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Treatment of Acute and Chronic Pain in the Outpatient Setting

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Summary

Although there have been dramatic changes in attitude and practice in the treatment of children's pain in the hospital, pain management in outpatient settings is treated essentially the way it was 20 years ago. It is quite remarkable that many common illnesses and procedures universally acknowledged to be associated with significant discomfort and anxiety have received minimal research attention. In this chapter, some of the more common pain problems (minor procedures and acute illnesses) encountered in office practice are reviewed, and suggestions for pain relief based on the limited literature are offered. The following areas are addressed: (1) pain associated with immunization, the most common painful procedure in office practice; (2) pain associated with common illnesses, specifically otitis media, pharyngitis, and viral mouth infections; and (3) chronic and recurrent pains, which require an alternative paradigm than acute pain. Through the uniform use of relatively simple strategies, much of the pain associated with these common problems can be significantly reduced.

Key Words: Chronic pain; immunization; otitis media, pharyngitis.

1. Introduction

The past 20 years have been witness to a revolution in the way pain is conceptualized and managed in children. This change is most evident in the treatment of hospitalized children with significant pain problems. The treatment of postoperative pain, for example, is dramatically different from what it was two decades ago, when it was essentially ignored or at best addressed haphazardly *(1)*. The outpouring of research attention that has been given to this problem coupled with the recognition that untreated pain may have negative consequences for the child *(2,3)* has been largely responsible for this change in practice. Similar attention has also been focused on cancer pain *(4,5)* and pain in the

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newborn nursery *(6,7)*, and the treatment of these problems has likewise improved significantly. Policies and procedures are in place in most centers that care for children to ensure that hospitalized children with predictable pain problems such as those mentioned receive appropriate care.

This change in practice, however, for the most part remains limited to treatment in the hospital. Remarkably, pain management in children in ambulatory settings is treated essentially the same way it was 20 years ago. This is all the more striking given the frequency of these pain problems compared with those associated with hospitalization. For example, there is almost no research addressing pain in otitis media or pharyngitis, which are often associated with significant distress and are among the most common causes of childhood visits to the physician. The pain associated with immunizations is another example. There are literally hundreds of millions of immunizations given yearly to children in physician offices and clinics around the world. For many children, these injections are so stressful that they color the child's entire relationship with his or her health care provider. Yet, the paucity of data on strategies that might alleviate some of the discomfort associated with them is quite remarkable. Likewise, common chronic pains, such as headache, abdominal pain, and limb pain, although subjected to some academic scrutiny, have yielded no uniformly accepted approach to their evaluation or treatment.

There are a variety of reasons for this lack of interest in these common pain problems. First, they are far less dramatic than the problems of children with life-threatening illness. Studying the pain of a self-limited illness like otitis media or a minor procedure like an immunization lacks the cachet, poignancy, and sense of urgency that exists for pain problems in the hospital. Chronic pain problems are often seen as vague and multifactorial, and as a result do not lend themselves to simple solutions; therefore, they are often perceived as both time consuming and nonrewarding for the physician. Significantly as well, there are limited financial incentives in this market for the pharmaceutical industry. Research on children is costly and fraught with ethical complexities. Because many of these problems are not seen as pressing and because drugs developed will have only short-term use, this market is felt to be limited. As a result, there has been little investigation into the treatment of these frequently encountered problems. The disparity between the frequency with which these pains are encountered and the paucity of research regarding them will become evident to the reader. This lack of investigation and interest, however, does not mitigate the fact that these problems impose a significant burden on children.

Commonly encountered pains in ambulatory settings can typically be categorized as acute or chronic. In the category of acute pain, there are the normative pains of childhood (teething); the pains associated with infection (such as otitis media, pharyngitis, viral infections of the mouth, and urinary tract infections);

the pain associated with minor procedures, such as injections, phlebotomy, urinary catheterization, and laceration repair; and pain associated with minor musculoskeletal injury, such as strains and sprains. Chronic or recurrent pains are defined as pain occurring either persistently or at least three times over the course of 3 months *(8)*. These include headache, recurrent abdominal pain, limb and back pain, widespread musculoskeletal pain, such as fibromyalgia, or pain that does not seem to remit associated with minor injury, such as reflex sympathetic dystrophy.

This chapter obviously cannot address this extensive list but attempts to review a number of the major common pains encountered in pediatric outpatient settings. In particular, the discussion focuses primarily on immunization pain, an area not been comprehensively reviewed in the past, selected infection-related pains, and a general overview of chronic pain in children.

2. Acute Pain

2.1. Immunizations

Immunizations are the most frequently occurring painful procedure in pediatric settings. These procedures have an enormous positive impact on disease prevention. For example, prior to the development of vaccines, there were 170,000 cases of diphtheria, 16,000 cases of paralytic poliomyelitis, and 500,000 cases of measles reported annually. In 2001, there were 2 cases of diphtheria, no cases of polio, and 116 cases of measles *(9)*. It is obvious that the impact of these agents on reducing the burden of disease is almost incalculable. There has been steady growth in the number of immunizations given to children and adults. At the present time, according to the most recent immunization schedule, more than 20 immunizations are given to children by the age of 2 years and more than 26 throughout childhood. The sheer volume of immunizations has necessitated that multiple injections must be given at a health supervision visit. For example, at the typical 2-month visit, up to five separate immunizations may be given. At the 4-month visit, four immunizations may be given; at the 6-month visit, about five immunizations may be given *(10)*.

Despite their undeniable value, these procedures are a mixed blessing. On the one hand, they protect the children from life-threatening illnesses. On the other hand, all health care providers who work with children are familiar with the anxiety that the anticipation of these procedures engenders. Every nurse or physician who works with children has entered the examining room and encountered a worried child cringing in the corner whose first question is, "Am I going to get a shot?" For a subset of children, the concerns about these procedures dominate the entire encounter with their health care provider. Preoccupation with these procedures affects not only the child, however, but also has a significant impact on families and on the health care provider.

