Paediatrics

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Contacts

Dr Tina Newton is the Paediatric Emergency Medicine Consultant. If not in the department she can be contacted via pager or mobile at any time.

Referrals: Ward 113 from 0800 to 2200 hours

Ward 112 from 2200 to 0800 hours.

This guidance should be read in conjunction with the <u>Trust Paediatric Guidelines</u>.

Approaching Children

If a child is ill, get help from the senior A&E doctor. Remember that the presentation of serious illness in a child may be subtle and the most important thing is to pay close attention to details (HR, RR etc) and be aware when observations are outside normal ranges. For this you have to have a working knowledge of what is normal at different ages.

Children should be seen promptly, especially at night.

Gain the confidence of the child, talk to the parents and examine non-tender parts first. Talk to the child and be honest, if it is going to hurt warn them. It is surprising how much more you can manage by way of treatment with honesty.

If a painful procedure can be avoided, e.g. by use of EMLA or ice for venepuncture then take advantage of this (provided the clinical need for urgency is not overwhelming). Be very clear in your own mind as to the necessity of invasive investigations. There is no place for "routine" blood tests; you should always carefully consider the need for, and potential benefit of tests before subjecting a child to a potentially frightening procedure.

The department has a separate children's waiting area and treatment area and you should make use of this whenever possible.

Another important resource available to you are the nursery nurses and children's nurses in the department who are highly skilled at distraction techniques as well as educational play which allows them to prepare children for painful procedures and to allay anxieties about other investigations or treatments. Once again it is surprising how much difference this can make to the whole process making it a lot less stressful for you as well as the child and their parents.

At times there will be a paediatric consultant and paediatric registrars in the department. Make use of their experience but don't use their presence as an excuse not to see children!

Children over the age of 12 years may be treated without the presence of a parent or guardian if the child is judged by the doctor to be able to make a reasoned assessment of the situation. (Gillick competent) Any child can be treated in the absence of a parent in an emergency. Remember, not all parents have parental responsibility.

No child under 12 may be discharged unless accompanied by an adult.

Details of all children up to the age of five are relayed to the Liaison Health Visitor automatically.

Messages may be relayed to the LHV via the nurses.

All paediatric patients seen by F2s must be discussed with a senior before discharge or referral to paeds. Any patient referred to Wards 112/113 should have a clear management plan in the notes.

Remember:

- Analgesia
- Involve parents as they know their child best and a child will feel safest with its parents.
- Get Help Early.

Paediatric Deaths

These are fortunately uncommon but few situations in A&E are more distressing. Be led by the nursing staff. Get support from senior A&E staff. Following such a tragedy there should always be an informal debriefing with all personnel involved. The paediatric on-call Consultant should be informed. The General Practitioner must always be notified.

More on Paediatric Deaths

Resuscitation

As well as enlisting senior help from within the department, the person to call in case of paediatric emergency is the on call general paediatrician (not PICU). You can also call Dr Newton but her work is split with PICU and she may not be available to attend.

Familiarise yourself with the Broselow paediatric resuscitation trolley. This is kept next to bed 1 in Resus. Paediatric arrests have a very poor prognosis and success lies in prevention by recognising the ill child and instigating immediate treatment. Unlike in adults, an arrest in a child always has preceding warning signs, and is rarely due to primary cardiac problems.

A child is different anatomically. This can lead to the following:

A Problems managing the airway

In infants the face small but head is large in relative terms with prominent occiput. Maintain head in neutral position

Teeth may be loose

Tongue is relatively large

The larynx is high and relatively anterior

Trachea easily compressed by vigorous extension of the neck

The length of a Guedel airway is measured from the centre of a child's mouth to the angle of the jaw

The head of an infant (< 1 year) is kept in the neutral position for easier intubation. Nasopharyngeal tubes are better tolerated than oral ones in children and are measured in length from the tip of the nose to the tragus of the ear.

B Breathing problems

Airways are small and easily obstructed by secretions/oedema (particularly if less than 6 months old)

Predominant muscle for respiration is the diaphragm and this can fatigue easily The ribs are flexible. There can be damage to the lungs in the absence of rib fractures

C Differences in managing circulation problems

Circulating volume is 70 - 80 mls/ kg. This is a higher amount per kilogram than an adult but the absolute volume in a child is smaller so a small volume of blood loss can be critically important in very small children.

