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Pain in Infants, Children, and Adolescents

- I. Pain in infants
 - A. Know that the postnatal period is a time of considerable synaptic growth and reorganization in the dorsal horn of the spinal cord (Fitzgerald 2000; Fitzgerald and Howard 2003) and that the developing nociceptive system responds differently to injury (i.e., increased excitability and sensitization) when compared to the mature adult system (see Chapter 3).
 - B. Understand that some inhibitory mechanisms in the dorsal horn are immature at birth and descending inhibition is delayed (Fitzgerald and Koltzenburg 1986; Boucher et al. 1998; Jennings and Fitzgerald 1998).
 - C. Know that behavioral studies on human infants have revealed comparable findings of plasticity and increased excitability in the developing nervous system and that in comparison to adults, young infants have exaggerated reflex responses (i.e., lower thresholds and longer-lasting muscle contractions) in response to certain types of trauma, such as needle insertion (Andrews and Fitzgerald 1994, 1999).
 - D. Recognize that repeated mechanical stimulation at strong (but not pain-inducing) intensities can cause sensitization in very young infants (Fitzgerald et al. 1988) and that preliminary studies have noted a striking hypersensitivity (to touch as well as pain) in infants after surgery (Andrews and Fitzgerald 2002).
 - E. Recognize the differing immediate, short-term, and long-term effects of pain exposure on the developing nervous system (Anand 2000; Anand et al. 2000; Grunau 2000, 2002, 2003; Bhutta and Anand 2002; Goldschneider and Anand 2003). Appreciate that pain experienced by neonates has both immediate and longer-term effects on their pain reactivity (Johnston and Stevens 1996; Porter et al. 1998; Grunau et al. 2001a,b; Johnston et al. 2003).
 - F. Know that circumcised infants displayed a stronger pain response to subsequent routine immunizations at 4 and 6 months than uncircumcised infants (Taddio et al. 1995) and that studies of former premature infants who required intensive care have shown behavioral differences related to early pain experiences (Grunau et al. 2001a,b).
 - G. Appreciate the complexities in effects of pain and opiate exposure in vulnerable infants (Abbott and Guy 1995; Anand et al. 1999; Bhutta et al. 2001; Lidow et al. 2001; Rahman et al. 1998).
 - H. Recognize that the differences in pharmacokinetics and pharmacodynamics among neonates, preterm infants, and full-term infants warrant special dosing considerations for infants and close monitoring when they receive opioids. Know the guidelines for neonatal and child analgesia administration and appreciate the pharmacokinetics and pharmacodynamics specific to the major opioids, nonsteroidal anti-inflammatory drugs (NSAIDs), and adjunctive analgesics (Clinical Practice Guideline 1992; Olkkola et al. 1995; Kart et al. 1997; Krane et al. 2003; Maunuksela and Olkkola 2003; McGrath and Brown 2003; Yaster 2003; Yaster et al. 2003a).
 - I. Know practical interventions for managing pain and distress in infants such as developmental care, containment, sucrose, feeding, and kangaroo care (Franck and Lawhon 2000; Stevens et al. 2004).