2.1.1. Impact of Immunization Pain on the Child

The impact of the immunization on the child is intuitive and obvious. In multiple studies *(11,12)*, the needle has been shown to be the most powerful negative symbol associated with medical care. Needle phobia is a well-established concern among many children. We now also know, that during infancy children have memory for pain and can anticipate painful procedures if they have experienced them recently *(13)*. Research has also suggested that children react more intensely to new procedures if they have had previous painful procedures without adequate anesthesia. This has been demonstrated with circumcisions *(14)*, painful procedures in the newborn intensive care unit *(15)*, and bone marrow aspirations in older children *(16)*. We also know that there is a wide variation of response to injections among different children and even at different times in the same child.

In an attempt to understand the individual differences among children in response to injections, we studied the impact of a host of variables on the children's response to their 5-year preschool injection *(17)*. At a home visit 1 month prior to the scheduled injection, parents were queried regarding their own attitudes toward pain, their personal experiences with pain, and their child-rearing attitudes. A questionnaire categorizing the child's temperament was also given to parents. Finally, they were asked to predict the degree of distress they felt their child would experience during the injection. Children were also interviewed in an attempt to assess the degree of anxiety about the pending immunization they were experiencing. At the visit to the medical office 1 month later, the child's response to the immunization was assessed using their self-report on the Oucher *(18)*, as well as Visual Analog Scale (VAS) ratings by the parent and provider. In addition, the Procedure Rating Scale *(19)*, which assesses "pain behaviors" was also administered.

This study identified a subset of children—perhaps 10–15%—who displayed significant distress at the procedure and who rated the pain associated with the immunization as "the most pain imaginable." Surprisingly, parental characteristics and attributes did not predict children who experienced the most distress. The strongest predictor was the parent's rating of the child's temperament. In particular, children who have more "difficult" temperamental styles have more distress. The trait of adaptability correlated most strongly with distress: the less adaptable, the more distressed. Also, parents were able to predict how their child would react to the injection. Others *(20,21)* also identified the important role of temperament in defining children's response to painful procedures.

2.1.2. Impact of Immunization Pain on the Family

It is not only the child who is concerned about immunization pain. Meyerhoff et al. *(22)* attempted to quantify parental concern about immunization pain using a methodology entitled *willingness to pay*. Their group asked families how much they would be willing to pay to eliminate the discomfort associated with immunization pain. Parents, regardless of socioeconomic level, stated that they would pay "on average" $57 to eliminate the pain of a two-shot visit and $80 to eliminate the pain of a three-shot visit. Regardless of the specific numeric value and whether, in fact, parents would actually pay the amount they implied they would, this study clearly suggested that parents have concerns about the distress associated with immunization and desired, if possible, to ameliorate some of that discomfort.

There is other evidence that parents have significant concerns about immunization pain. Reis *(23)* suggested that parental concern about injections may well have an impact on their compliance with medical care in infancy. New work using functional magnetic resonance imaging (fMRI) technology supports the depth of parental distress. Singer et al. *(24)* proposed the notion of pain empathy. They examined fMRI data in individuals experiencing pain and compared that with fMRIs of those individuals when witnessing a loved one experience pain. They found that the structures involved in the emotional aspect of pain (the bilateral anterior insula, rostral anterior cingulate cortex, brain stem, and cerebellum) were activated similarly both in individuals who were subjected to painful experiences and in those who were witnessing a loved one being subjected to a painful experience. The emotional aspect of pain was identical in both individuals. The brain structures associated directly with the sensory experience of pain (posterior insula, somatosensory and sensorimotor cortex, as well as the caudal interior cingulate cortex) were only activated in the individuals who were directly subjected to the painful experience. They interpreted this data to suggest that the response of an individual observing a loved one experience pain was almost identical to the emotional aspect of pain in the individual receiving it. Certainly, the case can be made that parents experience profound emotional distress when witnessing their child experience the discomfort of an immunization, especially because they are helpless to protect the child from this pain or to ameliorate it once it has occurred.

2.1.3. Impact of Immunization Pain on the Provider

Not only the parents and the child are distressed by the pain associated with immunizations; the health care provider is distressed as well. Woodin et al. *(25)* evaluated the impact on providers of giving multiple injections. In an article, "Are Children Becoming Pincushions?," they identified that 65% of physicians reported strong concerns about administering four injections to infants at one visit. More than 80% of physicians had strong concerns about giving multiple injections in general. In fact, physicians were more likely to be troubled than parents about the number of shots that they are expected to administer under the current immunization schedule. Reis *(26)* reported that physicians were six times less likely to give all the immunizations at a visit if three or more were scheduled than if two or fewer were scheduled.

It is obvious, therefore, that children, parents, and health care providers all have strong concerns about the pain engendered by immunizations. Despite this concern and the frequency with which immunizations are administered, there has been strikingly little research on reducing immunization pain. Although the literature is limited, the following components of injection pain are reviewed: prior to the injection (these are preparation and education), selection of the appropriate site and needle gage, and injectate properties and administration technique; during the injection, we review securing the child, use of nonpharmacological strategies, local anesthetic, and physical approaches.

2.1.4. Prior to the Immunization

2.1.4.1. Preparation

Preparation of the child and his or her family is an essential aspect of pain reduction. If parents are less anxious, they can convey that to the child, which may have a positive impact on the child's perception of the painful stimulus. There is a well-established relationship between anxiety and increased pain perception. Parents should be informed of the reason for the injection and its potential value to their child. There should be realistic discussion about the pain associated with it and the potential complications of the injection. Parents should be queried regarding their perception of their child's coping style (information seeking or avoidant). This may help the provider in subsequent discussions with the child. Finally, parents of toddlers, preschoolers, and school-aged children should be offered some distraction techniques that they can use for this and for subsequent procedures. These may include reading or telling favorite stories, breathing, and blowing techniques.

