

Children's pain, largely ignored by re-searchers and authors of pediatric nursing textbooks in the first half of this century, finally has been recognized as a phenomenon that must be described, prevented when possible, and relieved to the fullest extent when prevention is not possible. Pain for children, as for adults, is multidimensional with physiological, sensory, affective, cognitive, behavioral, and cultural dimensions. This chapter addresses pain in children and adolescents age 3-18 years of age, including prevalence, how pain is experienced and described by children and adolescents, multidimensional assessment techniques, and management strategies.

## State of the Science

### *Prevalence*

That children and adolescents experience pain with intensity similar to that of adults is no longer disputed. More than 50 articles summarized by Goodman and McGrath (1991) in a review of the epidemiology of pain in children and adolescents gave some insight as to the incidence of pain in specific populations in clinical and nonclinical settings. Although Mather and Mackie (1983) addressed the incidence of postoperative pain, most studies of the prevalence of pain data addressed one or more specific conditions, i.e., headache, stomachache, dysmenorrhea, cancer, and limb pain. Headache has received the greatest attention, but acute pain, relatively little.

Other data on prevalence of pain were found in studies where the major purpose was not documentation of pain. Examples are the research of Hester, Foster, and Kristensen (1990) and Savedra, Tesler, Holzemer, Wilkie, and Ward (1990) on evaluation of pain assessment tools with inpatient populations; and research of Tesler, Ward, Savedra, Wegner, and Gibbons' (1983) with nonhospitalized and hospitalized school-aged children. The latter investigators reported that in school classrooms 28 (25%) of the 114 9-12 year-old children reported being in pain while answering the questionnaire.

Procedure-related or iatrogenic pain has received minimal attention. Wong and Baker (1988) reported that 3-18 year-old children rated procedures from 2.0 for IV removals and finger sticks to 4.7 for chest tube insertions on a 0-5 point scale; 0 equaled "no pain" and 5 equaled "worst pain." The practice of premedication for these procedures is sporadic. Distress caused by blood sampling was reported as 36-64% for children 3-6 years of age (n = 103); 52% of the children 7-17 years of age reported pain (n = 93) (Fradet, McGrath, Kay, Adams, & Luke, 1990).

Limitations in design, data collection strategies, and criteria for defining pain make comparisons of findings difficult. Missing is a comprehensive analysis of pain problems in childhood and adolescence (Goodman & McGrath, 1991). More important, health care providers do not know if the dissemination of information on pain assessment and management has altered the prevalence of pain. Also missing are data related to pain prevalence in different socio-economic or cultural groups such as Afro-Americans, Asians, and Hispanics.

### *Children's and Adolescents' Views of the Dimensions of the Pain Experience*

A fair amount of research has been directed specifically toward understanding how children view their pain experience and how they cope with it (Abu-Saad 1984a, 1984b, 1984c, 1984d; Fowler-Kerry, 1990; Hester, 1989; Jerrett, 1985; Savedra, Gibbons, Tesler, Ward, & Wegner, 1982; Savedra, Tesler, Ward, & Wegner, 1988; Schultz, 1971; Scott, 1978; Tesler, Wegner, Savedra, Gibbons, & Ward, 1981). Those who have sought to understand the phenomenon believe that knowledge of children's views is critical to planning and implementing nursing care (Fowler-Kerry, 1990). Data regarding children's views of pain are available from several sources; i.e., comprehensive pain studies (Ross & Ross, 1982); studies directed to stress related to hospitalization and procedural pain (Broome, 1986; Fradet et al., 1990; Jay, Ozolin, Elliott, & Caldwell, 1983; Katz, Kellerman, & Siegel, 1980; Menke, 1981; Stevens, 1986; Weekes & Savedra, 1988); descriptions of pain related to specific diagnosis (Geist, 1989); and children's spontaneous discussions of pain when it is a component of a broader study area (Ross & Ross, 1984). A growing body of literature

has provided information on how children and adolescents describe their pain and feelings through drawings and verbal reports (Jerrett, 1985, 1991; Ross & Ross, 1988; Unruh, McGrath, Cunningham, & Humphreys, 1983).

In 1971, Schultz sought answers from 10 and 11 year-olds in school settings to questions about what things had happened to them to make them feel pain, the feelings they experienced when in pain, and the meaning of pain. These children had no difficulties in responding, and provided graphic answers that highlighted the stressful nature of the pain experience. Eland (1974) asked hospitalized children 4-10 years of age: "Of all the things that have happened to you, what hurt you the worst?" Sixty-five of 119 children indicated their worst pain was "a shot" or "a needle" (Eland & Anderson, 1977). Building on this early research, Savedra et al. (1982, 1988) queried 214 9-12 year-olds and 156 13-17 year-olds in schools and hospitals, and concluded that children can clearly and graphically describe pain. Hospitalized school-age children selected more words that relate to tension, fear, and overall intensity of pain than nonhospitalized children of the same age. With increasing age, pain is associated with mental anguish as well as with trauma and pathology. Abu-Saad (1984a, 1984b, 1984c) expanded this research by examining the answers to several pain questions, with three ethnic populations: Arabic-American, Asian-American, and Latin-American, providing data from a cultural perspective on such issues as causation of pain and feelings when in pain.

