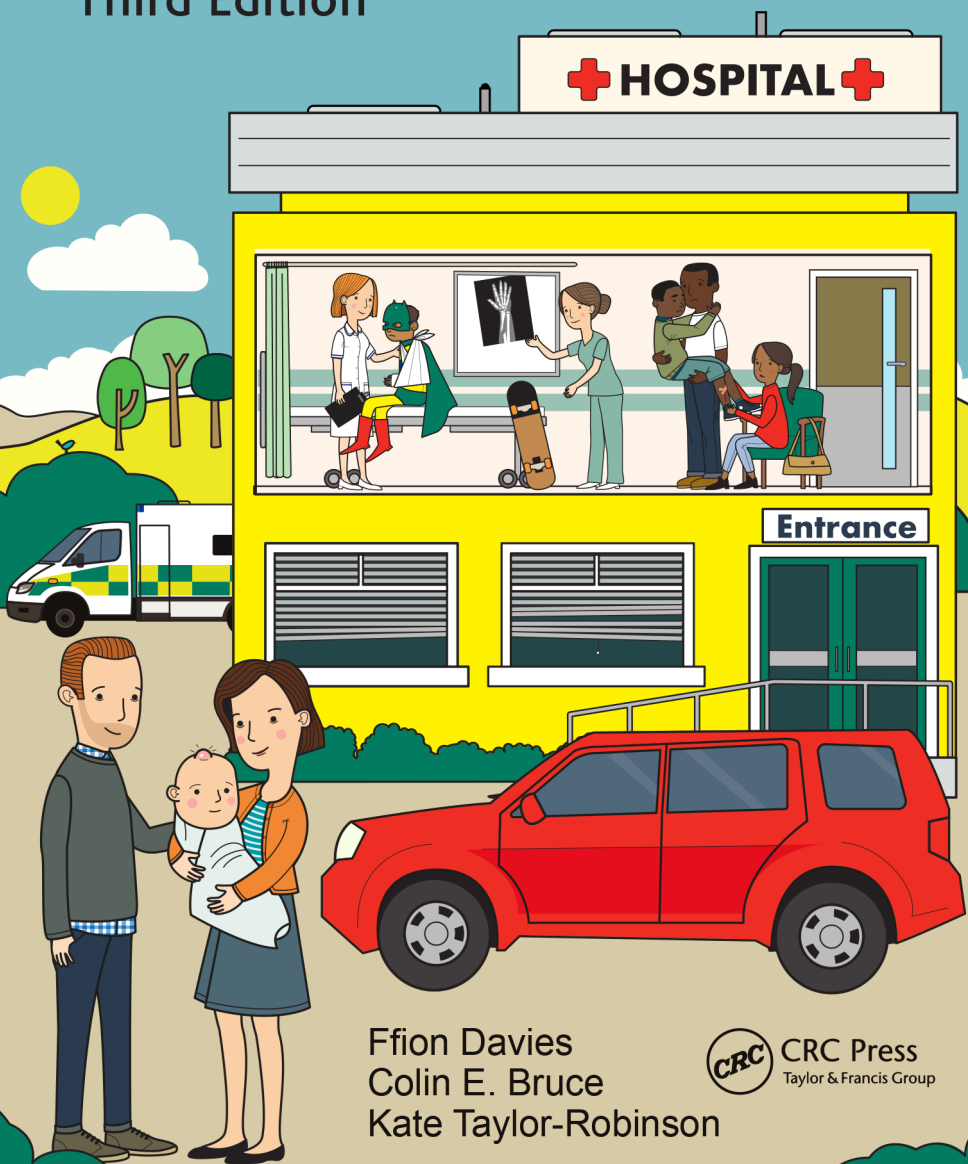


# Emergency Care of Minor Trauma in Children

Third Edition



Ffion Davies  
Colin E. Bruce  
Kate Taylor-Robinson

 CRC Press  
Taylor & Francis Group

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# Emergency Care of Minor Trauma in Children

## Third Edition

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## INTRODUCTION

We all remember injuring ourselves during our childhood. Minor trauma is a normal part of growing up, and in developed countries the majority of people will have attended an emergency department (ED) with an injury by the age of 18 years. Children are therefore high users of emergency services, and emergency services spend quite a lot of their time seeing children!