Regarding preparation of the child, there is amazingly limited research available to guide practice. Obviously, the type and extent of preparation should be based on the child's age and developmental level. In general, content has more relevance for children over the age of 2 years. Toddlers and preschoolers should be informed of the procedure as close to the time it will occur as possible. Most authorities suggest that preparation for all procedures should include at least two elements *(27,28)*: (1) what will happen (that is, what exactly will be done, how long it will take, etc.) and (2) how it will feel (i.e., the coolness of the alcohol swab, the pinch of the needle, etc.). It also may help for children to be asked what strategies they believe will help them effectively deal with the procedure.

2.1.4.2. Selecting the Appropriate Site

In general, there appears to be some agreement regarding the site at which intramuscular injections should be administered. Consensus statements from major professional and educational organizations suggest that the anterior lateral thigh should be used in infants, and the deltoid muscle should be used in older toddlers and preschoolers *(10,29–31)*. These sites have been selected for theoretical reasons, and although there is much anecdotal literature to support their appropriateness, the research literature on site selection is scant. The anterior lateral thigh was selected because it is a relatively large muscle and free of vital structures that might be injured during the injection. When the changeover should occur to the deltoid is clearly controversial. In the one article that examined this topic, Ipp and colleagues *(32)* suggested that by 18 months severe pain was identified in 30% of children injected in the thigh, but in only 8% of those injected in the arm. They also stated that 50% of children had decreased movement and ambulation when injected in the thigh at 18 months; in fact, two-thirds of that group limped for 24–48 hours following immunization. This was compared with 35% of children who had decreased arm movement when injected in the deltoid. They did report that there was more swelling and redness in the deltoid group. They suggested it is logical to change to the deltoid at 18 months based on these data.

Others disagree, however. The Los Angeles Department of Public Health *(31)* suggested that 36 months is a more appropriate time to change. The American Academy of Pediatrics *Red Book (10)* is nonspecific and suggests 18 months as the appropriate time to change sites.

Despite the limited evidence to guide practice, it is generally agreed that in young children up to 18 months, the anterior thigh (vastus lateralis) is the appropriate site for intramuscular injections, and a point between 18 and 36 months is the appropriate time to rotate to the deltoid muscle. There are unique situations in which the upper outer quadrant of the buttocks may need to be used, particularly when large volumes of injectate are necessary, such as for immune globulin. If this site is used, care must be taken to avoid injuring the sciatic nerve.

2.1.4.3. Needle Length

As with selection of the most appropriate site, there has been little research directed toward identifying the ideal needle length. Although it may appear intuitive that the shorter the needle is, the less pain there will be, in fact it appears that the opposite is true. Shorter needles seem to be associated with increased redness and swelling. The length of the needle chosen, however, obviously depends on the size of the child, as well as other technical variables associated with immunization technique, such as whether the skin is bunched or stretched taut. This issue is complicated by a number of contradictory studies. Diggle and Deeks *(33)* randomly assigned a sample of 4-month-old infants scheduled to receive their diphtheria–tetanus/*Haemophilis influenzae* type b vaccine in the anterolateral thigh to receive their immunization with either a 16-mm (5/8-inch) or a 25-mm (7/8-inch) needle. Over half of the infants vaccinated with the 16-mm needle developed redness and swelling initially; only one-third of the group injected with longer needle did. This distinction persisted and in fact increased by 3 days.

Two additional studies, however, called these conclusions into question. Studies by Cook and Murtagh *(34)* and Groswasser et al. *(35)* used ultrasonographic techniques to measure the subcutaneous tissue and muscle layer thickness of 2-, 4-, 6-, and 18-month-old children. Both studies identified that the shorter needle was adequate and would deposit drug in the muscle and not subcutaneous tissue if the skin was held taught and not bunched. The available data, therefore, are somewhat confusing. Zuckerman *(36)* has suggested the need for individualization of needle length based on patient size and injection technique.

In summary, it appears that in larger infants or if skin bunching is used, a longer needle is appropriate. The *Red Book* suggests needle length of 7/8 to 1 inch for infants, toddlers, and older children and 1–2 inches for adolescents and adults. There seems to be no reason not to support this suggestion. In a related matter, it had previously been suggested that aspiration of the plunger once the needle has been inserted into the muscle was important. The most recent edition of the *Red Book* suggests that the evidence for this practice is nonexistent and suggests that it is no longer necessary *(9,10)*.

2.1.4.4. Injectate Properties

In addition to the site and needle length, the properties of the injectate itself have an impact on pain. The pH of the injectate, temperature of the injectate, and type of diluent all may alter the distress associated with the immunization. Although there are very few studies that examined these factors directly for immunizations, these variables have been examined during other types of injections and may, by extrapolation, ultimately have implications for immunization pain reduction. Certainly, specific research will be necessary before any formal integration of these constructs can be endorsed.

The only studies of injectate qualities that are directly relevant at present are those that have looked at pain associated with the measles–mumps–rubella (MMR) vaccine. There have been two studies at this time *(37,38)* that have compared the traditionally administered MMR-2 vaccine with alternative immunizations (Pluserix and Priorix). Both of these vaccines appear to have a higher pH than the MMR-2. The data from Lyons and Howell *(37)* suggested that children were at least twice as likely to cry when given the MMR-2 as those given the Pluserix. Ipp and colleagues *(38)* conducted a study using VAS scores by parents, as well as videotapes of infant pain expression and pain behaviors while receiving their injections. They likewise reported a dramatic difference between the two types of immunization, with the Priorix inducing far less discomfort than the MMR-2.

Other features of the injectate may also help reduce the pain of immunization, although they have not been formally studied in this context. Based on studies of lidocaine injection, it appears that a warmer injectate causes less pain than a cold injectate *(39)*. A study by Maiden and colleagues *(40)* on temperature and immunization pain, however, called this previous work into question. They evaluated the pain of individuals over the age of 16 years who required an adult diphtheria–tetanus vaccine. The patients were randomly assigned to receive cold vaccine, rubbed vaccine (rubbed between the palms for 1 minute), or a vaccine warmed to 37°C. They found no difference in the pain scores in these groups. The role of temperature of the injectate on pain surely requires further study and may ultimately have relevance.