Scott (1978) investigated perception of pain in 4-10 year-olds using a projective test to examine synesthetic aspects of pain. Children 4-6 years of age had more clearly differentiated synesthetic perceptions of pain than did older children. The last of the early studies was Jerrett's (1985) exploration of the pain experience of 5-9 year-olds using a combination of drawings and interviews. The drawings of many of the children portrayed pain as internal, personal in nature, and related to their health problems.

Reports of the influence of variables, such as *development* (Gaffney & Dunne, 1986) and *gender* (Lander, Fowler-Kerry, & Hargreaves, 1989), on pain perception suggested that concepts of pain in 5-14 year-olds could correspond to successive stages of cognitive development. No gender differences were found in a sample of 200 4½-6½ year-olds. Broome's (1986) study of the relationship between children's fears and behaviors during a painful event supports the idea that fear is associated with procedural pain and is a greater determinant of expected pain than recalled pain (Lander & Fowler-Kerry, 1991). The finding that most children report that an injection is one of the most threatening

experiences in health care corroborates the research of Ellerton, Caty, and Ritchie (1985) and Menke (1981). Stevens (1986) reported that 38% of a sample of 63 hospitalized adolescents (12-17 years of age) identified needles as a threat and that the most frequently anticipated and reported stressful event during hospitalization was pain. Other research (Fradet et al., 1990) has added to an understanding of children's and adolescents' reactions to blood tests by identifying age and parents' prediction of how upset the child would feel before the blood test as a significant predictor of the observed distress and self-report of pain.

### **Assessment**

Research on the assessment of children's pain began in the 1970s. Because pain is a personal experience, ways were sought to assist verbal children to share their own experience of pain with others. Nurses and psychologists assumed a major role in developing self-report tools that were developmentally appropriate and clinically useful. Assessment of the intensity component of pain received major attention; relatively little research focused on alternative means of assessing pain in children and adolescents when self report is not possible.

### **Self Report Tools: Assessment of the Sensory, Cognitive, and Affective Dimensions**

Current literature describes the development and/or use of tools to assess one or more of the sensory dimensions of pain in children and adolescents. The Eland Color Tool, a body outline to be marked with colored crayons selected to represent levels of pain intensity was used first by 172 children 4-10 years of age to report their pain location and intensity. The body outline is representative of a late preschool/early school-age child, with hair and unisex clothing (Eland & Anderson, 1977). Several researchers (O'Donnell & Curley, 1985; Tesler et al., 1983; Varni, Thompson, & Hanson, 1987) have reported some form of body outline supporting the use of this means to document pain location. Validity of body markings received attention in early studies (Eland & Anderson, 1977; O'Donnell & Curley, 1985). Later, the high validity and reliability of body outline markings on an unclothed, nongender specific outline of 8-17 year-olds (Savedra, Tesler, Holzemer, Wilkie, & Ward, 1989) and 4-7 year-olds (Van Cleve & Savedra, 1993) was established. Predictive validity of the body outline to relate pain location to underlying potential pathology has yet to be established.

There is no dearth of developmentally appropriate tools for measuring pain intensity in children and adolescents. Several tools have been developed for a specific age group with attention to psychometric properties; i.e., Poker Chip Tool (Hester, 1979), Oucher (Beyer, 1984), Word Graphic Rating Scale (Tesler, Savedra, Ward, Holzemer, & Wilkie, 1991), Pain Thermometer (Molsberry, 1979), Pain Ladder (Hay, 1984), Faces Rating Scale (Wong & Baker, 1988), and Children's Pain Inventory (visual analogue scales) (McGrath, de Veber & Hearn, 1985). Several investigators (Abu-Saad & Holzemer, 1981; Abu-Saad, 1984d; 1990; Fowler-Kerry & Lander, 1987; Fowler-Kerry & Ramsay-Lander, 1990; Lander et al., 1989), have provided evidence that school-age children can use adult tools or adaptations of adult scales to report pain intensity. Age appears to influence how well children use the visual analogue scale (VAS). Though it has been used with five year-olds (McGrath, 1990), findings are inconclusive.