Cardiac massage landmarks in the:

Infant - use 2 fingers. 1 finger above the xiphisternum Child - use 1 hand. 1 finger above the xiphisternum

In infants a serious bradycardia is a HR <60 associated with signs of impaired perfusion and cardiac massage should be commenced, along with atropine and fluid.

Fluid bolus resuscitation in children is 20ml/kg in non-traumatic shock (i.e.sepsis) and 10ml/kg in trauma. The fluid of choice is crystalloid. Boluses may need to be repeated in refractory non-traumatic shock (i.e. meningococcal septicaemia) but if the patient requires a three boluses, an anaesthetist must be called and advanced airway management considered. Refractory shock will need inotropes as well as fluid. Remember inotropes can be given via intraosseous access. Caution should be exercised in DKA when no more than one bolus should be given without discussion with a senior colleague.

Drug dosages are weight related. A formula to help estimate a child's weight is

Weight in $kg = (Age in years + 4) \times 2$

This formula is only useful for children between the ages of 1 and 10. Outside this range the formula can be used as a guide but common sense adjustments made according to the child's habitus.

Resus Council Paeds BLS Algorithm Resus Council Paeds BLS Guidelines

Resus Council Paeds ALS Algorithm Resus Council Paeds ALS Guidelines

Resus Council Paeds Choking Algorithm

Drowning

Get an anaesthetist

Third most common cause of accidental death in children.

Cervical spine injuries are common.

Intubation and insertion of nasogastric tube with stomach aspiration are mandatory. Record CORE temperature:

- If core temperature is higher than 32 degrees C, external warming is sufficient, i.e. use blankets, heating blanket, humidified oxygen. remove wet clothes.
- If core temperature is lower than 32 degrees C, also give warmed IV fluids, gastric or bladder lavage with Normal Saline at 42 degrees C, and consider extra corporeal rewarming (contact Renal Unit).

Look for associated injuries.

Arrhythmias, especially VF, may be resistant to treatment including cardioversion if hypothermic

DO NOT abandon resuscitation until core temperature is greater than 32°C, as a drowning victim is not dead until warm and dead.

Take bloods for U&E's, Glucose, ABGs and blood cultures.

Get a BM reading and chest x-ray, start IV broad spectrum antibiotics.

Basic life-support at the waterside is the most important prognostic factor.

Recognising the Seriously III Child

This is vitally important because of the aforementioned poor prognosis in paediatric arrests. Children never arrest without warning and thus disaster can often be averted by a systemic approach to the assessment.

A: AirwayB: BreathingC: CirculationD: Disability

DEFG: Don't ever forget glucose!

BEWARE THE QUIET CHILD!!

Airway: If a child can speak, then this indicates a patent airway, that breathing is occurring and that there is adequate circulation. The child may speak to a parent rather than yourself. If the child is too young or scared then crying also serves as an adequate substitution.

If no evidence of air movement the head tilt and chin lift. If this results in patency then an adjunct may be required and intubation should be considered.

Breathing: A patent airway does not mean adequate ventilation. It is important to assess extent of respiratory disease

1. Work of Breathing

Respiratory Rate

Tachypnoea at rest indicates increased ventilation is required due to lung/airway disease or metabolic acidosis. Normal respiratory rates are as shown

<1 yr 30-40 breaths/min 2-5yr 25-30 breaths/min 5-12yr 20-25 breaths/min >12yr 15-20 breaths/min

Recession

Intercostal, subcostal or sternal recession are indicators of increased work of breathing and are seen most easily in young children as they have more compliant chest walls.

If present in child >6 or 7 yrs, indicates severe respiratory problems Severity of problem is indicated by degree of recession.

Inspiratory/expiratory noises

An inspiratory noise (stridor) indicates laryngeal or tracheal obstruction. The inspiratory component of stridor is usually the more pronounced.

Wheezing

Usually an expiratory noise is more of a lower airway noise. Volume of noise does not indicate severity in either wheeze or stridor

Grunting

Produced by exhalation against partially closed glottis. It is essentially self-generated PEEP in an attempt to prevent small airway collapse

A sign of severe respiratory distress and usually seen in infants

Accessory muscle use

As in adults, children may use sternomastoid as an accessory muscle. Usually ineffective in infants as it overwhelms their musculature and causes head bobbing

Nasal flaring

This is seen in infants in respiratory distress.

