CHAPTER 11
Pain Management

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Introduction

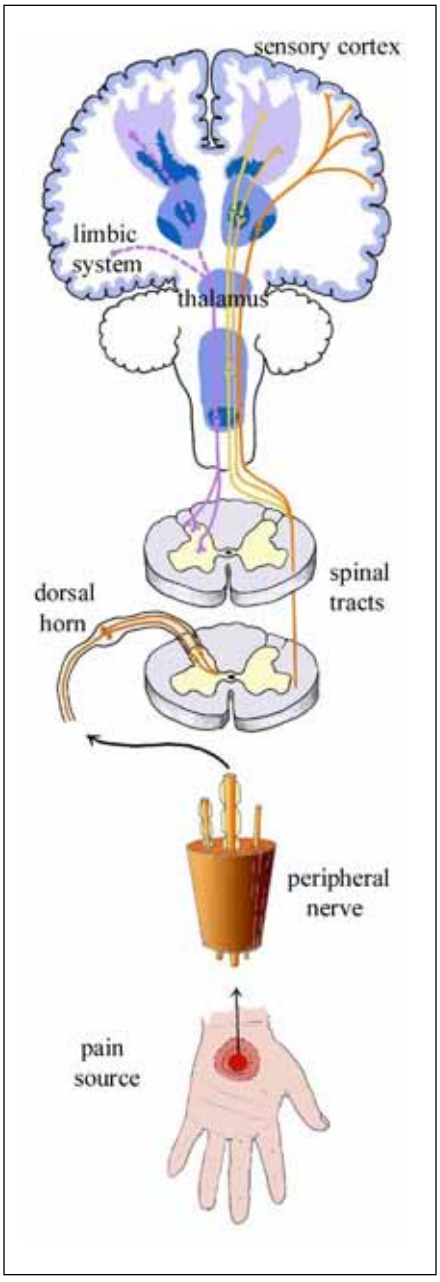
Most hospitalized children will experience some pain, either as a result of disease itself or as a result of interventions. A number of studies have demonstrated that the management of pain in children is, unfortunately, often inadequate, especially in the African setting, where resources and skills are limited and overwhelming acute life-saving events override pain management.

Accurately assessing pain and treating it accordingly can be challenging in children due to the different ways in which pain is expressed in the various age groups, compounded by cultural and individual differences in the perception of pain. Effective pain management in children therefore requires much more than just a sound knowledge of analgesic medications; it requires health care professionals to be trained *and* experienced in recognising the degree of pain being experienced by children of different age groups. Health care professionals in Africa must be skilled in using pain assessment tools as well as appreciating the role of social, cultural, and environmental factors in influencing pain perception. Careful consideration must be given to how pain can be prevented and minimised when children are in hospital, and appropriate prescription of analgesics must be combined with a variety of nonpharmacological methods to improve pain perception. Availability of appropriate medications is another limiting factor in African health care systems.[1]

Aetiology/Pathophysiology

Pain can be defined as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage".[2] This definition highlights an important concept that is especially relevant in children: Pain has both neurological and higher cognitive components. As a result, the degree of pain experienced is not necessarily a reflection of the underlying illness. A relatively minor procedure for one child might cause intense distress for another. Likewise, the health care worker should not underestimate the potential severity of the underlying illness in a child who exteriorises pain to a lesser degree. Factors known to affect a child's pain perception include anxiety, expectation, and previous experience, as well as biological factors such as developmental stage and gender. The role of the family, religion, and culture has also become increasingly recognised in the West[3]; however, this role is less recognised in Africa due to other life-threatening illnesses.

The basic pathways thought to underlie the perception of pain are shown in Figure 11.1. The pathway was originally described by the Melzack-Wall gate control theory in 1965,[4] which states that the detection and transmission of pain from the periphery takes place by A-delta and C nerve fibres that travel to the spinal cord, where a reflex withdrawal arc is triggered. Pain impulses are simultaneously transmitted up the spinal cord to the thalamus and cortex. Various ascending and descending pathways from the cortex and reticular formation allow levels of arousal and higher cognitive functioning to modify the basic pathway.



Source: www.perioperativepain.com.

Figure 11.1: Basic pathways involved in the perception of pain.