Minimal or no information exists on the psychometric properties of many tools used for measuring children's pain intensity. Of the available tools, the Oucher, Poker Chip Tool, and Word Graphic Rating Scale (as part of the Adolescent Pediatric Pain Tool) have received the most extensive testing of validity, reliability, and/or sensitivity (Table 4.1). While the Word Graphic Rating Scale emerged as the scale of choice in a large ethnically diverse sample, the children were able to use the VAS, graded graphic, color and a magnitude estimation scale equally well (Tesler et al., 1991). The Oucher has been adapted for Afro-American and Hispanic children, but the Poker Chip is the only tool that has been translated into another language; i.e., Spanish (Jordan-Marsh, Brown, Watson, & Yoder, 1990).

The pain diary, a tool used to monitor chronic pain, has received little attention. Validity, using inter-rater concordance between parent and child markings, was reported on a headache diary used with 9-17 year-olds (Richardson, McGrath, Cunningham, & Humphreys, 1983). Although discrepancies were common at lower levels of pain, the tool appears to be a viable option for chronic pain conditions.

Research on children's language of pain (Jerrett & Evans, 1986; Abu-Saad, 1990) has been directed toward improved understanding of the quality and/or intensity of children's and adolescents' pain. Findings of researchers in the United States with ethnic populations (Abu-Saad, 1984a, 1984b, 1984c), Canada (Jeans, 1983; Jerrett, 1991; Jerrett & Evans, 1986), Ireland (Gaffney, 1988; Gaffney & Dunne, 1986), and The Netherlands (Abu-Saad, 1984a, 1984b, 1984c) have provided a beginning knowledge with an international perspec-

tive of words children use to describe pain. Researchers have attempted to translate pain words from English into another language.

Little attention has been directed toward identifying word descriptors related to specific diseases or treatments. A series of studies, (Wilkie, Holzemer, Tesler, Ward, Paul, & Savedra, 1990) has produced a word list patterned after the McGill Pain Questionnaire for use with children 8-17 years of age. Words that children in this age range know and use to describe pain have been categorized as sensory, affective, and evaluative. This word list has been included in a multidimensional tool and tested with a postsurgical sample. Varni, Thompson, and Hanson (1987) also have a list of pain descriptors as part of a multidimensional tool tested with children and adolescents who have juvenile rheumatoid arthritis. While data suggest that commonalities exist in words used to describe pain, it is not known to what extent they exist, nor the relationship between age and gender and the language of pain.

Research is in progress to identify effective strategies for assessing the temporal component of pain related to change in patterns over time. A dot matrix format on which children and adolescents 8-17 years of age have plotted pain intensity over a designated period has been reported (Savedra, Tesler, Holzemer, Ward, Wilkie, & Brokaw, 1992).

A facial scale, part of the Children's Pain Inventory (McGrath, de Veber & Hearn, 1985), while specifically designed to assess the affective dimension of pain in children 4-17 years of age, is intended for use with a visual analogue scale (VAS) to assess pain intensity (Table 4.1).

### ***Behavioral Tools: Assessment of Behavioral Dimension***

While numerical scales used by researchers to document pain often are operationally defined in terms of behaviors; i.e., crying and requiring restraint, calm or motionless, the two behavioral tools currently available that focus on pain are Children's Hospital of Eastern Ontario Pain scale (CHEOPS) developed and tested on young children age 1-7 (McGrath, Johnson, Goodman, Schillinger, Dunn, & Chapman, 1985) and the Douleur Enfant Gustave-Roussy (DEGR<sup>®</sup> for 2-6 year-olds (Gauvain-Piquard, Rodary, Rezvani, & Lemerie, 1987; Gauvain-Piquard, Rodary, Francois, Rezvani, Kalifa, Lecuyer, Cosse, & Lesbros, 1991) to measure acute and chronic pain. Three behavioral rating scales have been developed to assess procedural distress: Procedure Behavioral Rating Scale (PBRs) (Katz, Kellerman & Siegel, 1980), Observational Scale of Be-

havioral Distress (OSBD) (Jay & Elliott, 1984, 1986), and Procedure Behavior Checklist (PBCL) (LeBaron & Zeltzer, 1984), and a behavioral check-list to assess postoperative pain in children 9-15 years of age (Abu-Saad & Holzemer, 1981). Data from behavioral scales present problems because behaviors noted may not exclusively reflect pain. Nurse assessments of changes in physiological parameters, patient behaviors, and vocalizations appear to be the most universal methods for assessing pain in children (and adults) and making decisions to medicate them. No generally agreed upon parameters exist for quantifying or qualifying these behaviors, which usually are uniquely defined by each individual nurse.

### **Physiological Tools: Assessment of Physiological Dimension**

While self-report strategies have received the greatest attention in children old enough to communicate verbally, Abu-Saad and Holzemer (1981) examined physiological and behavioral parameters in addition to intensity scale recordings and word descriptors used by 8-12 year-old children following surgery. They reported a clear relationship between vocalization, facial expressions, and body movements and intensity markings on the 10-cm pain scale. Gedaly-Duff (1983), in assessing the effectiveness of a preparation strategy with children age 36 to 90 months undergoing a dental procedure, included Palmar Sweat readings in addition to self-report of intensity. No change in palmar sweating was observed in relation to preparation and a noxious stimulus; however, the linkages between palmar sweating, stress, pain, and development have not been broadly explored (Gedaly-Duff, 1989).