An absence of increased work of breathing may occur if the child has had problems for some time and is now tiring. Exhaustion is a pre-terminal sign.

2. Effectiveness of breathing

Auscultation of the chest will provide an idea of the amount of air being shifted. A silent chest is an extremely worrying sign.

Pulse oximetry is useful also. Sats of <90% on air or <95% on O2 is very low and very worrying, but remember low sats may be due to poor peripheral perfusion rather than true hypoxia

Inadequate respiration produces other effects also including:

- Tachycardia
- Bradycardia(a late and pre-terminal sign)
- Skin pallor
- Cyanosis (also a pre-terminal sign)
- Agitation then drowsiness.

Circulation:

Heart Rate

The initial response is a tachycardia, bradycardia is a pre-terminal sign. Normal resting heart rates are as follows.

<1yr 110-160 bpm 2-5yr 95-140 bpm 5-12yr 80-120 bpm >12yr 60-100 bpm

Pulse Volume

Compare peripheral to central pulses. If peripheral pulses absent and central weak then severe shock is present.

Capillary refill

This is assessed by pressing on the sternum for 5 seconds. Capillary refill should occur in 2 seconds or less. If refill time is increased then this indicates poor skin perfusion and is especially useful in septic children.

Remember this is a less useful sign if the child is cold

Blood Pressure

Much less useful sign generally as children compensate for fluid loss very well until suddenly crashing.

Do not be falsely reassured by a normal blood pressure

The presence of hypotension in a child is extremely worrying. If hypotensive, cardiac arrest is imminent unless resuscitation is commenced immediately.

A child can lose up to 50% of its circulation prior to any drop in blood pressure A useful formula for the calculation of a normal BP in a child is

Systolic BP =
$$80 + (age in yrs x 2)$$

Inadequate circulation produces other effects:

- Tachypnoea usually without recession, indicating metabolic acidosis
- Mottling of skin
- Agitation then drowsiness
- Oliguria defined as less than 1ml/kg/hr in children and 2ml/kg/hr in infants.

Disability:

Assess mental function on the AVPU scale which indicates to what type of stimulus the child responds.

- A Alert
- V Voice
- **P** Pain
- **U** Unconscious.

Assess pupils Check BM

The Febrile Child

To be read in conjunction with the NICE Guidance on Fever in the under 5's

History

Specific Symptoms noticed by parents.

Duration of symptoms / speed of deterioration.

Any known contact with infectious diseases or recent travel abroad Is the child eating and drinking?

Is the child miserable or lethargic?

Examination

General appearance of child, any rash? any lymphadenopathy? Record respiratory rate, O2 saturation and capillary refill Neck stiffness, photophobia, Kernigs sign. Chest. Abdomen, ENT exam.

Investigations

These will be determined by how ill the child is and by what you find on examination. Consider: CXR, Urinalysis / microscopy, FBC, Blood Cultures

If the child is very sick call for senior help and paediatric help early.

Septicaemia in young children may be present with:

- Shock
- Drowsiness
- Poor feeding
- Pyrexia
- Convulsions
- Apnoea / Cyanosis
- Purpura

Discharge

All children less than 6 months with a documented pyrexia will need referral to paediatrics for further evaluation.

Except in these cases, if there is an obvious cause for the pyrexia and the child is relatively well you can discharge the child with appropriate treatment (F2 after discussion with senior)

Advise Paracetamol or Ibuprofen in appropriate doses.

Give appropriate antibiotics if you suspect a bacterial infection. Do not to give antibiotics if you suspect a viral illness - a couple of minutes spent explaining to patients why antibiotics are not indicated is preferable to inappropriate prescribing.

NB: Urinary Tract Infections

A proven urinary tract infection in a child less than 3 should lead to investigations of the child's renal tract.

Many young children with UTIs are systemically unwell and should be referred to Paediatrics, but remember the signs may be subtle. If a child is well enough to go home but you suspect a UTI you must ensure that an MSU is sent to microbiology before antibiotics are started. Ask the laboratory to send the result to the child's GP (you need to put the GP's name and address on the form!). Ask the parents to see their GP for the result so that any necessary follow up can be arranged.