Inflammatory mediators, such as prostaglandins and bradykinins, have been found to be responsible for stimulating nerve receptors in the periphery. Neurotransmitters, such as endorphins and encephalins, are thought to be at least partly responsible for the central modulation of the pain response. As a result, both the initial inflammatory response and central pathways involved in pain perception are targets for analgesics.

The Importance of Pain Control

Everyone involved in the care of a child is distressed when the child is in pain. It is increasingly being recognised, however, that the deleterious effects of pain are more far-reaching than the immediate psychological dimension. The experience of pain leads to activation of the sympathetic nervous system. This has various potentially harmful effects, including increased myocardial stress and hypertension. In neonates, pain can precipitate apnoeas, and infants may experience syncopal episodes. Pain also leads to activation of the stress axis, which causes increased blood cortisol levels that could impair wound healing. In addition, patients in pain are less likely to mobilise in the postoperative period, putting them at increased risk of atelectasis and chest infections.[5] An increased risk of deep venous thrombosis is also a concern in the adolescent age group. The culmination of these adverse consequences is an increased length of hospital stay and associated increased costs. In addition, longer-term consequences to consider with a child who has suffered a distressing experience include the likelihood that the child will be more distressed and less cooperative in the future.

The Assessment of Pain

The first step towards appropriate pain management is being able to assess how much pain a child is experiencing and why. Naturally, the source of pain should be identified by using investigations appropriate to the differential diagnosis. The accurate assessment of pain in children, however, requires separate consideration of the history of the pain, observation and examination of the child, and the use of validated scoring tools, in addition to knowledge of the underlying cause of discomfort. No single method should be used in isolation. The child and parent should both be consulted; in addition, a range of appropriately trained and experienced health care professionals should be assembled.

History

A good history of pain can aid the clinician in diagnosing the underlying condition as well as in gaining insight into the degree of discomfort. Where possible, the clinician should seek the child's description of the pain. Parental report is also useful. The "SOCRATES" mnemonic is helpful to use whenever taking a pain history—enquiry should be made to the **S**ite, **O**nset, **C**haracter, **Ra**diation, **A**ssociated features, **T**emporal features, **E**xacerbating/relieving factors, and the **S**everity of the pain. Questions pertaining to the effect of the pain on the child's level of activity and behaviour are often especially insightful. In particular, the child's ability to partake in usual activities or interest in pleasurable activities should be queried. Enquiry should be made into school absences, sleep disturbance, and reduced interest in feeding, which are often also particularly significant.

In taking the history, the clinician should also attempt to elicit family beliefs and expectations about pain and disease. Previous experiences of the child or other family members may well affect how the child (and parents) responds to pain. Culture also affects how pain is described or even acknowledged.

The signs from the physical examination that can be used to make an assessment of pain largely fall into two categories: physiological and behavioural.

Physiological

First, the cause of pain may be identified, for example, by seeing a visible wound or from palpating abdominal guarding, suggestive of peritoneal irritation. Second, increased heart rate, respiratory rate, and blood pressure are indicative of sympathetic stimulation in response to pain. Such signs are objective and do not require the child's cooperation. They are therefore particularly important in preverbal children, those with physical or mental disability, those with impaired consciousness, and the apparently "stoic" child. However, they are also nonspecific indicators of physiological stress, so these indicators should not be used in isolation. Traditional healer's markings are other good indicators of the site of pain and disease.

