MANAGING **PAIN** IN CHILDREN AGED UNDER 12 YEARS

"Pain is what the patient says it is". This definition of pain can be applied to any patient, regardless of their age. Good pain management in children involves identifying and assessing the pain, followed by prompt control of the pain through pharmacological management and resolution of the underlying cause. If unmanaged, pain can lead to anxiety and stress, and in the long-term this can impact on the psychosocial health and development of a child. Presentations of pain in children in primary care will generally fall into three broad categories: mild pain associated with childhood conditions commonly treated in general practice, acute trauma and medical situations where referral and stronger analgesia may be required, and management of pain associated with long-term conditions.

Children experience pain in much the same way as adults do, but may manifest or display that pain in a different way. Pain for children is often emotionally complex, and the involvement of parents and caregivers can add to the difficulty of management. These factors, along with a cautious approach to giving analgesia to children, can lead to pain being under-treated in some situations.

Identifying pain involves observing the child's verbal and non-verbal cues and listening to the parent's judgement of the child's pain. The signs and symptoms that indicate pain in children may be different from those seen in adults, and can be counterintuitive, e.g. quietness and withdrawal.

Children presenting with pain in general practice fall into three broad categories:

- Mild, acute presentations of conditions that are associated with pain and can be managed in the community, e.g. otitis media, sore throat and minor trauma
- Acute presentations that require assessment or management in secondary care, e.g. burns, fractures, severe abdominal pain
- Ongoing management of pain associated with long-term conditions, e.g. rheumatological disorders, cancer pain and pain without an identifiable cause, e.g. recurrent abdominal pain

For General Practitioners, the key decision point in an acute setting is: "is this child's pain severe enough to warrant referral"? Depending on the cause, mild pain can usually be managed in the community, whereas moderate to severe pain is best managed in secondary care. If the source of the child's pain cannot be identified, consider referral. In most situations, infants aged under six weeks should be discussed with or referred to a Paediatrician if pain relief is required and there is not an identifiable cause.

Assessing and managing mild pain associated with general illness and injury in childhood

Assess the cause and severity of the child's pain

The aim of assessment of children with mild pain is to identify the location, quality, duration and intensity of their pain.[1] Consider aggravating and relieving factors, and if the child has already taken analgesia, consider the medicine, preparation, dose and effect in relation to current pain intensity.[1]

Self-reporting of pain by the child is the preferred method of assessing the level of pain.[2] From approximately age 18 months, children will have acquired words to express pain, and from age three to four years, children may be able to provide information on the location of pain and describe the characteristics of their pain.[1] However, consider whether the child is competent to provide such information.[2]

If pain has been present for some time, usual behavioural indicators of pain, such as grimacing and crying, may be replaced with abnormal posturing or movement, lack of facial expression or interest in surroundings, quietness, low mood and changes in sleep patterns, appetite or sociability.[1]

The signs and symptoms present will also depend on the physical and emotional state of the child, their coping style and their familial and cultural expectations of pain and illness, e.g. stoicism, hiding pain to avoid parental distress, expressing pain to receive attention.[2]

Pain assessment tools can be considered, but these tools are subjective and may under or over estimate pain. Examples include the Faces scales where the child is shown a series of faces in increasing distress and asked to identify the one they most relate to and the Poker chip tool where the child is given

Non-pharmacological management of pain

Non-pharmacological techniques should be included in the management of children with pain, when appropriate. These techniques are particularly helpful for children undergoing frequent procedures, e.g. IV insertion, burn dressing changes, but they can also be useful in more general situations such as administering immunisations.

Distraction and comfort can be provided by parents with physical touch (e.g. cradling, cuddling), books, toys, singing, storytelling or engaging in conversation. The child should be encouraged to choose the distraction, as this gives them a sense of control and will usually provide better engagement. Education about their illness or injury, such as why it hurts and when it will resolve, is useful in helping both the child and their parents feel more in control. Cognitive behavioural strategies that involve the use of breathing techniques, education and self-regulation have been shown to be effective in providing pain relief on their own or in conjunction with pharmacological pain management.[2]

