surgery?

10 The worst possible pain
9
8
7
6
5
4
3
2
1
0 No pain

3) How helpful do you think pain medicine will be for making your pain feel better?

10 Really helpful
9
8
7
6
5
4
3
2
1
0 Not helpful at all

Appendix III

Parent Report of Anxiety and Expectations

Participant Number _____

1) How anxious or nervous is your child about his or her surgery?

10 Really anxious or nervous
9
8
7
6
5
4
3
2
1
0 Not anxious or nervous

2) How anxious or nervous are you about your child's surgery?

10 Really anxious or nervous
9
8
7
6
5
4
3
2
1
0 Not anxious or nervous

3) How much pain do you think your child will have from her or his surgery?

16 The worst possible pain
9
8
7
6
5
4
3
2
1
0 No pain

Participant Number _____

4) How helpful do you think pain medicine will be for making your child's pain feel better?

10 Really helpful
9
8
7
6
5
4
3
2
1
0 Not helpful at all

5) Have you ever had surgery? ☐ Yes ☐ No

5a. If so, how much pain did you have from your surgery?

10 The worst possible pain
9
8
7
6
5
4
3
2
1
0 No pain

5b. How helpful did you find pain medicine following your own surgery?

10 Really helpful
9
8
7
6
5
4
3
2
1
0 Not helpful at all

Appendix IV

Psychosocial Comfort Scale

Psychosocial Comfort Measures

These questions are about things that you may or may not have done to help your child feel less pain after his or her surgery. Please circle the answer that describes how frequently you used each of these strategies.

1) How frequently did you use heat or cold packs?

Never	About once a day	Several times a day	About once an hour	More than once an hour

2) How frequently did you help your child to use deep breathing or rhythmic breathing strategies?

Never	About once a day	Several times a day	About once an hour	More than once an hour

3) How frequently did you help your child to use relaxation strategies?

Never	About once a day	Several times a day	About once an hour	More than once an hour

4) How frequently did you use stroking, rubbing or massage?

Never	About once a day	Several times a day	About once an hour	More than once an hour

5) How frequently did you rock your child?

Never	About once a day	Several times a day	About once an hour	More than once an hour

6) How frequently did you hold and/or cuddle your child?

Never	About once a day	Several times a day	About once an hour	More than once an hour

7) How frequently did you encourage your child to talk about a special place or activity?

Never	About once a day	Several times a day	About once an hour	More than once an hour

8) How frequently did you encourage your child to think about other pleasant things?

Never	About once a day	Several times a day	About once an hour	More than once an hour

9) How frequently did you help your child to use his or her imagination in other ways?

Never	About once a day	Several times a day	About once an hour	More than once an hour

10) How frequently did you help your child to find a comfortable position?

Never	About once a day	Several times a day	About once an hour	More than once an hour

11) How frequently did you talk softly or soothingly to your child?

Never	About once a day	Several times a day	About once an hour	More than once an hour

12) How frequently did you sing to your child?

Never	About once a day	Several times a day	About once an hour	More than once an hour

13) How frequently did you explain how the body works and/or why the child has pain?

Never	About once a day	Several times a day	About once an hour	More than once an hour

14) How frequently did you offer your child a pacifier?

Never	About once a day	Several times a day	About once an hour	More than once an hour

15) How frequently did you encourage your child to play with friends?

Never	About once a day	Several times a day	About once an hour	More than once an hour

16) How frequently did you encourage your child to play with toys?

Never	About once a day	Several times a day	About once an hour	More than once an hour

17) How frequently did you read books with your child or encourage your child to read?

Never	About once a day	Several times a day	About once an hour	More than once an hour

18) How frequently did you encourage your child to listen to music?

Never	About once a day	Several times a day	About once an hour	More than once an hour

19) How frequently did you encourage your child to watch TV?

Never	About once a day	Several times a day	About once an hour	More than once an hour

20) How frequently did you encourage your child to play video games?

Never	About once a day	Several times a day	About once an hour	More than once an hour

21) How frequently did you tell stories to your child?

Never	About once a day	Several times a day	About once an hour	More than once an hour

22) How frequently did you play games with your child?

Never	About once a day	Several times a day	About once an hour	More than once an hour

23) Alternative/Complementary Treatment Techniques
We are also interested in what some people call alternative medicine or complementary medicine, which means any treatment that is different from what is used in traditional Western medicine. These can be family remedies or treatments from other cultures.
Did you use any of these methods to help your child feel better?

Please describe each of the methods that you used on these lines.

1) ____

How frequently did you use this method?

Never | About once a day | Several times a day | About once an hour | More than once an hour

2) ____

How frequently did you use this method?

Never | About once a day | Several times a day | About once an hour | More than once an hour

3) ____

How frequently did you use this method?

Never | About once a day | Several times a day | About once an hour | More than once an hour

4) ____

How frequently did you use this method?

Never | About once a day | Several times a day | About once an hour | More than once an hour

24) Other

Were there any other things you did to help your child manage his or her pain?

Please describe each of the other methods that you used on these lines.

1) ______________________________

How frequently did you use this method?

Never	About once a day	Several times a day	About once an hour	More than once an hour

2) ______________________________

How frequently did you use this method?

Never	About once a day	Several times a day	About once an hour	More than once an hour

3) ______________________________

How frequently did you use this method?

Never	About once a day	Several times a day	About once an hour	More than once an hour

4) ______________________________

How frequently did you use this method?

Never	About once a day	Several times a day	About once an hour	More than once an hour