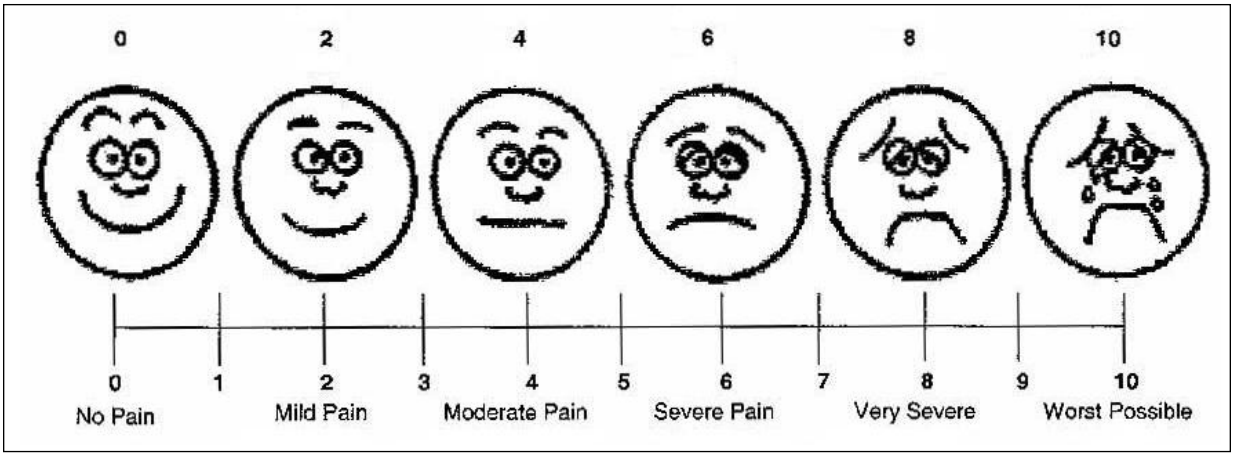
Behavioural

Behavioural signs may be generalised responses to pain, such as facial expression, irritability, crying, or lethargy, or may be more specific reactions to certain types of pain, such as ear pulling, assuming certain postures, or refusing to move a certain limb. Although useful, one should not be misled by such signs. There is well-established cultural and even gender-related variation in the degree to which pain is externalised—particularly in the social acceptability of crying. The degree of illness can also influence the extent to which a child is able to express his or her pain. One should always beware of underestimating the degree of pain being experienced in a critically ill child. In some cultures, pain is acknowledged as a sign of weakness, and this taboo needs to be eradicated.

Assessment Tools

Various pain scales have been developed to help measure the degree of pain being experienced by a child. Using such tools has been shown to improve pain management and aid nursing care.[6]

The choice of scale should reflect the nature of pain (for example, acute versus chronic pain), the ethnicity of the child, and—crucially—



Source: Wong-Baker Faces Pain Scale 1981.

Figure 11.2: Example of pain scale using facial expression of pain severity.

the child's age and developmental level. Children older than 3 years of age are generally considered to have the cognitive ability to use self-report scales. Commonly employed techniques involve the child being asked to point to a photograph or cartoon of a face in various degrees of pain, or the use of linear analogue scales reflecting the continuum of pain intensity. Examples of commonly used tools and the age group for which they are validated include:[7]

- the Oucher Scale, from the age of 3 years;
- the Bieri Scale, from the age of 6 years;
- the Wong-Baker Faces Pain Scale, 8–12 years of age; and
- the Adolescent Paediatric Pain Tool, validated in children from 8 to 17 years of age.

Tools that use cartoon representation of children's faces in various of degrees of pain are likely to be more globally applicable and may be especially useful where resources are limited. An example is shown in Figure 11.2.

For children who are not considered able to verbalise their pain adequately, behavioural scales can be employed. The Faces, Legs, Activity, Crying, and Consolability (FLACC) scale, Toddler-Preschooler Postoperative Pain Scale (TPPPS), and the Children's Hospital of Eastern Ontario Pain Scale (CHEOPS) are generally thought to be suitable from around age 1 to 5 years. Specific scoring systems encompassing behaviour observation and physiological variables should be used in neonates, with separate tools needed for use in premature babies.

Ideally, a variety of different pain scales should be available, with the choice of which scale to use determined on an individual basis. Pain assessment using such tools should be approached with the same attention as that of vital signs: by staff trained in its assessment and who constantly re-evaluate the effectiveness of interventions. Pain flow sheets included in the hospital record may be useful in meeting this goal. Parents should also be educated in the ongoing assessment of their child's pain.

Management

It goes without saying that treatment of the underlying condition is critical to managing a child's pain. This, however, is often not immediately possible and, crucially, many treatments themselves *cause* pain. Adequate symptomatic relief is therefore essential. To control pain effectively, consideration must be given to both pharmacological and nonpharmacological methods of management. The relative use of each should be tailored to the individual child, and each intervention should be modified according to assessments of effectiveness.