II. Children's pain perception

- A. Know that children can experience many different types of acute, recurrent, and chronic pain (Goodman and McGrath 1991; McGrath et al. 2000; Perquin et al. 2000) and that the lifetime prevalence for most types of recurrent and chronic pain increases with age (McGrath 1999).
- B. Know that children's age and developmental level influence their perception of pain (McGrath and Unruh 1987; Ross and Ross 1988; McGrath 1990) and that children's understanding of pain, pain coping strategies, and the impact of pain increase with age (Ross and Ross 1984; Gaffney and Dunne 1987; Harbeck and Peterson 1992; Gaffney 1993).
- C. Know that most studies of children's acute pain caused by invasive medical procedures reveal that pain intensity and overt distress generally decrease with age (Jay et al. 1983; Fradet et al. 1990; Jacobsen et al. 1990; Lander and Fowler-Kerry 1991; Humphrey et al. 1992; Fanurik et al. 1993; Bournaki 1997; Goodenough et al. 1997).
- D. However, appreciate that the effect of age probably varies depending on the type of pain and the nature of children's previous pain experiences—that is, positive experiences with similar painful situations (Dahlquist et al. 1986; Bijttebier and Vertommen 1998; Thastum et al. 2001; McGrath and Hillier 2003). Some studies of postoperative pain show increasing pain with age (Bennett-Branson and Craig 1993), while others show age-related decreases (Palermo and Drotar 1996) or no differences (Gidron et al. 1995).
- E. Recognize that children's memories of past pain experiences and pain-coping efficacy also shape responses to present pain situations; prior difficulties can undermine active efforts to cope and heighten anxiety and rumination (Chen et al. 1999, 2000a,b). Thus, effective early intervention for children at risk is critical because it not only influences the child's present pain experience but also expectations of, and strategies for, coping with future pain situations.
- F. Know that the results of studies evaluating sex- and gender-related trends in children's pain perception yield equivocal results (Ross and Ross 1984; Grunau and Craig 1987; Fradet et al. 1990; Jacobsen et al. 1990; Fowler-Kerry and Lander 1991; Schechter et al. 1991; Humphrey et al. 1992; Manne et al. 1992; Bennett-Branson and Craig 1993; Tesler et al. 1998).
- G. Appreciate that in addition to experiential and maturational factors, temperament and children's reactivity are likely to play a substantial role in shaping children's response to pain (Peterson and Toler 1986; Field et al. 1988; Blount et al. 1989; Wallace 1989; Schechter et al. 1991; Siegel and Smith 1991; Peterson et al. 1999; Zeltzer et al. 1999; Chen et al. 2000a,b). Child development theorists have proposed that consistent, inherent predispositions underlie and modulate the expression of activity, reactivity, emotionality, and sociability.
- H. Appreciate that biopsychosocial, as well as developmental, factors modify all children's pain perceptions and pain behaviors. Situational factors, particularly cognitive, behavioral, and emotional factors, vary with the circumstances in which a child experiences pain and can profoundly affect a child's pain level and distress (Ross and Ross 1988; McGrath and Hillier 2003).
- I. Understand that family beliefs, attitudes, and parental pain history influence how children learn about pain, its impact, and how to cope with different types of pain (Edwards et al. 1985a,b; Bush et al. 1986; Gil et al. 1991; Walker et al. 1994; Schanberg et al. 1998). In particular, children's chronic pain problems should be viewed within the broader context of their family (Covelman et al. 1990; Ehde et al. 1991; Gil et al. 1991; Walker 1999; McGrath and Hillier 2001).
- J. Know that only a few studies have focused on the specific impact of culture on children's pain (Abu-Saad 1984; Zeltzer and LeBaron 1985; Pfefferbaum et al. 1990; Harrison 1991; Lewis et al. 1993; Rosmus et al. 2000), and empiric data on specific cultural differences in pain experience and responses are lacking (Bernstein and Pachter 2003).