This is not a full textbook of minor trauma. The purpose of this handbook is to enable doctors, nurses and emergency nurse practitioners based in hospitals, minor injury units/urgent care or ambulatory centres and general/family practice to manage common minor injuries, know when to ask for help and spot when the ‘minor injury’ has more significance and is not actually minor.

Although the advice in this book is based on UK practice, the types of minor injuries sustained by children, and the best way of managing them, are similar worldwide. Minor trauma is one of the poorest-researched areas of medicine and the quality of the scientific literature is generally poor, so much of this book is drawn from experience in practice.

A child’s minor injury should not be seen in isolation. In fact, the effect of something as simple as being in a plaster cast and missing school to attend follow-up appointments is seen as far from ‘minor’ by the family, so the term ‘minor injury’ is a bit of a misnomer. We need to ensure that the take-home advice we give is sensible and practical to the whole family.

As healthcare professionals we also need to consider our approach to the children and treat them with respect and compassion, being aware that the care they receive influences their behaviour and fears the next time they need medical help. Children should be seen in a child-friendly environment, ideally audio-visually separated from adults. This area should be designed for their needs with child-sized equipment, room for play and examination and treatment rooms that are bright and welcoming. It is quite easy to transform an area with brightly coloured paint and posters, and funding is often readily available from local charities. Toys can be used as distraction therapy during painful procedures and for

entertainment during periods of observation or waiting. A lot of your medical examination can be conducted through play, rather than a formal examination on a couch. Attention to these aspects really helps you and the child get the job done, in a happy way.

It is also our responsibility to pick up safeguarding issues – in other words suboptimal care or supervision. You can be forgiven for thinking that paediatric-trained colleagues can be obsessed by this, but it is vital that we detect these issues, which are unfortunately common.

Finally, if you would like more help with creating a good emergency service for children, internationally defined *Standards of Care for Children in Emergency Departments* is available from the International Federation of Emergency Medicine at <https://www.ifem.cc>.



## LIST OF VIDEOS

- Video 5.1 Log roll off spinal board.
- Video 7.1 Application of wrist splint.
- Video 7.2 Scaphoid examination.
- Video 8.1 Flexor and extensor tendon examination.
- Video 8.2 Radial, median and ulnar nerve examination.
- Video 8.3 Examining for finger rotation.
- Video 8.4 Reduction of a dislocated finger.
- Video 8.5 Application of mallet splint.
- Video 9.1 Knee examination.
- Video 15.1 Application of broad arm sling.
- Video 15.2 Application of high arm sling.
- Video 15.3 Application of collar and cuff.
- Video 15.4 Application of neighbour strapping.
- Video 15.5 Application of Bedford splint.
- Video 15.6 Application of Zimmer splint.
- Video 15.7 'Kissing' technique for a nasal foreign body.
- Video 15.8 Removal of a corneal foreign body.
- Video 15.9 Reduction of a pulled elbow.
- Video 15.10 Trephining of a nail.
- Video 15.11 Wound irrigation.
- Video 15.12 Application of adhesive strips.
- Video 15.13 Application of wound adhesive.
- Video 15.14 Injecting local anaesthetic.
- Video 15.15 Suturing.
- Video 15.16 Application of hand dressing in small child.

## PREVENTION OF INJURY

Injury is a leading cause of death and permanent disability in children and young adults in all countries. Most parents worry about how to let a child explore and learn, yet protect them from accidents. What is an ‘accident’? Many injuries in children could be avoided by adequate supervision and common-sense measures, so in a purest sense many are truly ‘accidents’. When true neglect to care for a child’s safety occurs it is important that we identify it and know what to do (see Chapter 14, Non-accidental Injury).