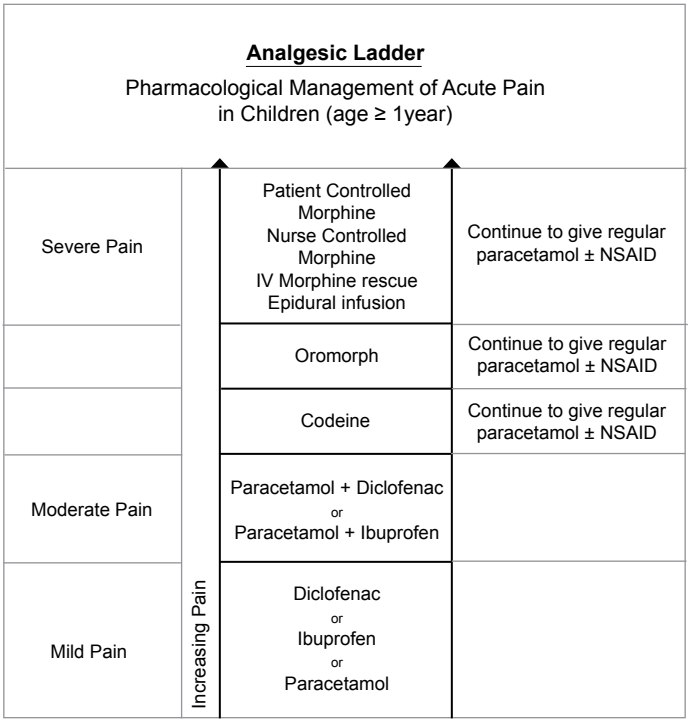
Nonpharmacological Techniques

Nondrug methods often do not alleviate pain completely but do help to make it more tolerable by providing the child with coping mechanisms. The hospital environment is often a source of distress in itself, which compounds the experience of pain in children. In recognition of this, attempts should be made to keep to the child's normal routine when in hospital; the number of "new" people tending the child should be minimised and parents should be involved in care as much as possible.

Other nondrug methods can be employed in specific situations—especially in relation to certain procedure-related pain. Distraction is especially useful for short procedures.[8] Methods should be age specific and chosen to reflect the interests of the child. Commonly used examples include videos, games, and books for older children, and bubbles, lights, and music for younger children. Feeding an infant or using a pacifier are simple and inexpensive interventions that have been shown to have analgesic effects.[9] Relaxation techniques, such as gentle rocking and massage, have also been used with some success. Discussion of the procedure, what it involves, and why it is necessary is often useful with older children. Allowing younger children to familiarise themselves with equipment by first playing with it in a nonpressured environment is also useful to reduce the shock associated with procedures. Employing "play specialists"—specially trained members of staff who are familiar in using a variety of such techniques and able to identify when best to use these—has been shown to reduce hospital length of stay and increase compliance in some hospitals.[10]

Analgesia

The prescription of analgesics should follow the World Health Organization (WHO) pain management ladder (Figure 11.3). A key principle behind this is the cumulative effect of drugs and the stepwise addition of drugs to address pain requirements. Similarly, as pain requirements reduce (for example, in the postoperative period), analgesia should be reduced in a stepwise manner down the ladder. The route of administration, dosage, and timing should be tailored to suit the individual child. In particular, it is important to realise that the gastrointestinal absorption of medications is affected after major surgery, meaning oral administration is often inappropriate in this setting. Age- and weight-appropriate dosages for each analgesic should be calculated for each child on an individual basis.



Source: Cross L, Bridge H, ORH & NHS Trusts, Version 1, July 2003.

Figure 11.3: The principles of the WHO analgesic ladder.

Paracetamol is an excellent first-line drug for children with pain. It exists in forms suitable for oral, rectal, and intravenous administration. Rectal absorption is often slow and unpredictable, so this route is less commonly used. Paracetamol is generally well tolerated and low in side effects.