Suspected Meningitis

Features in children aged three and above

- Possible prodrome of febrile illness, sore throat.
- Photophobia.
- Severe headache
- Neck stiffness.
- Coma.
- Convulsions.
- Shock
- Rash (may be a scanty erythema or classical purpura) check child carefully.

Features in children under three (but remember there may not be any of the following, just a pyrexial child who is unwell with no focus)

- Shock
- Drowsiness.
- Irritability.
- Poor feeding.
- Unexplained pyrexia.
- Convulsions with or without temperature.
- Apnoea, cyanotic attacks.
- Purpura.
- Bulging fontanelle (a late sign)

If a child is suspected of having meningococcal meningitis

- Inform senior A&E staff and on call paediatric team.
- Move child to Resus
- Give 100% oxygen
- Establish intravenous/intraosseous access
- Take bloods as directed by the protocol in Resus
- Give cefotaxime 50- 100 mg/kg IV or intraosseous as a matter of urgency
- If any signs of shock give crystalloid at 20ml/kg and repeat using albumin if required
- Reassure the parents-children with meningitis who reach our care usually go home fit and well

If there are doubts as to the diagnosis, it is better to treat and have it proved negative than the other way around.

Febrile Convulsions

General points

These occur in up to 3% of children between the age of 6 months and 6 years. If the seizure occurs outside this age range it is not, by definition, a febrile fit. It is unclear why some children should fit but it is believed to be related to a rapidly rising temperature in a susceptible child.

Management follows the ABC approach, remembering to include antipyretics in the treatment. The standard seizure algorithm is followed with first line treatment being either IV lorazepam or buccal midazolam. Occasionally seizures will not abort with standard therapy and in this case an anaesthetist will need to be called for rapid sequence induction (RSI) and intubation. Remember in small children it is sometimes difficult to tell whether they are still fitting. Assessment of haemodynamic parameters as well as neurological status can help to clarify the situation.

Investigations:

There is no place for routine blood work (except blood sugar) including blood gas in the febrile fitting child. Blood gases in particular will often be abnormal and will continue to be so until the fit is controlled. Once the seizure has stopped efforts should be made to identify a source of infection and arrange appropriate investigations. Unless the child has had previous seizures and recovers fully in the department, all children should be referred to paeds for appropriate assessment and observation.

Gastroenteritis

History

- Duration of history (NB diarrhoea is not classed as protracted unless it has continued for more than 2 weeks)
- Urine output (wet nappies per day)
- Amount of fluid input. (may be difficult to get accurate assessment)
- Compare present with previous weight if possible.
- General activity level etc (i.e. still playing with toys)

Examination

- Weight
- Temperature
- Full examination of the systems
- Assess hydration as per the chart below. Remember this is an estimate and most people overestimate the degree of dehydration. A child 10% or greater will be very sick.

NB Blood tests are usually not warranted in uncomplicated gastroenteritis. You do not need a blood gas to confirm dehydration

Symptoms and Signs	Mild	Moderate	Severe	Notes and Caveats
	<5%	5-10%	>10%	
Decreased urine output	+	+	+	Beware watery diarrhoea
Dry mouth	+/-	+	+	Mouth breathers are always dry
Decreased skin turgor	-	+/-	+	Beware the thin
Sunken anterior fontanelle	-	+	+	Crying increases pressure
Sunken eyes	-	+	+	
Decreased eyeball turgor	-	+/-	+	Difficult to assess in young
Tachypnoea	-	+/-	+	Worse in metabolic acidosis & pyrexia
Tachycardia	-	+/-	+	Also in hypovolaemia, pyrexia and irritability
Drowsiness & irritability	-	+/-	+	

Most children can be managed with oral rehydration. May need to consider nasogastric tube in infants. Only use IV fluids if shocked or demonstrably not keeping anything down.

Referral to Paediatrics

- If less than 2 wet nappies in 24 hours (may be difficult to assess if diarrhoea profuse)
- If parents or GP unable to manage the child at home.

• If 5% dehydration or more. ?temp/blood in motion

Inform senior staff if 10% dehydration.