III. Treating children's pain problems: drug therapies

- A. Understand that managing a child's pain requires a dual focus on addressing the primary cause, usually through pharmacological or physical interventions, and the contributing factors or secondary causes, usually through a cognitive-behavioral approach or specific psychological interventions (McGrath 1990).
- B. Know that analgesics include acetaminophen, NSAIDs, and opioids and that adjuvant analgesics include a variety of drugs with analgesic properties that were initially developed to treat other health problems, such as anticonvulsants and antidepressants. Appreciate the unique aspects of using these agents in infants and children (Morselli et al. 1980; Andersen et al. 1997; Finley 2001) and know the guidelines for analgesic administration in infants and children (Wolf 2001; Krane et al. 2003).
- C. Understand that neonates and infants require the same three categories of analgesic drugs as older children. However, premature and term newborns show reduced clearance of most opioids. The differences in pharmacokinetics and pharmacodynamics among neonates, preterm infants, and full-term infants warrant special dosing considerations for infants and close monitoring when they receive opioids (Wong et al. 2003).
- D. Understand that children should receive analgesics at regular times, "by the clock," to provide consistent pain relief and prevent breakthrough pain. The specific drug schedule (e.g., every 4 or 6 hours) is based on the drug's duration of action and the child's pain severity (Clinical Practice Guideline 1992).
- E. Recognize that the management of acute procedural pain requires appropriate pharmacological management (Liossi 2002; Schechter 2003). Understand that children who receive multiple invasive procedures throughout a prolonged time period, are at risk for developing increasing anxiety about these procedures, but that many brief cognitive-behavioral interventions can effectively lessen children's anxiety and pain (Ellis and Spanos 1994; Jay et al. 1995; Kazak et al. 1998; Barrera 2000; Kazak and Kunin-Batson 2001).
- F. Know that regional techniques for the administration of local anesthetics and analgesics are an integral part of pain control for children. Be aware of the central and peripheral nerve blocks available and the indications for their use in children of all ages (Brown et al. 1999; Peng and Chan 1999; Dalens 2003; Desparmet et al. 2003; Wilder 2003; Yaster et al. 2003b).
- G. Understand that children with severe pain may require progressively higher and more frequent opioid doses due to drug tolerance and that they should receive the doses they need to relieve their pain (Collins and Weisman 2003; McGrath and Brown 2003). Appreciate that the fear of opioid addiction in children has been greatly exaggerated.
- H. Understand that active participation of children and parents is important in pain management (Schechter 1985; Romsing and Walther-Larsen 1996).

IV. Treating children's pain: nondrug therapies

- A. Appreciate that an extensive array of nondrug therapies is available to treat children's pain, including counseling, guided imagery, hypnosis, biofeedback, behavioral management, acupuncture, massage, homeopathic remedies, naturopathic approaches, and herbal medicines (Kemper and Gardiner 2003; Lin 2003; McCarthy et al. 2003; McGrath et al. 2003).
- B. Know how to use basic psychological and behavioral approaches to pain in children (Broome et al. 1998; Kazak and Kunin-Batson 2001; Kuttner and Solomon 2003; McGrath and Hillier 2003). Understand that the evidence base supporting the efficacy of cognitive and behavioral approaches is strong (Zeltzer and LeBaron 1982; Kellerman et al. 1983; Katz et al. 1987; Blount et al. 1990; Jay and Elliott 1990; Routh and Sanfilippo 1991; Powers et al. 1993; Ellis and Spanos 1994; Janicke and

Finney 1999; Walco et al. 1999; Anie and Green 2000; McGrath and Hollahan 2003). These methods can mitigate some of the factors that intensify pain, distress, and disability for children.