Although the number of studies addressing physiological and behavioral manifestations related to pain in children and adolescents is limited, researchers have reported that nurses consider changes in vital signs, body language, facial expression, and emotional responses when assessing pain and making decisions to medicate (Atchison, Guercio, & Monaco, 1986; Bradshaw & Zeanah, 1986; Burokas, 1985). Hester and associates reported that nurses caring for 169 4-13 year-olds used a variety of cues for rating pain, including verbalization, vocalization, body language, appearance, activity, interaction, physiology, and temperament (Hester & Foster, 1990; Hester, Kristensen, & Foster, 1989). Change in these parameters over time was a critical factor. Measurement of pain via self-report or behavioral tools was not reported as used by nurses. Research to address the impact of using assessment tools is in the early stages.

### **Interventions**

The effective management of children's pain is receiving increasing attention, with research focused on both nonpharmacologic and pharmacologic strategies. The efficacy of innovative approaches, such as patient-controlled analgesia (PCA) and intra-theal and epidural opioids, is being tested. The increasing number of special editions and journal sections devoted to pediatric pain, including management issues, attest to an increasing awareness of the need for information on pain management (*MCN*, 1984; *Pediatric Clinics of North America*, 1989; *Journal of Pain and Symptom Management*, 1989; *Pediatrician*, 1989; *Current Problems in Pediatrics*, 1990; *Pediatric Nursing*, 1990). More than 20 narrative articles addressing pain management have been published in nursing journals since 1980, and twice this many in nonnursing journals, highlighting an increasing awareness of the need for health professionals to effectively assess and manage children's pain. Less attention has been directed toward pain prevention.

In addition to general publications on pediatric pain management, the 1980s also produced articles on the management of pain related to specific disease pathology or circumstances. These articles primarily addressed current practice; examples include pain related to: *juvenile rheumatoid arthritis* (Lovell & Walco, 1989); *sickle cell disease* (Burghardt-Fitzgerald, 1989; Morrison & Vedro, 1989; Scott, 1982; Shapiro, 1989); *burns* (Osgood & Szyfelbein, 1989; Shannon & Berde, 1989); *abdominal pain* (Sperhac, 1989); *headache pain* (Golden, 1987; Lascelles, Cunningham, McGrath, & Sullivan, 1989; McCarthy & Mehegan, 1982; Rapoff, Walsh, & Engle, 1988); *chest pain* (Rowe, Dulberg, Peterson, Vlad, & Li, 1990; Selbst, Ruddy, & Clark, 1990); *hemophilia* (LeBaron & Zeltzer, 1985; Varni, Gilbert, & Dietrich, 1981); and *cancer* (Jay, Elliott, & Varni, 1986; Miser & Miser, 1989; Wofford, 1985). Acknowledgement of the need to prevent and also alleviate pain resulting from injury, surgery, illness, and diagnostic procedures has led to examination of the efficacy of specific analgesics, modes of analgesic delivery, and nonpharmacologic strategies.

### **Pharmacologic Strategies**

Research on pharmacologic management of pain continues to explore new horizons. The studies include drug efficacy studies, method of delivering an analgesic, including patient controlled analgesia (PCA), regional analgesia, nerve blocks, and topical analgesia. Based on an extensive review of the literature, the Agency for Health Care Policy and Research (AHCPR) has released the Clinical Practice Guideline for Acute Pain Management: Operative or Medical Procedures

and Trauma (Acute Pain Management Guideline Panel, 1992). Dosing data for nonsteroidal antiinflammatory drugs (NSAIDs) and opioid analgesics are included as well as principles for managing pain with analgesics.

**Drug efficacy.** Research on the efficacy of analgesics has focused on postoperative pain and addressed pain relief as well as side-effects. Although age range varies widely across studies, the majority are restricted to verbal children but not necessarily to one developmental stage. There are, however, analgesic studies on infants. Some studies have investigated the effectiveness of a single analgesic for relieving pain (Faithfull & Tolhurst-Cleaver, 1987; Harcus, Ward, & Smith, 1980; Maunuksela, Korpela & Olkkola, 1988; Sartori, Gordon, & Darbyshire, 1990; Steg, 1988); others have compared the effectiveness of more than one analgesic (Berde, Holzman, Sethna, Dickerson, & Brustowicz, 1988; Bone & Fell, 1988; Krishnan, Tolhurst-Cleaver, & Kay, 1985; Maunuksela et al., 1988; Moore & Hargreaves, 1985; Ridley, Matthews, & Dixon, 1986; Sfez, LeMapihan, Gaillard, & Rosenblatt, 1990; Wandless, 1987).