If sending the child home

- Send a letter to the GP. The child should be reviewed by the GP within 24 hours.
- For the first 24 hours of illness the child should be encouraged to drink copious clear fluids (water, juice, dioralyte, flat coke...). This should be offered in a "little and often" approach. May need to use spoons or syringes to encourage intake. Aim at least half daily requirement plus 100ml per loose stool
- The child may restart light diet or milk after 24 hours of illness. No need to regrade milk
- Give advice on hygiene in the family
- Never advise parents to withhold oral intake in their child as this only leads to dehydration.

Croup

General points

An acute clinical syndrome with inspiratory stridor, barking cough, hoarseness and varying degrees of respiratory distress.

Most are viral and the peak incidence is in 2nd year of life. Age range 6 months to 5 years. Usually preceded by fever and coryza and symptoms usually either start or worsen at night.

Associated pyrexia is usually <38.5 and many have very little stridor unless hyperventilating. Other children, especially very young ones, may show a picture of progressive respiratory difficulty. If temp high, consider differential diagnosis.

Management

Confident and gentle handling. Avoid upsetting the child any more than is necessary as the child is often miserable and frightened. Allow child to find most comfortable position (usually sitting on parent's lap)

Sats monitoring and O2 as necessary (but don't force it if it upsets the child) Most will settle in 2-4 days.

If severe use nebulised adrenaline (5ml of 1:1000) but only in cases of severe obstruction. Its use does not shorten duration of symptoms or change requirement for intubation

Oral dexamethasone 0.15-0.6 mg/kg given orally or nebulised budesonide 1mg have both been shown to effect improvement within hour or two and shorten duration of symptoms. Should be given to all symptomatic children with a repeat dose at 12 hours

Acute Epiglottitis

This shares some of the same features of croup; although the child is generally more toxic. The differential diagnosis is bacterial tracheitis which can be equally serious. Unless recognised rapidly and treated appropriately, obstruction of airway and death is likely to ensue.

Clinical picture

- Age usually 1-6yrs
- Acute onset of high temp >38.5 usually
- Soft inspiratory stridor
- Progressive severe respiratory difficulty over 3-6 hours, usually without cough.
- Child usually quiet and motionless, chin raised and mouth open drooling saliva.
- Look toxic, pale and peripherally shut down.
- Unable to swallow due to pain.

Under no circumstances attempt to examine the throat or lie the child down. Death is the usual result!

If suspected then do not interfere with child, summon senior paediatric and anaesthetic staff immediately.

Treatment is careful gaseous anaesthetic followed by intubation and intravenous ceftriaxone.

Acute Asthma

Acute exacerbation of asthma is the commonest reason for admission to hospital in children and accounts for 10-20% of paediatric medical admissions. It still accounts for 40-50 deaths per year.

In pre-school child, the attack will often have been precipitated by an URTI, over 90% of which are viral.

Classic symptoms are cough, wheeze and shortness of breath. If symptoms are increasing then asthma worsening, this is often accompanied by difficulty in sleeping etc.

Assessment:

- Document pulse rate
- Document respiratory rate
- Document severity of indrawing and use of accessory muscles.
- PEFR if older than 5 and able to co-operate
- Chest XR not indicated unless diagnosis doubtful, poor response to treatment or sudden deterioration.
- ABG rarely indicated.
- O2 sats post neb therapy are better guide to likely progression of attack. If sats in air are <92%10 mins post-neb then severe attack.

Severe Attack

- Too breathless to feed or talk
- Recession/ accessory muscle use.
- Resp rate >50/min
- Pulse > 140 bpm
- Peak flow <50% of predicted or previous best.

For predicted peak flow rates see chart in department or use previous best as guideline. Remember PEFR difficult in the under 6 age group, and is technique dependent at all ages

Life-threatening Attack

- Conscious level depressed or agitated.
- Exhaustion
- Poor respiratory effort
- Sats <85% in air or cyanosed.
- Silent chest
- Peak flow <33% of predicted or best.