Another area that has not been studied for immunization pain but may also be valuable is the type of liquid used to dilute the vaccine. Because a number of these agents are not premixed (MMR, varicella, *H. influenzae* type b), it may be worthwhile to examine the use of lidocaine as a diluent instead of sterile water. It may be inferred from the work of Schichor et al. *(41)* that lidocaine may reduce injection pain when used as a diluent instead of sterile water. Their group compared the use of sterile water with lidocaine as a diluent for ceftriaxone injection and found dramatic differences initially, at 4 hours, and at 24 hours in the associated discomfort. Amir and coworkers *(42)* reported similar results when using lidocaine as a diluent for benzinathine penicillin.

2.1.5. During the Immunization

A number of strategies can be used during the injection itself that may have an impact on the pain that it produces. These include parental demeanor during the injection, the use of nonpharmacological strategies, such as distraction, as well as the use of physical strategies, such as pressure and sucrose.

2.1.5.1. Parental Demeanor

The role of parental attitude and demeanor has emerged as a critical factor in the reaction of children to immunizations. Although it seems somewhat anti-intuitive, excessive reassurance in which parents beg, plead, negotiate, or seem to apologize for the immunization is far more likely to cause distress than a more neutral response *(43,44)*. Children appeared to identify parental ambivalence toward the injection in that response pattern, and this may fuel in them an increased distress response with the hope that it can somehow cancel the immunization. It appears that a more appropriate role for parents is that of "coach" *(45)*. In that capacity, they can help their child by using distraction and other strategies that promote relaxation and active coping as compared with expressions of reassurance and sympathy, which are passive in nature and do not help with mastery.

2.1.5.2. Distraction and Breathing

Depending on the child's age, a number of techniques are available to help relax and distract the child. In infancy, distraction may consist primarily of stroking, soothing, and softly talking to the child. In older children, however, a number of more formal strategies have been identified as effective, starting in children as young as 3 years *(46–49)*. Breathing techniques include deep breathing, blowing away shot pain through the use of pinwheels, party blowers, or bubble solution, and snake breathing (a hissing sound). Distraction techniques that have been examined include reading a favorite book to the child, listening to music, telling familiar stories, or using visual imagery to describe a favorite place and involving the child in that description *(50–52)*. Hypnosis is the more active involvement of the child in a fantasy and involves reframing the experience. These techniques are described extensively in many review articles *(53–55)*, but it is quite clear that these behavioral/cognitive techniques are well supported by evidence-based research. Factors that promote the successful use of these techniques include their developmental appropriateness for the child, matching the technique with the unique attributes and personality of the specific child, and the child's willingness to practice them at times other than immediately preceding the immunization.

2.1.5.3. Local Anesthetics

A number of local anesthetic agents have been used during immunizations *(56–58)*. Although the depth of anesthesia that they provide varies from quite superficial for some of the refrigerant sprays to 8–9 mm for iontophoretic lidocaine, they all have a benefit of at least reducing the pain of needle insertion. Some of these agents also reduce pain subsequent to the injection itself. Eutetic mixture of local anesthetics (EMLA), amethocaine, and vapocoolant sprays have been studied specifically for reduction of injection pain. EMLA has been shown to reduce pain during the injection itself and up to 24 hours after the intramuscular injection. Both amethocaine and vapocoolant sprays have efficacy during the injection but have not been studied over the subsequent 24 hours.

There are at present a number of local anesthetic delivery systems in development (iontophoretic, heat-, and pressure-assisted delivery) that expedite the onset of anesthesia and may be more practical in the busy ambulatory setting. In general, it does appear that both refrigerant sprays and other topical agents (amethocaine, lidocaine) help somewhat with the immediate pain of injection, but refrigerant sprays may not have the prolonged analgesic benefit of the other agents.

Each practice, based on time and financial constraints, will decide on the routine use of local anesthetics for intramuscular injections. Clearly, however, for children who have developed needle phobia, the use of these agents coupled with behavioral/cognitive strategies is indicated. For other children, this remains an area of ongoing debate and evolution.

2.1.5.4. Sucrose

Although sucrose or other sweetened liquids have been used empirically in infants to reduce the pain of procedures (e.g., a sip of wine following ritual newborn circumcision), it has only been relatively recently that this area has been formally studied. In articles by Blass and Hoffmeyer *(59)* and Barr et al. *(60)*, sucrose reduced pain associated with medical procedures (heel prick, venipuncture, circumcision) in newborns. This effect has been demonstrated in newborn infants and remains in effect for infants as old as 6 months. Sucrose has essentially no efficacy in infants older than 6 months. Investigators *(61)* have determined that, at least in part, sucrose reduces pain through stimulation of opioid receptors much as the administration of an opioid antagonist, such as naloxone appears to reverse its efficacy. Traditionally, a 24% solution of sucrose has been used, but other agents (glucose) and other concentrations have been successfully used as well.

2.1.5.5. Site Pressure

Pressure at the site of injection is another strategy that has been used empirically. This concept is at least somewhat explained by the gate control theory of pain, which posits that by flooding a painful area with a non-noxious stimulus, the intensity of the painful stimulus will be reduced. Barnhill and colleagues *(62)*, in an article on adults scheduled to receive an injection, reported that those who received 10 seconds of direct pressure at the site just prior to the injection experienced a modest but statistically significant reduction in pain compared with those who did not receive site pressure. This work was replicated by Chung et al. *(63)*.

Using that basic principle, a device known as the ShotBlocker was developed. This device is a horseshoe-shaped plastic sheet with tufts on one side. It is used to provide pressure around the injection site. There are a number of unpublished studies that support its efficacy (Guevarra AD; and Gundrum T, Sherman C, and Ruhlman S, unpublished data), some with school-aged children and with adults, although some are unpublished, and their methodologies are significantly flawed.

2.1.5.6. Technique During the Injection

As with other aspects of immunization pain, there has been extremely limited research on the technique used to administer the injection. In general, it appears that a fast, darting motion at an angle of 90° is endorsed by most authorities for intramuscular injection. A 45° angle is appropriate for subcutaneous injection.