Children who do not get sufficient analgesia from paracetamol alone should also be prescribed a nonsteroidal anti-inflammatory drug (NSAID). Drugs such as ibuprofen and diclofenac work by inhibiting prostaglandin synthesis and reducing inflammation. They are therefore especially valuable in patients with surgical pain. Oral and rectal preparations are available, with rectal diclofenac being particularly well absorbed and of great use in acute pain relief. Caution should be exercised in patients with asthma or with renal or hepatic impairment. These drugs should not be used in patients with known bleeding tendency or those under 3 months of age. Due to the risks of gastric irritation, they should ideally be given with food or milk.

If analgesic requirements are still not met, then codeine, a mild opiate, should be administered. This is generally considered a safe drug with a significantly lower incidence of respiratory depression than other stronger opioids. Nausea and constipation are relatively common side effects that should be anticipated wherever codeine is prescribed. Codeine phosphate is most commonly given by mouth, although rectal preparations are available.

In patients whose pain is still not adequately controlled, or those who are deemed to have severe pain at initial assessment, a strong opioid should be used. The "lower steps" of the analgesic ladder (see Figure 11.3) should always be prescribed as well, with the exception of codeine. Morphine may be administered in oral solution, intramuscularly, or intravenously, depending on clinical need. An intranasal preparation is also now available and is especially useful in the emergency management of acute pain where intravenous access is not always available.[11] Patient-controlled analgesia (PCA) is an alternative mode of administration of intravenous morphine administration by which the patient can choose when doses are given according to need. PCA has been found to produce the same analgesic effect as intramuscular (IM) regimes, but with less sedation.[12]

Morphine has multiple side effects that should be anticipated whenever it is prescribed. Nausea and vomiting are commonplace, so antiemetics should be routinely prescribed on an "as required" basis. Urine retention is a recognised complication, especially in postoperative patients, so many centres routinely catheterise patients until their opiate requirement has ceased. Respiratory depression is the most feared complication associated with the use of morphine. Regular, documented monitoring of sedation level and respiratory parameters should be mandatory, as should the coprescription of "as required" naloxone wherever opioids are prescribed. Concern about respiratory compromise should not, however, influence the decision to use morphine in those who need it. Parents and health care professionals alike should be reassured that dependence is rare in children with surgical pain.

Opioid use in Africa is rare; possible reasons include strict national laws against opioid addiction and misuse of drugs, lack of knowledge, and nonavailability, as reported by WHO.[13] For example, morphine consumption in South Africa for 2004 was 4.6682 mg per capita in comparison to Uganda's 0.4001 mg per capita, Tanzania's 0.3250 mg per capita, and Zambia's 0.0704 mg per capita, and the use of pethidine in Uganda for 2004 was 0.2272 mg per capita, in contrast to South Africa's 3.7694 mg per capita.[14]

Additional Methods of Analgesia

Certain additional techniques are frequently employed in the perioperative period to improve pain management, as described here. Local anaesthetics can be used to create specific nerve blocks to reduce postoperative pain sensation from specific sites. The duration of such blocks depends upon the specific anaesthetic used, but is typically around 6–8 hours. Local anaesthetics now exist in a variety of formats, including gels and creams that can be applied postoperatively as well as solutions that can be infiltrated into operative sites. Local application of anaesthetic creams is particularly useful in procedures involving the skin or mucous membranes, and has been shown to be effective in reducing wound pain in the postoperative period.[15] An advantage of this is that community medical officers can easily acquire and utilise this technique to reduce pain associated with procedures.

When a greater area of analgesic coverage is required, an epidural may be used. This form of regional anaesthesia involves injection of analgesics (usually local anaesthetic with or without opioids) through a catheter placed into the epidural space. Epidurals are especially useful in thoracic procedures and after laparotomy.[16] They are usually inserted in the anaesthetic room and can be linked to a PCA system (where they become patient-controlled epidural analgesia, or PCEA, systems). Their main advantage is that the analgesic action of opioids can be gained without the systemic side effects. However, there are numerous disadvantages to the system. The incidence of postoperative urine retention is reasonably high, so catheterisation is often recommended; epidurals should be avoided in patients at high risk of bleeding or infection; and there is a risk of inappropriate level of blockage, so sensory level should be routinely checked while an epidural is in place.