As health professionals we have a role in educating the families we see and our local community, while striking a balance between advising on injury prevention and encouraging activity and sports for the child’s future health. We can be quite influential. A few gentle words of advice at the time of an injury are often remembered. So it is a good opportunity to talk about the patterns of injury that we regularly see when we spot an injury which could have been avoided.

Most injuries to children less than three years of age occur in the home or garden. At this age children develop rapidly, and their carers often underestimate their capabilities. When children become older they attend nurseries or schools, and move further from home for play and other activities. Many incidents leading to injury then occur in schools and sports facilities or in the neighbourhood. As children reach adolescence, injuries occur further from the home or in high-risk places (railway lines, derelict buildings) where bored teenagers seek adventure. There is a strong association between injury rates and social deprivation.

Many organisations exist in developed countries to promote injury prevention and have leaflets and websites with information. In the UK, health visitors assist families with accident prevention. Health professionals should be familiar with advising on simple measures such as:

- Inexpensive safety equipment, e.g. stair gates, fire-guards
- Child-resistant containers for medicines
- Safe storage of household cleaners and garden products
- Safe positioning of hot objects, e.g. cups of tea, kettles, pans, irons

- Safe use of equipment, for example not to put babies in baby bouncers or baby chairs on work surfaces and to always supervise the use of baby walkers
- Safety awareness on roads and railways
- Cycle helmets when riding a bicycle

Worldwide, the most effective way to reduce death and disability has been through compulsory (legal) interventions such as the wearing of seat-belts in cars, fencing around open water, wearing crash helmets when on a bicycle/motorbike/horse, safety locks on the windows of buildings over one storey high and severe speed restrictions in residential areas. Many of these legal interventions came about because we as healthcare professionals raised awareness of the problem, assisting with data collection or noticing local safety hot-spots, and bringing our concerns to local and national level.

## PAIN MANAGEMENT

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What are we treating?	3	Procedural sedation	10
Assessment of pain	4		

## INTRODUCTION

Minor injuries cause pain. Recognition and alleviation of pain should be a priority when treating injuries. This process should ideally start on arrival to your facility and finish with ensuring that adequate analgesia is provided at discharge.

Pain is often under-recognised and under-treated in children. There are several reasons for this. Assessing pain in children can be difficult. For example, children in pain may be quiet and withdrawn, rather than crying. Communication may be difficult with an upset child, and it may be difficult to distinguish pain from other causes of distress (fear, stranger anxiety, etc.). Choosing the right words so that you and the child understand each other means listening or asking what words the family uses, e.g. hurt, sore, poorly. In some cases children may deny pain for fear of the ensuing treatment (particularly needles).

There is often insecurity about dosage of medication in children, which has to be worked out in mg/kg. Some medications are not licensed for use in children, although are commonly used. And there are practical issues such as the psychological and real issues of inserting a cannula for intravenous analgesia.

## WHAT ARE WE TREATING?

- *Pain* – This requires analgesia (see below).
- *Fear of the situation* – All efforts should be made to provide a calm, friendly environment. You should explain what you are doing, prepare the child for any procedures and let the parents

stay with the child unless they prefer not to or are particularly distressed.

- *Loss of control* – Children like to be involved in decisions and feel that they are being listened to.
- *Fear of the injury* – Distraction and other cognitive techniques are extremely useful (see below). A little explanation and reassurance goes a long way to allay anxiety.
- *Fear of the treatment* – Unfortunately, some treatments hurt and are frightening in themselves (e.g. sutures). There are lots of things you can do to make procedures less stressful all round; this is covered below.

## ASSESSMENT OF PAIN

Pain assessment and treatment now forms an integral part of quality assurance standards for emergency departments in many countries and features in most triage guidelines.


 A blue circular icon with a white border and the word "STOP" in white capital letters.
 

STOP

If there is severe pain, is there a major injury or ischaemia?