- C. Be aware that providing age-appropriate information, some simple pain-coping methods like attention and distraction, and giving children as much choice as possible can effectively lessen children's pain and distress during invasive procedures (McGrath and Hillier 2003). These cognitive approaches can be easily incorporated into routine clinical practice.
 - D. Understand how to use a consistent cognitive-behavioral approach to target the multiple factors that typically contribute to children's recurrent and chronic pain (McGrath and Finley 1999; Walker 1999; McGrath and Hillier 2001).
 - E. Recognize that specialized multidisciplinary programs have been developed to treat certain pain problems for children including sickle cell pain (Dampier and Shapiro 2003), musculoskeletal pain (Varni et al. 1989; Kulas and Schanberg 2003), complex regional pain syndromes (Berde and Solodiuk 2003; Berde et al. 2003), chronic headache (Hillier and McGrath 2001; Hämäläinen and Masek 2003), abdominal pain (Apley 1975; Sanders et al. 1994; Scharff et al. 2003), burn pain (Kahana 2003), and cancer pain (Collins and Weisman 2003).
 - F. Understand that increasing attention is focusing on the special problem of pain for children with developmental disabilities; realize that pain assessment techniques are available (McGrath et al. 1998; Hunt et al. 1999; Oberlander 2001; Breau et al. 2002; Hadden and von Baeyer 2002; Stallard et al. 2002; Terstegen et al. 2003) and that practical guidelines for pain management have been detailed (Oberlander and Craig 2003).
 - G. Appreciate that children are increasingly using complementary and alternative therapies (Spigelblatt et al. 1994; Kemper and Gardiner 2003; Lin 2003), but that pediatric research is just beginning on many of the therapies regarded as complementary to traditional medical approaches such as acupuncture (Zeltzer et al. 2002). Thus, the efficacy of complementary therapies for treating children's pain is unknown.
 - H. Know that physical therapies are a major component of many pain management programs for children (McCarthy et al. 2003), especially for children with neuropathic pain (Lee et al. 2002).
 - I. Recognize that the neurosurgical approaches for treating pain in children are comparable to those used for adults' pain, but understand that there have been no studies documenting the effectiveness of particular procedures for children (Smith and Madsen 2003).
- V. Assessing pain in infants and children
- A. Know that pain onset, location, intensity, quality, duration (or frequency, if recurring), spatial extent, temporal pattern, and accompanying physical symptoms are the key pain characteristics for assessment (McGrath and Brown 2003). These characteristics are obtained from a child and parental report during the diagnostic interview and clinical examination. When possible, clinicians should obtain a quantitative rating of pain intensity.
 - B. Recognize that many physiological parameters have been monitored in infants and children as potential pain measures including heart rate, respiration rate, blood pressure, palmar sweating, cortisol and cortisone levels, O₂ levels, vagal tone, and endorphin concentrations (Harpin and Rutter 1982; Jay et al. 1983; Owens and Todt 1984; Johnston and Strada 1986; Gunnar et al. 1987; Szyfelbein et al. 1987). Understand how behavioral and biological measures may be used to assess pain (Sweet and McGrath 1998; McGrath and Gillespie 2001; Oberlander and Saul 2002).
 - C. Recognize that from birth, infants exhibit an array of distress behaviors and physiological changes in response to tissue damage (Craig and Grunau 1993) and that many behavioral pain measures have been developed and validated for use with infants (Stevens et al. 2000). Know the unique challenges

of assessing pain in infants and preverbal children (Stevens et al. 2000; Craig et al. 2002; Peters et al., in press).

- D. Know that children can use many analogue, facial, and verbal rating scales for assessing pain intensity and that many behavioral and self-report measures have been developed and validated for use with children and adolescents (Beyer and Wells 1989; Champion et al. 1998; Finley and McGrath 1998; McGrath 1998; RCN Institute 1999; McGrath and Gillespie 2001; Gaffney et al. 2003).
- E. Appreciate that different measures are required depending on the age and developmental level of children and recognize the impact of any developmental disability or neurological impairment on assessing pain in children (Stevens et al. 2000; Chambers and Johnston 2002; Craig et al. 2002; Gaffney et al. 2003; Johnston et al. 2003; Oberlander and Craig 2003).
- F. Know that a child's pain level should be routinely documented to ensure that health care providers assume appropriate responsibility for controlling pain.

VI. Special considerations for acute pain management

- A. Know the clinical guidelines for the management of acute procedural and postoperative pain in infants and children, including injuries, postoperative pain, burns, common pediatric diseases, and repeated invasive procedures (Finley 2001; Morton 2001; Bouwmeester et al. 2003; Schechter 2003).
- B. Know the primary approaches to pain management in the neonatal and pediatric intensive care unit (Tobias and Rasmussen 1994; Chambliss and Anand 1997; Macfadyen and Buckmaster 1999; Franck and Lawhon 2000; Stevens 2001; Tobias 2003; Wong et al. 2003).
- C. Know the primary approaches for pain control and sedation guidelines for treating children in the emergency department and the appropriate monitoring for respiratory, cardiovascular and neurological status (Selbst and Zempsky 2003).
- D. Appreciate the role of combined analgesic, anxiolytic, and amnesiac agents in the management of children's acute pain (Joseph et al. 1999; Krauss 1999).