Rest, ice, compression and elevation ("RICE") and techniques to stabilise an injury, e.g. splinting a fractured limb, will also reduce pain.
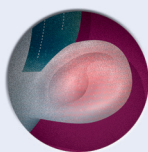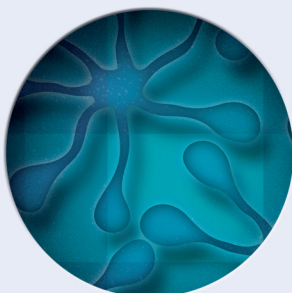
a set of chips that represent "hurt" and asked how many pieces their pain equals. Many of these tools are available online, e.g. www.wongbakerfaces.org

Managing mild pain: Paracetamol and ibuprofen

In most acute childhood presentations associated with pain, analgesia should be used to provide short-term symptomatic relief while the cause of the pain is being investigated and managed, e.g. in a child with stomach pain due to constipation analgesia may be used until laxatives and dietary changes have had time to be effective.

Paracetamol (usually first-line) or ibuprofen are the most appropriate medicines for children with mild pain. These medicines are also commonly used for their antipyretic effect (see opposite). Aspirin is contraindicated in children aged under 16 years.[3]

When prescribing analgesia to a child:

- Calculate dose based on an up-to-date measurement of weight and then double-check the calculation
- Check that the prescribed strength of liquid is as intended
- Check that the total volume of medicine does not exceed what is required
- Ensure the child is not being given any over-the-counter medicines that also contain the prescribed medicine

If pain is constantly present, analgesics should be administered on a regular schedule, i.e. "by the clock".[1] This results in more predictable and consistent levels of analgesia. The exception to this is children with intermittent or unpredictable pain, e.g. due to otitis media, where analgesia given on an as required basis is more appropriate.[1] Estimating the peak effect time of analgesics in children is difficult due to the variability in absorption rate. For example, paracetamol absorption rate following oral administration depends on gastric emptying time, which is variable in infants and children, ranging from five minutes to several hours (average approximately one hour).[4]

Paracetamol

Weight-based dosing is the preferred method of prescribing paracetamol in children, although there has been some debate as to whether weight-based or aged-based dosing is most appropriate.[1] The recommended doses of paracetamol are outlined in Table 1.

Weight-based dosing can present a problem in a very overweight or underweight child. There is disagreement as

to whether actual body weight or lean-mass weight should be used, and at present, there is limited evidence to indicate which is superior. In practice, clinical judgement should be applied when a calculated dose for a child falls outside of the usual dose range.

Age-based dosing of paracetamol does not account for the variations in body weight of children within each age category. Using this method of dosing leads to a potential risk of over-dosing in underweight children, and under-dosing in overweight children.

Paracetamol should be used with caution in children who are dehydrated, e.g. following diarrhoea or insufficient fluid intake in an infant refusing to feed. Hepatic impairment and chronic malnutrition also increase the risk of toxicity. In a child with any of these risk-factors, consultation with a Paediatrician or referral to secondary care should be considered.

Ibuprofen
Ibuprofen is the preferred non-steroidal anti-inflammatory drug (NSAID) in children. The recommended doses of ibuprofen are outlined in Table 1.

Diclofenac sodium 12.5 mg and 25 mg preparations are approved for use in children aged over one year,[3] however, it is rarely used for analgesia or inflammation in children treated in primary care.

Due to insufficient evidence and experience with use, no other NSAID should be routinely used in children or infants for the management of pain or fever.[1]

Antipyretic effects of paracetamol and ibuprofen

Many parents administer paracetamol and/or ibuprofen as antipyretics to a child with fever. Fever, however, is not an illness but a beneficial physiologic mechanism that aids in controlling infection. There is no evidence that fever itself worsens the course of an illness or that it causes long-term neurologic complications, unless particularly severe.[7] In general, the use of antipyretics will not prevent febrile convulsions. Therefore, the primary goal of treating febrile children should be to improve the child's overall comfort rather than the normalisation of body temperature.[7]

The practice of giving paracetamol before or after an immunisation to reduce the likelihood of fever is not recommended, as there is some evidence that this may reduce the antibody response to vaccinations.[9] Giving paracetamol after vaccinations, if fever does develop, is not associated with this effect.[9]

Table 1: Non-opioid pharmacological management of pain in young children[3]

Medicine	Age one month to 12 years	Maximum daily dose
Paracetamol	15 mg/kg, every 4 hours	Do not exceed 1 g per dose, four doses per day or 4 g per day
Ibuprofen	5 – 10 mg/kg, every 6 – 8 hours (5 mg/kg in children aged one to three months)	Do not exceed 30 mg/kg per day

There is evidence that NSAIDs are associated with an increased risk of acute kidney injury in children, even when given at recommended doses.[5] Therefore, NSAIDs should be second-line to paracetamol in most cases and should be prescribed with caution in children who are dehydrated.