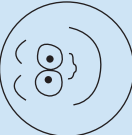

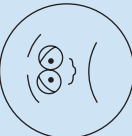

Your prior experience of injuries can help in estimating the amount of pain the child is likely to be in. For example a fractured shaft of femur or a burn are more painful than a bump on the head. After that, you will rely on what the child says and how the child behaves.

Clearly, the younger the child, the less they are able to describe how they are feeling, and separating out the distress caused by pain versus distress caused by other factors is tricky. Some children with mild pain can be very upset, due to the stress of the whole situation, the circumstances of the accident, their prior experience of healthcare or because their parents are upset. Having a reassuring environment and staff trained to be comfortable in dealing with distressed children makes a big difference.

Asking a child to rate their pain is difficult; they have little life experience to draw upon and may not clearly remember previous painful episodes, yet we are asking them to make a judgement of whether they are experiencing mild pain or the worst pain they have ever had! Linear analogue scales of 0–10 or comparisons with stairs or a ladder are often too abstract for a child.

Faces scores showing emotions such as those in Table 2.1 are frequently used for self-reporting of pain in children. They have value but cannot be

Table 2.1 Pain assessment tool suitable for children

	No pain	Mild pain	Moderate pain	Severe pain
<b>Faces scale score</b>				
<b>Ladder score</b>	0	1–3	4–6	7–10
<b>Behaviour</b>	Normal activity No ↓ movement Happy	Rubbing affected area Decreased movement Neutral expression Able to play/talk normally	Protective of affected area ↓ movement/quiet Complaining of pain Consolable crying Grimaces when affected part moved/touched	No movement or defensive of affected part Looking frightened Very quiet Restless, unsettled Complaining of lots of pain Inconsolable crying
<b>Injury example</b>	Bump on head	Abrasion Small laceration Sprain ankle/knee # fingers/clavicle Sore throat	Small burn/scald Finger tip injury # forearm/elbow/ankle Appendicitis	Large burn # long bone/dislocation Appendicitis Sickle crisis
<b>Category chosen (tick)</b>				

used in isolation, as they can also be flawed. Children may misunderstand the question because a spectrum of pain can be too difficult a concept. They may point to the happy face because that is how they want to feel or choose the saddest face to reflect how sad they feel.

Taking all of these issues into account, it is clearly better to use a composite score rather than relying on one system. Table 2.1 shows a suggested pain assessment tool recommended by the UK Royal College of Emergency Medicine; the assessor uses the available information to decide what category the pain is. It combines objective and subjective information and staff experience to give an overall score of no, mild, moderate or severe pain.

Once you've treated the pain (see below) you must reassess the child after the medication has had time to work. Failure to reassess and identify inadequate analgesia is, unfortunately, quite common. You should document the new pain score when you reassess.

## HOW TO TREAT PAIN

Having assessed the degree of pain, there are a range of ways to treat pain. These include psychological strategies, practical treatments and medication (via various routes). A working knowledge of all the options is useful, so that your treatment is appropriate for the child's age and preference, type of injury and degree of pain.

### Psychological strategies

Psychological strategies should be relevant to the age of child, but are useful in all situations. Many children object to practical procedures, even if the procedure is not painful. This generates a lot of anxiety in parents and staff alike. Experienced staff are invaluable when handling distressed children. It is important to be reassuring but sympathetic. Good communication at a level appropriate to the child and good listening skills make a big difference. Looking confident matters, since apprehension is always noticed!

Psychological preparation helps; for example, explain with carefully chosen words, focus on the endpoint, demonstrate on a doll or toy using the right equipment and allow parents to bargain around getting home as soon as possible or receiving rewards.

Next you need to provide distraction during the procedure. This applies from infants to teenagers and your unit should have a selection of age-appropriate toys. It is usually relatively easy to obtain toys from charity and local fundraising. Just be aware of your organisation's antimicrobial policies. Distraction aids include bubbles to blow, murals on walls, books, videos, computer games etc. Smartphones are successful at any age! Music is both soothing and distracting.