Findings generally reported pain control without serious cardiac or respiratory side-effects, but methodologic strategies and often small samples limit comparison of results across studies or interpretation of findings from a given study. A major weakness in many studies relates to the adequacy of the method of assessing pain. More specifically, questions of validity, reliability, and developmental appropriateness of tools used often impose major limitations.

**Route of analgesic administration.** A second category of research addresses questions related to effectiveness of the route of analgesic administration. Investigators have studied a specific route, i.e., *indwelling subcutaneous catheter* (Lavies & Wandless, 1989); *continuous intravenous infusion* (Beasley & Tibballs, 1987; Dillworth & MacKellar, 1987; Lynn, Opheim, & Tyler, 1984, Millar, Rode, & Cywes, 1987); and *rectal suppositories* (Scharli, Brulhart, & Monti, 1990); or compared two routes, i.e., *continuous versus intermittent* (Bray, 1983; Hendrickson, Myre, Johnson, Matlak, Black, & Sullivan, 1990) and *oral versus intramuscular injection* (O'Hara, McGrath, D'Astous, & Vair, 1987).

**Patient controlled analgesia.** A third category of research is concerned with the use of patient controlled analgesia (Brown & Broadman, 1987; Dodd, Wang, & Rauck, 1988; Gaukroger, Tompkins, & Van der Walt, 1989; Gureno & Reisinger, 1991; Rauen & Ho, 1989; Rodgers, Webb, Stergios, & Newman, 1988; Tyler, 1990). Although sample size has been small, some findings have suggested that children as young as 4-5 years

can successfully use this method of analgesia delivery (Means, Allen, Lookabill, & Krishna, 1988; Meretoja, Korpela & Dunkel, 1991). Data related to problems, dissatisfactions, effectiveness, and criteria for patient selection to use PCA, including age, are limited.

**Regional analgesia.** Other research addresses regional analgesia and nerve blocks (Amaranath, Andrish, Gurd, Weiker, & Yoon, 1989; Benlabeled, Ecoffey, Levron, Flaisler, & Gross, 1987; Bramwell, Bullen, & Radford, 1982; Cross & Barrett, 1987; Glenski, Warner, Dawson, & Kaufman, 1984; Jones, Beasley, MacFarlane, Davis, & Hall-Davies, 1984; Krane, Tyler, & Jacobson, 1989; Reid, Harris, Phillips, Barker, Pereira, & Bennett, 1987; Shapiro, Jedeikin, Shalev, & Hoffman, 1984; Tobias, Deshpande, Wetzel, Facker, Maxwell, & Solca, 1990; Warner, Kunkel, Offord, Atchison, & Dawson, 1987). Studies related to regional analgesia including epidural and intrathecal are both retrospective and prospective and examine the effectiveness of specific drugs, including morphine, sufentanil and local anesthetics, specific drug dosage, and/or compare the effectiveness of regional analgesia versus other methods for prolonged drug delivery and analgesia.

While comparison of results is difficult due to variation in methodology, results have suggested that regional anesthesia is effective in preventing and managing early postoperative pain. Drug side-effects while not uncommon and often most disturbing to children, can be managed with close monitoring. Data are lacking on when best to use these modalities and with which children as is information regarding cost effectiveness of various methods of controlling pain in children.

**Topical skin anesthesia.** Relatively little attention has focused on the relief of procedural pain. Eland (1981) and Hagedorn (1990) have examined the efficacy of topical skin anesthetic agents (frigiderm and ethyl chloride) for relieving injection pain. Both studies revealed significant differences in perception of pain with the experimental agent as compared with the standard procedure. Bass, Wormald, McNally, and Rode (1990) reported using a topical anesthesia solution of lignocaine, adrenaline, and cocaine on 100 consecutive patients when skin wounds were sutured. On a 1-4 behavioral assessment scale, with 1 defined as "crying and requiring restraint" and 4 as "calm and motionless", 63 children (mean age 5 years), were judged to have tolerated the procedure well. Clinical trials have investigated the effects of a eutectic mixture of local anesthetic (EMLA) used prior to venipuncture with infants and children (Cooper, Gerrish, Hardwick, & Kay, 1987; Halperin, Koren, Attias, Pellegrini, Greenberg, & Wyss 1989; Maunuksela & Korpela, 1986). All findings indicated a significant reduction in pain perception. Effectiveness of

amethocain preparation in children up to 16 years of age has been reported by Woolfson, McCafferty, and Boston (1990). The short application time is perceived as advantageous for procedural pain.