Combining or alternating paracetamol and ibuprofen is not routinely recommended

The practice of combining paracetamol and ibuprofen or alternating doses has gained popularity. Although acceptable, this is not routinely recommended in children as there is currently a lack of evidence to support the safety or efficacy of this practice.[6] If pain persists despite treatment with paracetamol or ibuprofen, first confirm that the child is receiving an adequate dose at the correct dosing interval. Short-term use of alternating doses of paracetamol and

ibuprofen may be considered if the child still has unmanaged pain despite optimal monotherapy,[6] although consideration should also be given to the original diagnosis of the underlying cause of the pain and the assessment of the severity of the condition.

Due to their mechanisms of action, using paracetamol and ibuprofen together theoretically increases the risk of renal and hepatic toxicity. While this has not been demonstrated in large clinical trials, there are individual case reports of reversible renal damage occurring in children being given the two medicines together.[6] Most studies on alternating doses of paracetamol and ibuprofen have been short-term and have focused on the medicines' use as antipyretic agents rather than analgesics. There is some evidence that combining paracetamol and ibuprofen is more effective at lowering body temperature,[7] but

Codeine and tramadol are best avoided in children

Codeine and tramadol are not recommended in a general practice setting for use in children, as other analgesic options with better safety data are available.

Codeine was previously recommended as an intermediate step on the pain ladder for managing pain in children. However, it is associated with safety and efficacy problems due to genetic variability in metabolism of codeine.

Codeine is a pro-drug that relies on conversion by the enzyme CYP2D6 to morphine, the active metabolite, to provide analgesic relief. The analgesic effect of this medicine relies on the amount and speed at which this conversion occurs, which is individually variable.[1] It is estimated that up to 10% of adults under-metabolise codeine and up to 29% are ultra-rapid metabolisers, resulting in either insufficient analgesic effect or increased adverse effects and overdose.[10] There is also significant ethnic variation, e.g. approximately 16 – 28% of people in North African, Ethiopian and Arab populations are ultra-rapid metabolisers of codeine.[10]

Codeine metabolism is even less predictable in children. It has been demonstrated that CYP2D6 activity in foetuses is approximately 1% of the adult rate.[1] From birth this slowly

increases; by age five years, enzyme activity is approximately 25% of the adult rate. Because of this, codeine will generally be under-converted in children, resulting in insufficient analgesic effect,[1] however, this also depends on the ethnicity of the child. Many paediatric hospitals around the world have now removed codeine from their formularies, although codeine is still sometimes used in a secondary care setting in New Zealand, e.g. following surgical procedures such as tonsillectomy, where appropriate monitoring can be carried out.

Tramadol metabolism is also individually variable, resulting in different levels of the active component and uncertainty in dosage. As such, there is currently insufficient evidence of its effectiveness or safety in children.[1] Some developed countries limit the use of tramadol to children aged over 12 years. In New Zealand, immediate release preparations are approved for use in children aged over two years, but modified release and IV preparations are restricted to children aged over 12 years.[3]

evidence is still conflicting on whether combination treatment improves analgesic effect. One systematic review found that paracetamol and ibuprofen combined provided superior analgesia for post-operative pain in adults and children, than either medicine alone.[8] However, data on the safety of short-term use of paracetamol and ibuprofen is lacking or conflicting and long-term safety has not been established.[6]

Have a plan for ongoing pain management

Discuss the child's ongoing pain management with the child and their parents. The plan should include instruction on ongoing assessment of the child's pain by the parents, including advice on when to stop the pain relief, and when to return to a health professional, e.g. if their condition worsens.

Refer if further pain relief is required

If paracetamol or ibuprofen are insufficient to control the child's pain, strong opioids, e.g. morphine, may be required. However, the need for strong opioids indicates that referral to secondary care is appropriate.