VII. Special considerations for chronic pain management

- A. Understand that chronic pain causes significant suffering, disability, anxiety, and emotional distress for many children and adolescents (McGrath 1999; Perquin et al. 2000). Appreciate that chronic pain often has nociceptive and neuropathic components and is affected by environmental and psychological factors, so a multimodal therapeutic regimen is usually required. Understand that independent of initial etiology, children may continue to experience long-term pain and disability (Bursch et al. 1998, 2003).
- B. Although psychological interventions are an integral component of treatment programs for chronic pain, be aware that the evidence base supporting the use of cognitive and behavioral interventions for relieving chronic pain other than headache is weak, as assessed by the number of controlled trials that have been conducted in children and by the few types of chronic pain that have been formally studied (McGrath and Holahan 2003).
- C. Appreciate that significant gaps exist within our evidence base for multidisciplinary treatment programs and psychological therapies for treating chronic pain in children. Reviews of psychological therapies for childhood headache (Holden et al. 1999; Janicke and Finney 1999; McGrath et al. 2001; Hermann and Blanchard 2003), recurrent abdominal pain (Blanchard and Scharff 2002; Weydert et al. 2003), disease-related pain (Walco et al. 1999), sickle cell disease (Anie and Green 2000), and chronic pain including headache (Eccleston et al. 2002; McGrath and Holahan 2003) have stressed the need for well-designed studies to obtain much-needed information on treatment efficacy for particular pain conditions.

- D. Understand that most of the pharmacological management of neuropathic pain in children and adolescents is based on extrapolation from adult studies. While tricyclic antidepressants and gabapentin are well-established analgesics for these conditions in adults, evidence for efficacy in children is confined to case reports or very small series (McGraw and Kosek 1997; Rusy et al. 2001).
- E. Be aware that certain children with chronic pain may also have long-standing emotional problems suggestive of mood disorders, anxiety disorders, and somatoform disorders (Ernst et al. 1984; Egger et al. 1998; Zwaigenbaum et al. 1999; Holden et al. 2001).

VIII. Palliative care for children

- A. Understand that pain control is an integral component of pediatric palliative care because children may experience many different types of pain from invasive procedures, the cumulative effects of toxic therapies, progressive disease, or psychological factors (World Health Organization 1998).
- B. Know that pain control should include regular pain assessments, appropriate analgesics administered at regular dosing intervals, adjunctive drug therapy for symptom and side-effect control, and non-drug interventions to modify the situational factors that can exacerbate pain and suffering (World Health Organization 1998; Goldman et al. 2003; McGrath and Brown 2003).
- C. Although specific drugs and doses are determined by the needs of each child, general guidelines for drug therapies to control pain for children in palliative care have been developed (Pichard-Leandri and Gauvain-Piquard 1989; Galloway and Yaster 2000; McGrath and Brown 2003). Recognize that children may not report all side effects (i.e., constipation, dysphoria) voluntarily, so they should be asked specifically about these problems.
- D. Appreciate that special problems in pain control may arise when children die at home, unless parents and medical and nursing teams communicate openly (Howell and Martinson 1993; Goldman 1994; Sourkes 1996; Davies and Howell 1998; Stevens 1998).

IX. Ethical considerations for children

- A. Understand the primary ethical concerns related to the undertreatment of pain in infants and children, end-of-life care, and the use of placebo controls in treatment trials (Kenny 2001; Walco et al. 2003).
- B. Know that experimental pains induced by electrical stimuli, pressure, and cold water immersion have been used to study pain and tolerance thresholds, pain intensity ratings, coping strategies, and cognitive-behavioral interventions in children (Zeltzer et al. 1989; Fanurik et al. 1993; Miller et al. 1994; Hogeweg et al. 1996; McGrath et al. 2003). However, appreciate that the use of experimental pain in children continues to be a controversial issue, and that ethical guidelines have been recommended for its use (McGrath 1993).

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