It is important to perform procedures swiftly, and not to explain the procedure to the child and then leave them worrying about it while you go and do something else. Try to perform your procedure while allowing the parent contact with their child. Keep the momentum moving forwards and do not allow excessive procrastination or bargaining if the child is trying to avoid the procedure. In some hospitals play specialists are available to calm children waiting to be seen, prepare them for what will happen during the consultation, provide distraction during procedures and give rewards afterwards. There is no hard evidence but in clinical areas where play specialists are employed, staff feel that children are treated with less stress, much quicker and with less recourse to sedation or hospital admission for general anaesthesia. Without play specialists, it is still quite possible to provide the right environment and some basic psychological techniques to achieve the same outcome.

### Practical treatments

Injured limbs are usually less painful if elevated (see Chapter 15, Practical Procedures). Fractures are usually less painful if immobilised in splints or a plaster cast. Soft tissue injuries feel better if cooled. Application of an ice pack, avoiding direct contact of ice with skin, can be helpful, although small children dislike ice packs. A lot of the pain from burns comes from air currents, which can be reduced with kitchen cling-wrap if access is still needed, and a proper dressing as soon as possible.

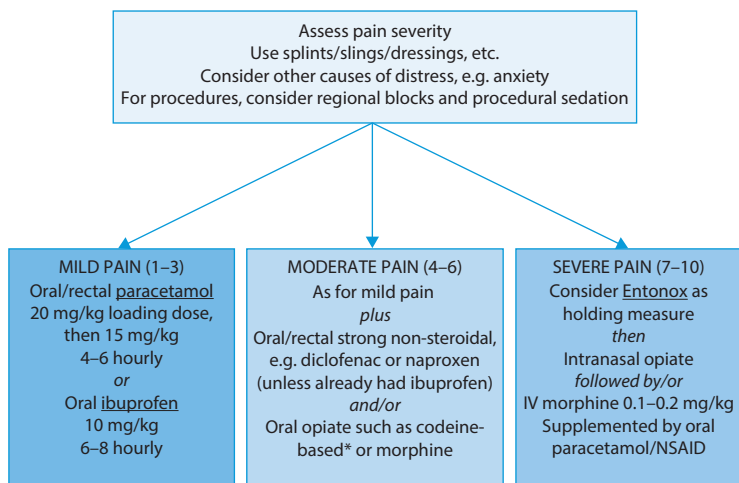
### Medication options

There are numerous options for analgesia, with differences between different organisations and different countries. These options are just suggestions. Figure 2.1 describes a practical pain strategy.


 A blue octagonal icon with a white border and the word "STOP" in white capital letters.
 **STOP**

For major injuries, seek senior advice and obtain IV access!





**Figure 2.1** Example of a pain treatment strategy. \*In the UK codeine-based drugs are not recommended under the age of 12 years.

### Oral medication

*Mild pain* may be treated with paracetamol (acetaminophen) or non-steroidal anti-inflammatory drugs such as ibuprofen.

*Moderate pain* may be treated with a combination of both paracetamol and an anti-inflammatory drug. Opioids can be added in, depending on your local guidelines. In the UK codeine-based drugs are not recommended under the age of 12 years. Diclofenac is a stronger anti-inflammatory than ibuprofen.

*Severe pain* may be treated with oral morphine solution but this takes around 20 minutes to start working.

### Intranasal analgesia

Intranasal opiates work more quickly than oral opiates. Intravenous opiates should not be avoided, but in many situations the intranasal opiate will give you 30-60 minutes of good analgesia and anxiolysis, allowing you to get venous access when the child is less stressed. These include intranasal diamorphine 0.1 mg/kg or fentanyl (1.7 mcg/kg) and have an onset of action within 2 minutes, an offset in 30-60 minutes. They are highly effective and have the added benefit of anxiolysis, so they are in widespread use in many countries. They are well tolerated and often

avoid needles because by the time dressings or splints have been applied, oral medication has started to work, the child's trust is gained and pain is often under control. If ongoing analgesia is needed, insertion of an IV line is much easier and less traumatic because the initial pain is often under control.