Likewise, there is limited literature on how a child should be restrained, in what position the child should be held, and who should do the holding during the injection. In general, young infants should be held so that a thigh is exposed, and if at all possible, the child should be positioned so the muscles relax. Often, this involves having the parent hold the child in his or her lap. Older children can either sit in the parent's lap facing the parent and with their legs wrapped around the parent (the so-called big hug) or can sit forward-facing. Either way, the deltoid should be exposed, and the muscle should be relaxed. Some parents are unable or unwilling to be involved in restraining their child, and if personnel allows, this preference should be respected.

In these days of multiple injections, there has been a debate about whether multiple immunizations should be given simultaneously or sequentially, one following the other. There have been two studies that have examined this question: one in infants and one in older children *(64,65)*. Both of these studies essentially came to the same conclusion: there is no obvious decrease in discomfort in the child if the immunizations are given simultaneously as compared to sequentially, although maximal heart rate did increase in sequential administration in infants. In both studies, however, parents seemed to prefer simultaneous administration if at all possible.

2.1.5.7. Summary

Despite the frequency of intramuscular injections in children, there is a striking lack of research to support strategies aimed at pain reduction. In general, it does appear that advance preparation has some value as does the active involvement of the parents as distraction coaches. Distraction techniques should be geared toward the individual child's development and personality. An appropriate needle length and site should be used. Local anesthetics should be used based on practice logistics and previous reactions of the child to immunization. In general, sucrose should be used for infants; for in toddlers, preschoolers, and school-aged children, distraction techniques and pressure are appropriate.

2.2. Pain Associated With Common Infections

2.2.1. Otitis Media

Otitis media is the most frequent illness diagnosis made in pediatric practice for children younger than 15 years old. By 1 year, 60% of children will have been diagnosed with otitis media, and by 3 years of age, 80% of children will have had at least one episode *(66)*. In a survey by the Centers for Disease Control and Prevention in 1990, otitis media was the primary diagnosis at

24.5 million visits to the doctor *(67)*. Paradise et al. examined the records of more than 2200 Pittsburgh area infants and found antimicrobial therapy for otitis media was prescribed on average for 41 days of the first year and 48 days of the second year *(68)*.

Despite the frequency with which otitis media is diagnosed and the vast amount of antibiotics prescribed for it, there is a striking lack of data on the extent of pain associated with otitis media and the appropriate treatment of that pain. Otalgia is a frequent presenting symptom associated with otitis media. There are many pain-sensitive structures in the ear, such as the tympanic membrane, the periosteum, and the mucoperiosteum. It is logical to assume that perturbations of the ear would result in discomfort.

The role of antibiotics in the treatment of otitis remains an area of significant controversy, as does their impact on pain. Despite an increasing wealth of data, the interpretation of that information remains variable. It appears that, in randomized clinical trials, approx 60% of children with otitis media treated with either antibiotics or placebo were pain free at about 24 hours. Between 2 and 7 days after presentation, 14% of the placebo group continued to have pain; only 6% of the antibiotic group had pain. Although this difference is statistically significant and represented a 41% improvement in that antibiotic group, its clinical relevance is questionable *(69)*. To prevent 1 child from experiencing pain at 2–7 days after otitis has been diagnosed, 17 children must be treated with antibiotics. Therefore, although the impact of antibiotics may not be dramatic, they do appear to have at least a modest impact on the pain associated with otitis media. In an exchange of letters in response to an article by Damoiseaux *(70)* on antibiotics and otitis media in the *British Medical Journal*, many respondents suggested that although antibiotics may have a minor role in pain reduction, local analgesia and systemic pain relief were at least as helpful, and research was required to identify how their use could be optimized *(71)*.

There have been very few studies looking specifically at analgesic use in otitis media. Bertin et al. *(72)*, in the only randomized, double-blind, placebo-controlled trial of analgesic usage in otitis media, reported that for dosing at three times daily, pain persisted in 7% of the children with ibuprofen, 10% with acetaminophen, and 25% with placebo. Although not statistically significant, their data implies that nonsteroidal anti-inflammatory agents are probably more effective than acetaminophen for this common pain problem. Fixed preparations of acetaminophen and opioids, such as codeine, are often recommended for more pronounced pain in otitis media, although their use has never been formally studied. Hauswald and Anison *(73)*, however, in an interesting study of emergency room physicians, reported that they were more likely to prescribe narcotic analgesics for adults with severe pain associated with otitis media that prevented them from sleeping than they were for children with the same clinical picture. This study suggests the continued bias toward undertreatment of pain in children compared with adults.

It has long been known that local treatment of ear pain has benefits. Warm compresses to the ear and warmed olive oil instilled in the ear have also been used for many years. A number of articles have looked more formally at these approaches. Sarrell and coworkers *(74)* looked at advocacy of naturopathic extracts in the management of ear pain associated with acute otitis media. They found a naturopathic herbal extract reduced ear pain at least similarly to an anesthetic ear drop group. Another local treatment, Auralgan, a mixture of antipyrine, benzocaine and oxyquinolone, and glycerin, has also been shown to be effective 30 minutes following instillation *(75)*.

The area of pain management in otitis media remains controversial. There is still ongoing debate about whether antibiotics should be prescribed, although at best their impact on pain reduction is only modest. If prescribed, they should be prescribed simultaneously with analgesics, primarily a nonsteroidal anti-inflammatory drug (NSAID), such as ibuprofen. Consideration of some type of local treatment should also be entertained.

2.2.2. Pharyngitis

Acute pharyngitis is another common cause of physician office visits for children as well as adults. Pain associated with pharyngitis is variable. Of pharyngitis in children, 15–30% is secondary to group A streptococcus, and it does appear that this etiology is associated with significant pain *(76)*. In a study of all causes of pharyngitis, 80% of individuals with streptococcal pharyngitis rated their pain at least 4 out of 5, whereas those with throat pain that was nonstreptococcal in origin reported significantly less pain *(77)*.