### **Nonpharmacological Management**

Non-pharmacologic strategies always have been used to relieve children's pain. Comforting measures, reassurance, positioning, rubbing an injured body part, diversion/distraction, and rest have been used by health professionals as well as parents to help children manage pain associated with injury, procedures, or pathology. These strategies for the most part have been used intuitively rather than as a purposeful intervention and often in combination or in conjunction with an analgesic. Recently bio-feedback and relaxation, hypnosis, and cognitive and behavioral techniques have been studied although there are major gaps in knowledge about which strategies are most effective with a given child in a given situation and in what combination.

While cutaneous stimulation, i.e., massage, heat, cold, transcutaneous electrical nerve stimulation (TENS) have been reported as useful strategies for managing pain, data from controlled studies are lacking. The synergistic effect of a nonpharmacologic strategy with an analgesic also has yet to be studied. Studies to evaluate the effectiveness of one or more nonpharmacological strategies vary widely, and have focused on recurrent pain, such as headache or induced, such as procedural pain.

**Recurrent Pain.** Nonpharmacologic strategies, and more specifically relaxation and biofeedback, have been studied primarily in managing headache pain, one of the most frequent recurrent pains among children and adolescents (Kandt & Levine, 1987). A relaxation component of an imagery strategy was reported to be effective in relieving pain associated with migraine (Brown, 1984). Duckro and Cantwell-Simmons (1989) reviewed seven studies of relaxation without biofeedback (Emmen & Passchier, 1987; Larsson, Daleflod, Hankansson, & Melin, 1987; Larsson & Melin, 1986; Larsson, Melin, Lamminen, & Ullstedt, 1988; Olness, MacDonald, & Uden, 1987; Richter, McGrath, Humphreys, Goodman, Firestone, & Keene, 1986; Wisniewski, Genshaft, Mulick, Coury, & Hammer, 1988). Five studies of relaxation with biofeedback have been reviewed (Fentress, Masek, Mehegan, & Benson, 1986; Labbe & Williamson, 1984; Warranch & Keenan, 1985; Werder & Sargent, 1984; Womack, Smith, & Chen, 1988). Both approaches provided decreased headache activity and intensity compared with the controls. Guarnieri and Blanchard (1990) have evaluated home-based thermal biofeedback and reported significant

reduction in headaches. Data of Grazzi, Leone, Frediani, and Bussone (1990) also indicated clinical improvement following a series of biofeedback sessions.

Other recurrent pains with acute episodes such as sickle cell crisis have received little attention related to management via nonpharmacologic strategies. Research is needed to address the still unanswered questions regarding recurrent pain: What is the most potent combination of interventions for pain reduction, short and long term? What is the most appropriate time post-intervention to assess effectiveness? What is the appropriate length of treatment? What is the minimal treatment needed to produce results? What is the long term efficacy?

Study of parental involvement in pain management in general and specifically with non-pharmacologic strategies is in the early stages of development. Pilot studies (Gedaly-Duff, 1990) with children 4-8 years old experiencing pain from day surgery tonsillectomy suggested that parents' perceptions of and responses to illness and pain are critical to the derivation of treatment models for childhood pain.

**Induced pain.** Induced pain from diagnostic tests or therapeutic procedures is most frequently referred to as procedural pain. Three studies of nonpharmacological strategies (Fowler-Kerry & Lander, 1987; Fowler-Kerry & Ramsay-Lander, 1990; Ryan, 1989), which employed taped music as a distractor during immunizations or venipuncture, showed promising results for reducing pain and could be easily employed in a wide range of settings. A verbal versus visual-verbal preparation strategy prior to dental surgery showed no significant differences in self report of pain following a dental procedure (Gedaly-Duff, 1987). Several studies (Hilgard & LeBaron, 1982; Jay, Elliott, Katz, & Siegel, 1987; Katz, Kellerman, & Ellenberg, 1987; Zeltzer & LeBaron, 1982) have examined hypnosis and/or other nonpharmacologic strategies to relieve pain and/or distress associated with bone marrow aspirations and lumbar punctures. Findings suggested that hypnosis is effective in relieving anxiety and cognitive-behavior therapy, as compared with an attention-control situation, significantly lowers behavior distress ratings, pain rating, and pulse rates (Jay, Elliott, Katz & Siegel, 1987). Kuttner (1988) also tested a hypnotic pain reduction technique with 3-6 year olds, in which the child's favorite story became the hypnotic vehicle to create a pleasant imagery involvement. Findings suggested the strategy was more effective than behavioral distraction and standard medical practice in alleviating distress, pain, and anxiety during bone marrow aspirations. Findings from these studies are promising and deserve more rigorous testing.