### ***Inhalational analgesia***

Thirty per cent nitrous oxide and oxygen (Entonox®) can be provided in cylinders with a face mask or intra-oral delivery system. It depends on the child's cooperation and coordination, and understanding that it is self-activated. For continuous administration of nitrous oxide see the 'Procedural Sedation' section.

### ***Topical anaesthesia***

Local anaesthetic creams used for cannulation are not licensed for use on open wounds, but there are gel formulations available for use on wounds such as LAT gel (lignocaine 0.4%, adrenaline 0.1% and tetracaine 0.5%). These are very useful and usually mean that local infiltration of anaesthesia (with a needle) is not needed. Topical preparations can also be used to aid deep cleaning of abrasions. They are mostly licensed for use over the age of 1 year. Do not use on mucous membranes (e.g. near the eyes or mouth). Onset of action is 20–30 minutes and offset 30–60 minutes after removal.

In the case of LAT gel, apply 2 mL to the wound in 1- to 3-year-olds and 3 mL in older children. Then cover with a small square of gauze and overlay a non-occlusive dressing. On removal 20–30 minutes later the skin will appear blanched. Should additional local anaesthesia be needed after testing for pain, only 0.1 mg/kg of lignocaine can be used, due to lignocaine already being present in the LAT gel.

### ***Local infiltration of anaesthesia***

Infiltration of local anaesthetic is painful and may not be justified if only one or two sutures are required. Consider LAT gel for wound management, if available. The pain of injection can be reduced by using a narrow bore needle (e.g. a dental needle), by slow injection (see Chapter 15) and probably by buffering and warming the solution.

**Regional anaesthesia**

Nerve blocks are easy to learn, well tolerated by children and avoid the risks of sedation and respiratory depression. Particularly useful nerve blocks are the femoral or 'three in one' nerve blocks for a fractured femur, the infra-auricular block for removing earrings and digital or metacarpal nerve blocks for fingers (see Chapter 15).

**Intravenous (IV) analgesia**

IV opiates such as morphine are used when immediate analgesia is required. There should be no hesitation in administering these drugs to children provided care is taken and resuscitation facilities are available. IV fentanyl or propofol should only be used for procedural sedation (see section below).



Respiratory depression and drowsiness may occur with IV opiates!

Respiratory depression may be avoided by titration, starting with the recommended minimum dose and waiting a few minutes before giving further doses. Naloxone should not be required as an antidote if you titrate opiates, but should be available in your department. Anti-emetics are not usually required in young children.

**Intramuscular route (IM)**

This route is best avoided as it subjects the child to a needle and holds no advantage over the IV route. Absorption is unpredictable and often slow, making repeated doses (and therefore needles) necessary, and the dosage difficult to calculate. It can be useful for ketamine (see next section), as the child has retrograde amnesia for the injection itself.

## PROCEDURAL SEDATION

A wider discussion of the various techniques for procedural sedation is beyond this handbook. Procedural sedation is practiced in many emergency departments worldwide, but it is not suitable for most other urgent care settings, as full resuscitation equipment and skills are needed. It holds benefits for the child (amnesia as well as analgesia) and

fills a useful middle ground between minor procedures and distraction (discussed previously) and recourse to general anaesthesia, which helps the family. Many countries and hospitals have guidelines for safe procedural sedation.



Adequate monitoring, trained staff and resuscitation facilities are essential. Do not attempt procedural sedation unless your unit fulfils the basic requirements!

Midazolam is a benzodiazepine which may be given orally, intranasally, rectally or intravenously (IV). Oral midazolam at a dose of 0.5 mg/kg provides mild anxiolysis within 10–15 minutes, but has wide individual variation in effect and can cause hyperactivity. It is most useful in facilitating distraction, such as when removing a foreign body. The oral route is less likely to cause a rapid peak in drug levels than the rectal route and is better tolerated than the intranasal route, which may cause local irritation. Midazolam is not an analgesic. IV midazolam is often combined with an IV opiate for procedures such as fracture or dislocation reduction. The adverse effects of both drugs combined are higher than with a single agent and only experienced doctors should use this combination.