Despite this level of discomfort, major clinical reviews of acute pharyngitis often ignore the substantial pain associated with it. In fact, Sagarin and Roberts *(78)* responded to a primary care review of acute pharyngitis in the *New England Journal of Medicine (79)* with their concern over the limited importance assigned to the assessment and management of the pain, usually the presenting symptom, in that review article. They stated that patients with pharyngitis typically come to the physician for relief of pain associated with swallowing, yet clinicians typically ignore the main reason why they have sought treatment and prescribe antibiotics, which will be of little immediate help and essentially no help if the pharyngitis is nonbacterial in origin.

For the most part, pharyngitis is a self-limited condition. After 1 week, 90% of individuals will be well, whether or not antibiotics were prescribed regardless of the origin of the pharyngitis *(80)*. It does appear, however, that for individuals with proven group A streptococcal pharyngitis, the period of pain that they experience is reduced with appropriate antibiotic therapy. For patients who have a sore throat without evidence of streptococcal pharyngitis, antibiotics have minimal effect on pain reduction.

There has been extremely limited research on the use of analgesics in pharyngitis. In one study *(77)*, ibuprofen was compared with acetaminophen and placebo. At 48 hours, pain had resolved in 80% of the patients who were on around-the-clock ibuprofen, 70% of the patients on around-the-clock acetaminophen, and 55% of patients who took placebo. Acetylsalicylic acid (or aspirin) has also been widely used for pain treatment in this condition for more than 100 years. In a double-blinded, placebo-controlled study by Eccles et al. *(81)* in adults, treatment with aspirin was found to provide relief from sore throat pain. Moore and colleagues *(82)* compared the tolerability of ibuprofen, aspirin, and acetaminophen for 7 days in patients with mild-to-moderate pain resulting from sore throat. They found 12% incidence of side effects in the ibuprofen and acetaminophen groups and a higher percentage—almost 16%—in the aspirin group. Of course, aspirin is not appropriate for use in children because of its relationship to Reye syndrome.

A number of articles have looked at the use of steroids in addition to antibiotics for severe sore throat pain. Marvez-Valls et al. *(83)* and colleagues reported on adults who presented to the emergency room with acute exudative pharyngitis. They were given an intramuscular injection of benzathine penicillin and randomly assigned to either a placebo injection or an injection of betamethasone. Those in the betamethasone group had significantly lower pain scores at follow-up 24 and 48 hours after the visit. In a similar study by Bulloch and coworkers *(84)* looked at children 5–16 years old who presented with acute pharyngitis; the children were randomly assigned to either oral dexamethasone or a placebo for pain control. In the group of children in this study who had antigen-positive streptococcal pharyngitis, the median time to clinically significant pain relief was 6 hours in the dexamethasone group vs 11 hours in the placebo group. Complete pain relief occurred at essentially the same time, about 40 hours for both groups. They suggested that the use of dexamethasone offers only limited benefit for this population.

There are a host of local treatments that have been used to improve the pain associated with pharyngitis. These include a number of local anesthetic sprays, lozenges, and gargles. At present, none of these have been rigorously investigated.

In summary, it appears that antibiotic prescription may decrease pain associated with group A streptococcal pharyngitis. Analgesics are somewhat effective as well, with ibuprofen trending toward more efficacy than acetaminophen. The role of steroids remains controversial. Local anesthetic treatments certainly should be tried, although it is difficult to recommend one specific therapy over another given the lack of evidence.

2.2.3. Pain in Viral Mouth Infections

Herpetic gingivostomatitis and herpangina are relatively common viral infections that affect infants and young children. They both cause mouth ulcers associated with significant discomfort and lead to anorexia and dehydration because of the child's unwillingness to eat or drink.

Herpetic gingivostomatitis presents with lesions on the gingiva and palate. The gingiva are red and edematous and have yellow vesicles that are often surrounded by a red halo. Herpangina, which is caused by a coxsackie A virus, presents with lesions more posteriorly placed in the mouth, in the oropharynx and posterior oral cavity.

A number of systemic treatments have been attempted for these conditions. Acyclovir has been shown to shorten the duration of lesions, as well as the duration of fever in some children *(85)*. It also may decrease eating and drinking difficulties in children who have had gingivostomatitis symptoms less than 72 hours. Other systemic strategies include the use of analgesics, either ibuprofen or acetaminophen with codeine. Children should be offered only a bland diet, avoiding irritating foods that are acidic. Dehydration should be avoided. Sometimes the use of a straw, which reduces the surface contact area with the liquid, may be helpful.

A number of local strategies have been traditionally used for viral mouth ulcers. "Magic Mouthwash" has been advocated for this condition, although its support is purely anecdotal. Magic Mouthwash consists of an agent with local activity mixed in a one-to-one concentration with agents that adhere to the ulcer *(86)*, for example, diphenhydramine plus kaopectate in a one-to-one solution.

Medications designed to help heal ulcers, such as sucralfate, have also been suggested, although there is no published literature on their use for viral mouth infections *(87)*. A mixture of polyvinyl pyrrolidone plus hyaluronic acid, marketed as Gelclair®, has been developed for pain associated with chemotherapy-induced mucositis. Innocenti et al. *(88)* reported on 30 adults who had a dramatic decrease in the pain associated with mucositis (VAS scores from 8.1 to 0.63). This product or a modification of it may ultimately have efficacy for some of the childhood viral mouth infections, but it cannot be recommended at this time.

Finally, the use of a local anesthetic agent, such as viscous lidocaine 2%, has been recommended for herpetic gingivostomatitis. This compound contains 100 mg lidocaine per 5 cc. Because a toxic dose of lidocaine is 4–5 mg/kg, it is important the product not be swallowed in large amounts, especially in infants and young children. There have been reports in the literature of significant problems associated with this compound when used inappropriately *(89)*. It is to be used when children are able to "swish and spit." If used in younger children, it should be applied with an applicator directly to the lesions.

In summary, viral mouth infections remain a significant source of distress for children. Antiviral agents may provide some relief, but systemic analgesics coupled with local treatments are the mainstay of pain relief at this time.