Bone marrow preparation and lumbar puncture are the procedures most used for testing the effectiveness of nonpharmacologic strategies to reduce pain and distress. The effectiveness of these strategies also has been examined in studies of burn dressing change (Elliott & Olson, 1983; Kavanagh, 1983a, Kavanagh, 1983b; Kavanagh, Lasoff, Eide, Freeman, McEttrick, Dar, Helgerson, Remensnyder, & Kalin, 1991). Kavanagh's research has focused on patient participation in dressing changes and suggested that behavioral distress is less when children are involved in the procedure.

For ethical reasons, experimentally induced pain has not been a major area of study with children and adolescents. An exception is a pilot testing of a cold pressor model with children 6-12 years of age (LeBaron, Zeltzer, & Fanurik, 1989) and subsequent use of the model to test the effectiveness of hypnosis in reducing pain (Zeltzer, Fanurik, & LeBaron, 1989). The feasibility of the cold pressor paradigm was supported.

Many questions remain as to what non-pharmacologic strategies, administered in what manner, for what children, and in what combination are appropriate. Eland's (1989) case presentations of the use of transcutaneous electrical nerve stimulation (TENS) for reducing pain in children with cancer suggests this is a fertile area for investigation.

### ***Nurse's Role in Pain Management***

Nurses play a key role in managing children and adolescents' pain; yet little is known about the decision-making process for pain interventions. Researchers have reported a wide range of variance in the prescribed dose of analgesia (Beyer, DeGood, Ashley, & Russell, 1983; Burokas, 1985; Foster & Hester, 1989; Gadish, Gonzales, & Hayes, 1988; Schnurrer, Marvin, & Heimbach, 1985; Tesler, Savedra, Ward, Holzemer, & Wilkie, 1991). Beyer, Ashley, Russell and DeGood (1984) and Schechter, Allen, and Hanson (1986) reported fewer and less potent drugs ordered for children as compared with adults undergoing a similar surgical procedure. Findings related to analgesia administration showed similarly that children frequently received less than the prescribed dose (Eland, 1974; Foster & Hester, 1989; Lukens, 1982; Tesler et al., 1991).

The frequency of use of nonpharmacologic strategies -- specifically cognitive strategies, such as distraction and guided imagery -- has not been reported. The fact that such strategies are not generally ordered and/or recorded presents a major problem for examining this area of pain management. A major study is in progress (Hester & Foster) to examine the decision-making process of nurses when managing

children's pain. Studies of attitudes toward pain and barriers to effective pain relief also are missing.

A related area of research addresses the relationship between nurses' perceptions and ratings of pain as compared with those of children and adolescents. Powers (1987) reported relatively strong agreement between nurses' rating of children's pain and children's rating of their own pain, while Favaloro and Touzel (1990) reported a moderate relationship between adolescents' and nurses' pain assessment. In the latter study, adolescents perceived that nurses knew how much pain they were experiencing, while nurses expected adolescents to rate the pain higher than the nurses themselves did.

### **Research Needs and Opportunities**

Nursing research on pain in children was pioneered by Eland (1974) who reported findings from a study of 25 children 5-8 years of age hospitalized for surgery. Thirteen of 21 of the children for whom analgesics had been prescribed received no pain medication (Eland, 1974; Eland & Anderson, 1977). Although studies have escalated in the past decade and myths about the existence of pain in children have begun to be dispelled, much still remains to be learned about the prevalence of pain, the trajectory of specific pain experiences, cultural differences in children's response to pain, and the role of family in shaping pain behaviors and management. Although pain assessment and the development of tools for measuring pain intensity have received considerable attention from nurse researchers, rigorous testing of many tools is only in the early stage. Randomized clinical trials are needed to determine the effectiveness of management strategies and replication studies are needed to test the general reliability of findings in other settings and populations.

Research needs and opportunities fall within six major categories: assessment, management, patient-centered variables, family roles, under-represented populations, and delivery of nursing care. In addition, documentation of prevalence of pain related to trauma, treatment, diagnostic tests, and procedures is needed.

### ***Assessment of Pain***

Research focused on self-report tools has resulted in several psychometrically substantiated instruments for children ages 3-17. Behavioral tools have been used to assess procedural pain, but for the most part are not standardized. They are not appropriate for acute or chronic pain assessment because most

focus heavily on crying or resistive behaviors. These tools need to be used in connection with self-report tools and also when it is not possible to obtain self-report data.

Findings from studies on physiological measures of pain are inconsistent. More specifically, discrepancies of clinical assessments of pain by different health care providers, including behavioral manifestations and physiological indicators need study. With the availability of valid and reliable tools, clinical settings are using one or more of these tools. Research is needed to determine nurse preference and how the use of these tools affects pain management and the quality of patient care.

### ***Pain Management***

While studies related to the efficacy of specific analgesics, modes of delivery of analgesics to children and adolescents, and usefulness of nonpharmacologic strategies have proliferated, the research base for much of the currently accepted practice of pain management is lacking. Small sample size, nonrandomization of subjects, and selection of pain measurement tools with little attention to the psychometric properties are major limitations in many of the studies. Replication of studies needed to make generalizations of findings to other populations of children in different settings is also missing.