Treatment

• In mild to moderate attacks the management is B-2 agonists via a spacer. Give 10 puffs of Salbutamol and assess (and document) response. In more severe cases use nebulised B-2 agonists. Use salbutamol 0.15mg/kg or terbutaline 0.3mg/kg. Nebulisers should always be oxygen driven and can be run continuously for first 3-4 hours in severe asthma. Watch potassium

- In all except mild cases give prednisolone. Give as soluble form in >1yr olds.
 Dose is 0.5-1mg/kg.
- Very small children (<1yr) may not respond to nebulised salbutamol so try Atrovent 250mcg instead. There is little evidence to suggest that combination therapy is better than either on its own. If not responding to above then will require IV therapy.
- Aminophylline. Loading dose of 5mg/kg over 20 mins, followed by infusion of 0.9mg/kg/hour. Omit loading dose if already taking oral theophylline.
- Hydrocortisone. 4mg/kg IV 4-6 hourly.
- Salbutamol. Given as infusion at 10mcg/kg/hour. May help where nebs have not.
- IV magnesium

If an attack is not too severe and the child responds very well then they may be discharged. It is important that the child can demonstrate adequate use of inhalers, and that these should be given using spacer devices. If doubts about therapy, there is now an out-patient clinic available for paediatric asthmatics to which we can refer directly. In all cases referred to paediatrics remember there may be a delay between referral and actual arrival on the paediatric ward. To prevent an unacceptable delay in treatment in this situation, on-going therapy should be prescribed on an in-patient drug chart and the child reassessed regularly whilst still in the department for signs of improvement or deterioration.

Child Not Using A Limb

History

Duration and nature of symptoms.

Presence of systemic symptoms (pyrexia, anorexia, etc.).

Any history of injury and exact mechanism

Previous history of similar

Remember the possibility of NAI

Examination

Look for deformity. Try to localise pain / tenderness. Examine all joints for pain and range of movement. Neurology of limb Temperature.

Differential Diagnosis

The most common diagnosis will be trauma, either soft tissue injury or fracture. Always be suspicious about fractures in infants.

The important diagnosis to confirm or exclude is septic arthritis or, less commonly, osteomyelitis.

Septic arthritis usually presents with:

- Constant pain which is severe especially with movement: often the child holds the joint absolutely still.
 - o Pyrexia.
- Systemic upset: loss of appetite, miserable.
- Hot swollen joint.

Upper Limb

Common fractures include: clavicle, neck of humerus. supracondylar and radius and ulna

With all fractures/ dislocations you must check neurovascular status of distal part of limb.

Supracondylar fractures of the elbow are a particularly high risk group.

Pulled elbow

This is unique to children, affecting toddlers - 5 years. This diagnosis is clinical. The history must be of a specific pulling injury, e.g. being pulled up by the hands or slipping on stairs resulting in the child being suspended by the parent on one arm. The child presents with a limp arm. It is difficult to

localise any tender spot but there is pain on elbow movements. The underlying pathology is subluxation of the radial head, resulting in its impaction in the orbicular ligament and hence pain on rotation The diagnosis is clinical, X-rays look normal and are therefore not indicated unless there is doubt about the history. Treatment consists of warning the parents that you are about to make the child cry, (explaining the diagnosis usually helps at this point), and simply supinating the forearm whilst applying a little pressure in a proximal direction. If the child uses the arm within a few minutes no splinting is required. If it does not, reconsider your diagnosis and ask for senior advice.

Lower Limb

Any child presenting with a limp should have the whole leg examined including the sole of the foot.

Common pitfalls:

A toddler with a fractured tibia may still be able to weight bear. Knee pain in children is commonly referred from the hip.

Differential Diagnosis of Hip Pain

Any age: Septic arthritis

Transient synovitis Chronic synovitis (JCA)

4-10 years: Perthe's disease

Puberty: Slipped Upper Femoral epiphysis (SUFE)

Septic arthritis, Perthe's disease and SUFE all need referral to orthopaedics.

Transient synovitis is common. It usually presents as a limp, pain at limit of hip movements, child is afebrile and has no systemic symptoms. No treatment is required and the patient can be discharged The differential diagnosis of septic arthritis cannot always be excluded by examination alone however and all children with atraumatic limp should be referred to orthopaedics for assessment. A FBC, ESR and CRP should be performed to aid diagnosis and an appropriate series of xrays requested. Ideally USS should be arranged but this is often not available as an emergency.

Fractured Tibia

Toddlers with fractured tibia may still weight bear. Toddler fractures may not always be apparent on acute xrays; the child may need to be treated as a fracture until repeat films can be taken at two weeks. Remember toddler fractures are stable and decisions regarding treatment will depend on symptoms. Fractured tibia in a non-walking child is a result of NAI unless proved otherwise.

Non-Accidental Injury in Children