3. Chronic Pain

There are a number of chronic pain syndromes commonly seen in pediatric offices and clinics. Chronic pain is traditionally defined as pain existing recurrently or consistently in the previous 3 months *(8)*. The American Pain Society has added to that definition that chronic pain, in contrast to acute pain, rarely is accompanied by autonomic arousal *(90)*. Chronic pain is a remarkably frequent occurrence in children and has an overall prevalence ranging between 15 and 25%. Girls tend to have more chronic pain than boys (30 vs 19%). Chronic pain in childhood seems to peak between 12 and 15 years, but it is still significant in children as late as 16–18 years *(91)*.

Typical chronic problems are headache, abdominal pain, and limb pain. Of children who report chronic pain, 50% have pain in multiple sites, and the incidence of multiple pain sites increases with age. In children who have multiple pain sites, the most common combination is headache and abdominal pain, which occurs in 25% of all cases *(92)*.

Chronic pain has a significant impact on the child who experiences it, as well as on his or her family and on the health care system. For children, there are often problems with adjustment, school performance, and social skills as they are removed or remove themselves from the social arena because of discomfort *(93)*. School performance suffers as well, and school absenteeism is frequent. In particular, children with headache, irritable bowel syndrome, and widespread musculoskeletal pain are frequently absent from school. School absenteeism places a burden on parents, who often must miss work as a result. This may have significant economic impact on the family, which further exacerbates the family stress and discord that often accompany chronic pain.

Perquin and colleagues *(94)* examined the impact of childhood chronic pain on the health care system. Of the 25% of survey respondents who reported chronic pain, 57% of that group required physician consultation, and 39% were on continuous medication. They did not address the economic impact of hospitalization, ongoing diagnostic evaluation, or other interventions for this population.

The evaluation of chronic pain often falls on the already-burdened shoulders of the office-based practitioner. The evaluation and management of these problems is often complex and time-consuming. Elaborate algorithms have been developed to address the very lengthy list of potential etiologies for these problems. Physicians often fear that, despite extensive evaluation, an organic explanation may be uncovered in the next series of investigations. It is hard as a result to draw the diagnostic "line in the sand" when it is felt that enough investigation has already occurred. Physicians will often state that "for the sake of completeness" they will continue investigating the problem even though they genuinely believe that the symptom is unlikely to have a defined organic explanation. Families perceive this continued investigation as evidence of a lurking organic explanation that is yet to be uncovered, and they press the physician for even further testing or search for another physician who will orchestrate additional and often more invasive investigation. When extensive and expensive testing does not yield a conclusive explanation, the physician will often designate the symptom as "psychosomatic" or "functional," attributions that are usually unhelpful and often inaccurate. The art of medicine in this area is identifying the red flags in the history, physical, and initial laboratory investigations that suggest that additional investigation might be warranted on the one hand while not extensively overmedicalizing the problem on the other. During this period of evaluation, which Eccleston has called a "diagnostic vacuum" *(95)*, the child's pain should be treated.

Detailed discussion of the evaluation of each of the common chronic pain problems (abdominal pain, back pain, headache, limb pain, widespread musculoskeletal pain) is significantly beyond the scope of this chapter, and there are excellent review articles available. In addition to the typical aspects of the history and physical that are considered for each of these pain problems, a few aspects of the routine evaluation that are not often discussed but may yield additional information deserve emphasis.

From the biological side, hypermobility frequently co-occurs with many types of chronic pain, especially limb, back, and widespread musculoskeletal pain *(96,97)*. Although the nature of this relationship (causation vs correlation) is not certain, using a Beighton scale *(98)* or other measure to identify hypermobility often yields positive results and may offer a hypothesis for the etiology of the child's discomfort.

All evaluation of chronic pain should include some psychological assessment. This does not imply causation, but there may be a transactional relationship between chronic pain and anxiety and depression, with pain yielding anxiety and depression and depression/anxiety exacerbating pain. Evaluating the child for these problems should not be perceived as implying a "psychogenic" explanation for the child's discomfort. It should be explained to the family that all pain, particularly chronic pain, has psychological and physiological components. Any comprehensive evaluation and any treatment plan should contain all of those elements.

Along similar lines, the child's school experience should be examined. Learning disabilities and attentional problems not infrequently complicate chronic pain. It is also imperative to discuss social factors at school and inquire about bullying. These factors should not be construed as the "cause" of the pain *per se* but may have a role in amplifying the child's interpretation of the pain signal. All pain is, of course, the composite of the nociceptive input and the interpretation of that input.

There are a number of general principles about the treatment of chronic pain as well. Again, these should be considered along with the specific strategies for the particular pain problem. Treatment should be multimodal from the outset, as almost all pain problems have biological, psychological, social, and educational components. When dealing with chronic pain, success should be measured not only by decreased pain intensity ratings, but also perhaps more importantly by improved function. This may include mood, activities of daily living, school attendance, involvement with friends, "joie de vivre," sleep, appetite, and so on. These functional markers are a more sensitive indication of improvement than self-reports of pain intensity, which may not decrease initially.

A critical aspect of treatment for all chronic pain problems is the initial explanation to the child and family. It is important to convey the message that the clinician is familiar with the symptom complex that the child has, and that it is not life threatening, even if the exact problem is not clearly defined. Most important, we help them distinguish the notion of "hurt" from the notion of "harm" *(99)*. We explain that, in chronic pain, the protective or warning function of the pain message that is the hallmark of acute pain is no longer operative.

Chronic persistent pain does not imply that progressive damage is occurring, as might be expected with acute pain (e.g., if we leave our hand on a stove or walk on a broken leg). It is critical for parents and children to understand this for a number of reasons. First, it may reduce the urgency that parents feel to identify the exact cause of the problem. Second, many of the treatment strategies used for chronic pain may in fact require the child to experience a slight increase in discomfort in the short run (physical therapy, school attendance, social interaction). Parents may be far more willing to comply with requests to encourage normal behavior if they do not feel that this will cause further deterioration.