Weak opioids, e.g. codeine and tramadol, are no longer routinely recommended in children (see opposite).[1] The well understood risks of using morphine is acceptable compared to the uncertainty associated with a child's response to codeine or tramadol.[1]

Assessment and management of children requiring referral for moderate to severe pain

A child aged under 12 years presenting in general practice with moderate to severe pain, generally requires referral to secondary care.

If urgent referral is required, and ambulance transport is most appropriate, pain relief should be started while waiting. This allows the child to be moved more easily and can reduce the total amount of analgesic administered overall.[2]

Pharmacological management in children who will be referred

Morphine is the first-line choice stronger analgesic for children with moderate to severe pain.[1] Fentanyl can be considered if morphine is contraindicated, if use of an IV injection will be problematic (see: "Intranasal fentanyl", over page) or if the child has previously had intolerable adverse effects with morphine.

Pethidine should not be used in children, as it is considered inferior to morphine due to central nervous system toxicity.[1]

Dosing strong opioids

The goal in any acute situation is to control the child's pain as rapidly as possible. Table 2 outlines the initial doses; further doses should be titrated depending on patient response.

Table 2: The starting dose for morphine in opioid-naive children aged one month to 12 years[3]

Route of administration	Starting dose, adjusted according to response
IV injection (over at least 5 minutes)	Age 1 – 6 months: 100 micrograms/kg, every 6 hours Age 6 months – 12 years: 100 micrograms/kg (max 2.5 mg), every 4 hours
Oral (immediate release)	Age 1 – 3 months: 50 – 100 micrograms/kg every 4 hours Age 3 – 6 months: 100 - 150 micrograms/kg, every 4 hours Age 6 – 12 months: 200 micrograms/kg, every 4 hours Age 1 – 2 years: 200 – 300 micrograms/kg, every 4 hours Age 2 – 12 years: 200 – 300 micrograms/kg (max 10 mg), every 4 hours

For further information see the NZFC: **www.nzfchildren.org.nz**

Technically, there is no "upper-limit" for opioid analgesics as, unlike paracetamol and NSAIDs, there is no ceiling to their effectiveness.[1] The appropriate dose is the lowest dose which provides effective analgesia, with manageable adverse effects.[1]

The main adverse effect associated with opioids is respiratory depression. Appropriate monitoring is necessary, e.g. respiratory rate and pulse oximetry.

Choice of opioid formulation

Opioids are most commonly given intravenously for managing acute, severe pain. If available, immediate-release oral morphine tablets may be given to children who are reliably able to swallow them,[1] but oral morphine is more likely to be used for continuing or persistent pain (if required) rather than in an acute, emergency situation.

Intranasal administration of fentanyl is increasingly being used in hospital and ambulance settings (see: "Intranasal fentanyl"). This is an unfunded, off-label use of fentanyl, however, St John and Starship Hospital have both developed protocols for its use.

Analgesia should not be given intramuscularly in children, because absorption can be unpredictable.[1, 2]

Intranasal fentanyl: a potential option for emergency pain relief

Fentanyl is a strong opioid that has traditionally been used for chronic pain as a transdermal patch or via IV injection. Intranasal administration is becoming more widespread in emergency situations for both adults and children. Fentanyl provides approximately equal analgesic effect to morphine.[11] Intranasal administration has the advantages of very rapid onset of analgesia, with significant reductions in pain scores within five minutes, and is less invasive than IV administration.[11] The duration of action is at least 30 minutes, which in most situations will be long enough for transport to hospital or for a topical anaesthetic to take effect, meaning that an IV cannula can then be sited more easily.[11]

In a hospital setting, intranasal fentanyl is used for children aged over two years with moderate to severe pain, e.g. due to burns or suspected fractures.[11] It is often used if the child has an injury or requires a procedure where IV access may not be required. Intranasal fentanyl is contraindicated in children with head trauma, chest trauma, abdominal trauma, epistaxis or hypovolaemia.[11] Dosing may be unreliable if used in a child with a "blocked nose", i.e. upper respiratory tract infection.