Ketamine merits special mention with regard to pain control in areas where access to and training in administering other modes of analgesia are limited. This anaesthetic drug has also been shown to have good analgesic properties at subanaesthetic dosages.[17] It can be administered intravenously (IV) or by IM injection, and is generally well tolerated in paediatric patients. Its main adverse effects are transient hypertension, vomiting, agitation on recovery, and hallucinations. Diazepam is coprescribed to buffer the duration and intensity of any side effects.

Prevention

Although it is difficult in practice to completely prevent pain in hospitalised children, several strategies can help to minimise it. Naturally, the accurate diagnosis and prompt treatment of the underlying condition before pain escalates is highly desirable. Regular prescription of analgesia is more effective than medicine given only when pain arises. The clinician should also attempt to recognise the potential for procedures to be painful or distressing and carefully consider which measures are really necessary so that only those that are likely to bring about a change in management are undertaken.

When potentially painful procedures are required, a range of methods can be employed to prevent unnecessary pain. This includes administration of analgesics before an event as well as the use of special additional measures, such as Entonox® in dressing changes of burn patients, or local anaesthetic creams (EMLA®—a eutectic mixture of local anaesthetics—or Amitop®) and cold sprays to minimise discomfort associated with phlebotomy or removal of foreign objects.

In the longer term, minimising pain for paediatric patients will require continued efforts to educate and train staff in its assessment and management. *Crucially, this should involve dispelling such commonly held myths as that infants do not feel pain and the active child is not in pain, and the general feeling that children have to "earn" analgesics before they are given.*

Ethical Issues

The African child is particularly vulnerable to disease and injury, and subsequently to pain and suffering. Factors such as inadequate training, language barriers, cultural diversity, limited resources, and the burden of disease prevent sick and injured children from receiving basic pain care. This situation can be rectified only by providing pre- and postgraduate training on the safe use of analgesic preparations, making drugs available, and gaining government support.

These ethical issues are best summarised in a review titled: "Challenges associated with paediatric pain management in Sub Saharan Africa" in the International Journal of Surgery.[1]

Evidence-Based Research

Table 11.1 deals with a study of postoperative pain relief following inguinal herniotomy.

Table 11.1: Evidence-based research.

Title	A comparison between EMLA cream application versus lidocaine infiltration for post-operative analgesia after inguinal herniotomy in children
Authors	Usmani H, Pal Singh S, Quadir A, Chana RS
Institution	Department of Anesthesia, Jawaharlal Nehru Medical College, Aligargh Muslim University, Aligarh, India
Reference	Reg Anesth Pain Med 2009; 34(2):106–109
Problem	Postoperative pain relief following inguinal herniotomy.
Intervention	Topical application of 5% EMLA cream before surgery or wound infiltration with 1% lidocaine.
Comparison/ control (quality of evidence)	Study group comprised 90 children aged 4–12 years undergoing elective herniotomy under general anaesthetic. Patients were randomly assigned to placebo cream alone, 5% EMLA cream, or placebo cream + 1% lidocaine infiltration after induction of anaesthesia. Operative protocol was standardised among groups. The requirement for postoperative analgesia among groups was compared.
Outcome/ effect	The number of patients requiring fentanyl as rescue analgesia was significantly less in the study groups than in the placebo group. Topical application of EMLA provided postoperative pain relief comparable to infiltration with 1% lidocaine.
Historical significance/ comments	Suggests that the application of local anaesthetic cream is a viable alternative to wound infiltration in the control of postoperative pain. This would be a valuable strategy in settings where clinical training and resources are limited.

Key Summary Points

1. Pain of some degree is almost universal in hospitalised children, either as a result of underlying disease or interventions.
2. The recognition and subsequent management of pain is often inadequate in children.
3. Health care professionals have a moral obligation to provide the best possible management of children's pain and should be trained in pain recognition.
4. The perception and expression of pain is highly dependent on the age and cognitive function of the child.
5. Accurate determination of the level pain is the first step to adequate management and should take into consideration the parent's and child's reports, the change in behaviour of the child, the measurement of physiological parameters and knowledge of the underlying medical condition.
6. Cultural- and age-validated scoring tools should be routinely used in the assessment of pain in children.
7. A combination of pharmacological and nondrug methods should be used for managing pain.
8. Clinicians should anticipate pain in children and minimise the number of potentially painful procedures to which a child is subjected.

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