At the outset of treatment, parents should be informed that the child will be monitored carefully through scheduled follow-up visits. It is reassuring to families and validating that, even if a potential biological explanation for the child's discomfort was not identified initially, a system of monitoring is in place to identify changes in symptoms that may imply the need for alternative investigations or treatments. This has been labeled "watchful waiting" *(100)*; obviously, if a pain problem does not evolve or change significantly over time, it strongly mitigates against an ongoing progressive disease.

Monitoring of symptoms can be aided through the use of a symptom diary. This allows the child to participate in his or her own care and alerts the clinician to new or changed symptoms. It can also be used to monitor the success of the intervention. It is important that the focus of the diary be on symptoms and function (mood, time with friends, school attendance) and not solely on pain intensity ratings, which are often unchanging.

Individuals with chronic pain often have problems sleeping *(101)*. Attention to sleep hygiene should be given, and medications should only be used when necessary. Amitriptyline, which may be effective in the treatment of neuropathic pain, has the useful side effect of sedation, which helps with sleep onset. Melatonin and trazodone may also be beneficial.

A number of other medications may be helpful, but it is important not to overmedicate children with chronic pain. Depending on the nature of the pain, NSAIDs may be used around the clock or as needed. Tramadol is often helpful for more severe pain, and tricyclic antidepressants may be beneficial in widespread pain or pain that may have a neuropathic component. Obviously, medications for specific pain problems may have value, such as NSAIDs plus caffeine for headache or famotidine or pizotifen for abdominal pain *(102)*.

Physical therapy is often the cornerstone of the treatment of chronic pain *(103)*. Interventions include general conditioning for problems like fibromyalgia, desensitization for reflex sympathetic dystrophy, and stretching or strengthening particular muscle groups. In addition, therapy such as transcutaneous electrical nerve stimulation, heat, and massage may benefit certain pain problems. There has been limited controlled research in this area, but anecdotally a graduated physical exercise program appears to be an important intervention in the treatment of many chronic and persistent pains. Whether this represents the impact of the therapy itself, the ongoing relationship with a helping, caring professional, or improvement in self-efficacy when success is achieved is unclear. Regardless, there are reasonable data to suggest that physical therapy is essential for the adequate treatment of chronic and persistent pain.

Likewise, cognitive-behavioral strategies are also valuable and are indicated for all pain problems, regardless of origin *(104,105)*. These strategies are often helpful during acute pain suffering, and there are limited data on their efficacy for chronic pain, although anecdotally they seem to be effective. Strategies include meditation, distraction, use of biofeedback, and hypnosis. They may be taught by the primary care provider, a psychologist, or another skilled individual. If possible, this should occur during relatively pain-free periods and not in the middle of severe pain episodes.

Parents have a critical role in decreasing chronic pain. They need to encourage normal behavior and deemphasize responding to pain escalations. This can be done sympathetically without appearing to ignore the pain, but by positively emphasizing the virtue of coping, parents can encourage children to practice cognitive behavioral strategies and can function as a coach emphasizing those strategies during painful episodes or procedures.

Attention to schoolwork and attendance is critical as well. In children with chronic and persistent pain, development of a modification program may be necessary. In the United States, this program is sometimes known as a 504 plan and stems from the Rehabilitation Act of 1973. The program should be tailored to the child's specific needs and may allow for alterations in the length of the schoolday as well as modifications of homework volume. Regardless of the program, school attendance should be mandatory, and if the child has not been attending school for a time, graduated reentry with supportive tutoring can be developed. In such a situation, the school nursing office can be a sanctuary and temporary refuge where the child can rest and be removed from the stress of school. It is sometimes helpful to develop a "script" for the child to use on reentry to school and to offer specific phrases to use when other children ask about his or her absence.

Specific criteria for staying home also need to be developed. Parents need to be as consistent as they possibly can in this area. For example, children should go to school every day unless they have a fever. This eliminates the inevitable parental vacillation, which is quite common in children with chronic pain. Each morning, parents must try to assess the child's level of comfort and disability when confronted with the child's report of escalating discomfort. Such a plan gives parents criteria by which they can make informed decisions regarding school attendance.

In general, the overall approach to chronic pain in the primary care setting is to evaluate the history, physical examination, and screening laboratory assessments for red flags that might suggest organic disease. Testing should be kept to a minimum unless there are specific indications for additional tests. The child and family should then be informed that no progressive illness was identified, and that the child's clinical picture is similar to many other children. Regardless, families should be reassured that the child will be carefully monitored over time. The primary care provider needs to keep a positive attitude and needs to function as a cheerleader, reinforcing any successes that the child may have. Frequent follow-up visits should be scheduled so that the family can feel comfortable that evolving organic disease will not be missed. Typical interventions include physical therapy and cognitive/behavioral strategies with medications targeted to specific symptoms. Success should be monitored by improvement in function and not specifically through reduction in pain intensity scales.

4. Conclusion

Despite its frequency, pain in the pediatric office has been grossly under-researched. It does appear that simple changes can yield a significant reduction in pain in that setting. The pain of immunizations can clearly be reduced through the selection of the appropriate site and needle, through the routine use of physical and psychological techniques, and through the use of local anesthetics. Reduction in immunization pain may increase compliance with subsequent immunizations and decrease anticipatory anxiety over future visits to the doctor.

Pain associated with common infectious diseases, such as otitis media, pharyngitis, and viral mouth infections, can be reduced with systemic and local approaches.

Chronic pains, such as headache, recurrent abdominal pain, limb pain, and widespread musculoskeletal pain, are also common symptoms presenting to the pediatric office. It is critical that they be investigated adequately to rule out pathological conditions, but not so extensively that they create the impression that there is an underlying medical cause waiting around the next laboratory bend. Treatment usually involves explaining the distinction between hurt and harm, appropriate monitoring, and a cluster of approaches that involve physical activity and cognitive behavioral strategies with analgesics for the occasional severe pain episode.

Even though all pain in ambulatory settings cannot realistically be relieved, merely acknowledging it and attempting to address it is an important first step. Introducing some of the simple strategies discussed in this chapter will go a long way to reassuring the children and families for whom we care that their comfort, as well as their health, is our concern.

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