Adverse effects of intranasal fentanyl can include nausea, vomiting and sedation.[11] Respiratory depression and muscle rigidity are theoretically possible, but have not been described with the use of intranasal fentanyl.[11]

Intranasal fentanyl uses an IV preparation (e.g. a 100 microgram/2 mL ampoule), with a 1 mL syringe and a Mucosal Atomiser Device (MAD) head attached to the syringe.[11]

A dose of 1.5 micrograms/kg is used initially. A second dose of 0.5 micrograms/kg can be given ten minutes after the first dose if significant pain persists.[11] Doses of greater than 1 mL in volume should be divided between the nostrils.[11]

To administer the dose, sit the child at approximately a 45° angle, or with their head to one side. Insert the device loosely into the nostril and depress the plunger rapidly to atomise the medicine. The child should be observed for 20 minutes for adverse effects.[12]

At present, intranasal administration is an off-label use of fentanyl. Fentanyl is not available subsidised on Practitioner's Supply Order, and practices will need to purchase both the medicine and the atomiser device required for intranasal application. The medicine is relatively inexpensive to purchase.

 For further information on intranasal fentanyl, see: **www.adhb.govt.nz/starshipclinicalguidelines/ Intranasal%20Fentanyl.htm**
   OR
www.rch.org.au/clinicalguide/guideline_index/ Intranasal_fentanyl

Managing persistent pain in a child

The most common causes of persistent or recurrent pain in children include migraine, complicated recurrent abdominal pain and general musculoskeletal pain.[12] Pain should be regularly assessed and the analgesic regimen altered as necessary. The use of a pain assessment tool can allow change to be measured against baseline.

Assessing the psychosocial aspect of pain

Long-term or recurrent pain in children can affect physical and social development.[1] Psychosocial issues are more likely to occur if the child's pain leads them to feel out of control, the pain is overwhelming, the source of the pain is unknown or the cause of the pain is serious.[2]

Common psychosocial issues in children with persisting pain include:[1]

- Distress due to restriction of physical and social activities
- Emotional disturbances, e.g. fear, anxiety and emotional stress, usually seen as irritability, tantrums and failing school performance
- Sleeping difficulties
- Poor or inappropriate coping skills, usually worse in younger children, e.g. withdrawal, anger

Pain itself may also have a psychosocial cause. Recurrent abdominal pain is the classic example of a challenging diagnosis in children. One United Kingdom study showed that presentations of idiopathic abdominal pain in children increase during the school term and decrease during school holidays, a trend not seen in presentations for appendicitis and other forms of identifiable abdominal pain.[13] Another study found that approximately 75% of children presenting with recurrent abdominal pain had no identifiable organic cause, but that presentations were closely tied to stressful life events such as economic hardship, moving house and parental divorce.[14]

Violence and abuse (physical, emotional and sexual), bullying, anxiety and mental health issues can all be underlying factors in children presenting with recurrent pain. Assessment should include evaluation of the child's mental health and social factors; in older children (generally not before age ten years), consider using a HEADSSS assessment (Home, Education/employment, peer group Activities, Drugs, Sexuality, Suicide/depression and Safety).[15]

If a child's pain is thought to be psychosocial in origin or if significant psychosocial morbidity is present, consultation with or referral to a Paediatrician or other relevant specialist is recommended.

Pain management in children with chronic pain

Management of children with chronic conditions will usually be under the guidance of a relevant specialist. In these situations chronic, moderate to severe pain may be managed with strong opioid analgesics, such as morphine (Table 2). Other medicines may be initiated depending on the source or type of pain, e.g. neuropathic pain.

The role that general practice plays in the management of chronic conditions in children will vary with the child's condition and the availability of secondary services. This may involve observing for adverse effects and complications of treatment, being aware of potential medicine interactions and monitoring and adjusting the dose of analgesic medicines over time with assessment of pain levels and tolerance.[1]

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Adverse Drug Reaction

Adverse Drug Reaction Reporting Tool

GPs in all regions of New Zealand have access to an online tool to report Adverse Drug Reactions directly to the Centre for Adverse Reactions Monitoring (CARM).

The reporting form pre-populates with patient demographic and relevant clinical data from the GP practice software. This facilitates completion of a detailed report while encrypted electronic submission ensures confidentiality of information. Every report submitted receives a personal reply from CARM.

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