The undertreatment of pain from a pharmacologic perspective has been well documented and the efficacy of analgesia and anesthetic agents supported. Studies need to address appropriate, safe therapeutic dose ranges, incidence and management of analgesic side-effects, patient variables that affect drug action, and the synergistic effect of nonpharmacologic strategies when used in conjunction with analgesics.

High technology methods for analgesic delivery are gaining wide acceptance and are being instituted in health care settings. Evaluation of the effectiveness, satisfaction, time used, and cost need investigation. Studies need to address the efficacy of child-initiated management strategies as well as data-based criteria for guiding the implementation of such strategies.

Supporting data on the efficacy of non-pharmacologic studies including cutaneous stimulation and cognitive strategies are needed as well as study of the effects of combining nonpharmacologic strategies. Interdisciplinary research that examines attitudes and the decision-making process related to safe and effective analgesic management across the health-illness continuum and in varied settings is also needed.

### ***Patient-Centered Variables***

Research needs to address a number of patient variables, including preference for tools and for management approaches, satisfaction, self-efficacy beliefs, and demographic variables including gender, age, ethnicity, and diagnostic conditions as they relate to assessment tools and pain management strategies. Continued study is needed on how children and adolescents respond to pain and their beliefs of what represents satisfactory pain relief. Also needed is research that addresses patient concerns and fears related to the use of analgesics and specifically opioids.

### ***Family Roles***

That families play a vital role when children and adolescents are ill or injured is well recognized. The family's role in pain management has received scant attention. The impact of pain in a child upon the family and the impact of the family upon the child should be studied. Data are needed on how children's views of appropriate pain behavior and relief measures are formed. Parental education on preparation and support of a child for painful procedures should be studied.

### ***Underrepresented and Culturally Diverse Populations***

Studies to date primarily have used Caucasian, English speaking populations. Further testing of assessment tools to identify ethnic bias is needed as well as research related to disease specific problems with an ethnic component. Culturally determined preferences for both reporting and managing acute and procedural pain are needed. Research is needed to address the needs of specific populations including the developmentally disabled, handicapped populations, substance abusers, and those with other socially stigmatized pain conditions. Also of concern are children in pain in clinical settings such as intensive care units and emergency rooms where the focus of care is on life-saving measures.

### ***Nursing Care Delivery***

Attitudes and beliefs of nurses about pain play a dominant role in dictating nursing practice related to pain management (see Chapter 7). Research has identified the problem; more is needed to identify the spectrum of variables that constitute the belief system and develop strategies for modifying beliefs and attitudes that hinder effective pain management. Informal standards related to pain management also need to be identified and tested. Issues related to prevention versus alleviation also need to be addressed. Studies need to

test the effectiveness of implementing such strategies. The advent of guidelines (Acute Pain Management Guide-line Panel, 1992) to direct pain management presents the need to test the results of implementation.

### Recommendations

Based on the foregoing assessment of research needs and opportunities on pain in children and adolescents, the Panel has made the following recommendations concerning research in this area:

- Document the prevalence of pain related to trauma, treatment, diagnostic tests, and procedures.
- Develop and test instruments to assess the behavioral dimensions of pain.
- Evaluate the use of a standardized tool and/or protocol to assess pain.
- Validate clinical impressions that influence pain assessment and management strategies.
- Examine the link between physiological indicators of pain and behavioral and self-report responses.
- Document the incidence of analgesic side effects and evaluate the extent to which opiates can be used safely.
- Examine the synergistic effect of nonpharmacologic strategies when used in conjunction with each other or with pharmacologic strategies for managing pain.
- Evaluate high technology methods for delivering analgesics including variables influencing effectiveness of use.
- Examine attitudes and the decision making process related to safe and effective analgesic management.
- Evaluate the effectiveness of preparing children and adolescents for anticipated pain experiences.
- Test patient-centered variables including satisfaction with pain relief, preference for assessment and management approaches, self-efficacy beliefs, fears and concerns regarding taking drugs, gender, and ethnicity as they relate to assessment and management strategies.

- Evaluate strategies for assisting parents to prepare and support children for painful experiences and for assessing and managing pain.

- Address pain management issues for underrepresented populations including developmentally disabled, multiple handicapped, substance abusers, those with other socially stigmatizing conditions, and culturally diverse populations.

- Identify the factors including beliefs and attitudes that impede effective pain management; test strategies for changing or modifying beliefs and attitudes that hinder effective pain management in children and adolescents.

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- <sup>1</sup>Abu-Saad and Holzemer (1981) also studies the psychometric properties of a 10 cm line. However, their use of 10 cross hatches along the line technically makes their tool a graphic rating scale (Huskisson, 1974).