Nitrous oxide 50%, with 50% oxygen administered continuously, provides analgesia, anxiolysis and amnesia. Monitoring and resuscitation facilities are needed. Ketamine is a more effective and safe drug which provides ‘dissociative anaesthesia’ and has become the preferred option for procedural sedation in the UK and many other countries. Upper respiratory tract symptoms or abnormal airway anatomy (e.g. history of prolonged neonatal ventilation, abnormal face shape) are the main contraindications to the use of ketamine. It may be given IV (ideally) or IM. The IV route allows you to titrate the dose and wears off quicker. A dose of 2.5 mg/kg IM or 1–2 mg/kg IV works within 3 minutes and allows you to perform procedures lasting up to 20 minutes with the child remaining undistressed.

Ketamine may cause hypersalivation which, rarely, may cause laryngospasm. Also, children are at risk of agitation and hallucinations in the ‘emergence’ phase as the drug wears off, so should therefore be

allowed to recover in a quiet room, although still under close nursing observation. Published guidelines also provide useful templates for monitoring, discharge criteria and parental advice post-discharge. IV propofol is also gaining in popularity but its use is not yet mainstream in the UK.

## WOUNDS AND SOFT TISSUE INJURIES

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Wounds and superficial injuries are common in childhood. Often the child is distressed by the wound itself (and bleeding), the parents will worry about scarring and both parents and staff may be reticent about the procedure of wound repair itself. The use of psychological techniques, an experienced nurse and adequate analgesia will make the procedure more endurable for all (see Chapter 2).

You can avoid most pitfalls related to wound management by stopping to ask yourself – how exactly did this happen? Are there likely to be associated injuries? What lies underneath this wound, anatomically? Is this a simple wound which is suitable for simple repair or do I need expert help? For specific areas, you can refer to the following chapters: face, Chapter 4; hand, Chapter 8; genitalia, Chapter 13.

### BASIC HISTORY

Here we will outline some important questions you can ask to take a basic history.

#### Mechanism of injury

A precise history is needed to alert you to potential problems. For example:

- Underlying injury to tendons/nerves (e.g. wound from something sharp)

- Hidden foreign body (e.g. wound from broken glass)
- Significant head injury (e.g. fall from higher than child's head height)
- Significant blood loss (e.g. wound over blood vessel such as femoral canal)
- Non-accidental injury (e.g. injury in non-mobile child)



By asking What? How? Where?, you will spot important pitfalls!

### Time of injury

Wounds over 12 hours old may be better left to heal by secondary intention. If the wound is clean it may be repaired up to 24 hours later, particularly if it is on the face or scalp. You should consider prescribing an antibiotic such as flucloxacillin if suturing an injury after 12 hours.

### Tetanus immunisation status

Most children in the UK will be fully vaccinated. Routine immunisations are given at 2, 3 and 4 months old, then again preschool and aged 14–15. This confers lifelong immunity. If an immunisation has been missed, the opportunity should be taken to provide it (if there are departmental arrangements to ensure communication with primary care/community colleagues to avoid duplication). In a non-immunised child this will not provide cover in time for the existing wound, so if the wound is dirty anti-tetanus immunoglobulin should also be given.

### Concurrent illness

This is rarely an issue in children and does not affect wound repair. If the child is immunosuppressed or on long-term steroid treatment, follow-up to check wound healing at 5–7 days is advisable. Remember that children with chronic illness may be more needle-phobic.

### Consideration of non-accidental injury and accident prevention

The circumstances of the accident need to be given adequate attention (see Chapter 14). However, wounds more often raise concerns about supervision of the child rather than actual deliberate injury. In the UK the health visitor should be notified for all injuries to preschool children. They will identify issues around accident prevention, and may subsequently visit the family at home.