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## CHAPTER 2 – PEDIATRIC PROCEDURES

*First Nations and Inuit Health Branch (FNIHB) Pediatric Clinical Practice Guidelines for Nurses in Primary Care.*  
**The content of this chapter has been reviewed July 2009.**

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## PEDIATRIC PROCEDURES

### RESTRAINT

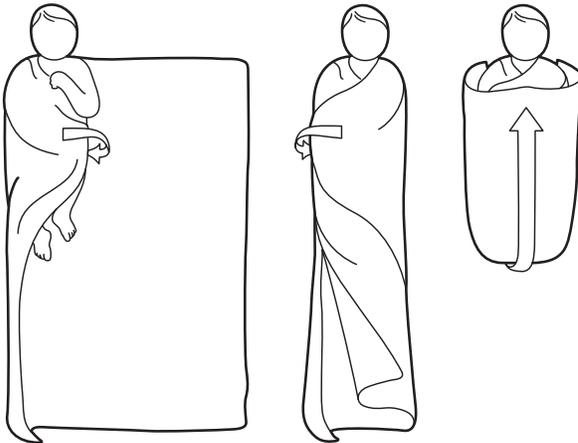
#### GENERAL

Although a least restraint approach is desirable at all times, if holding a child firmly is not sufficient to keep him or her immobile for a procedure, a wrapping technique can be used. This technique may be used with children between the ages of 1 and 6 years.

#### PROCEDURE

Use a sheet or blanket to wrap the child as shown in the figure below. If a limb is required for the procedure (IV access), leave it outside the wrapping.

#### Wrapping Technique to Immobilize a Child for a Procedure



### TOPICAL ANESTHESIA<sup>1,2,3</sup>

#### GENERAL

Procedures can cause distress for parents and children. Topical anesthesia is used to reduce the pain associated with painful procedures in children. It can be applied painlessly and reduce the need for restraint.

#### INDICATIONS

- Prior to intravenous access
- Prior to venipuncture for specimen collection

#### CONTRAINDICATIONS

- Situations where emergency intravenous access or venipuncture is required
- Neonates < 37 weeks' gestation
- Known allergy to topical anesthetic or occlusive dressing
- Patients with congenital or idiopathic methemoglobinemia
- Infants < 12 months of age who are receiving treatment with methemoglobin-inducing agents (for example, sulfas, phenytoin)

#### SITES

- Intact skin over vein

**PROCEDURE<sup>3</sup>**

1. Take your time to identify the largest, most prominent vein you can find. It is sometimes easier to feel a vein than to see it.
2. Cleanse skin.
3. Apply lidocaine 2.5% and prilocaine 2.5% (EMLA) cream to the centre of the area you will be attempting venipuncture or intravenous access, cover the cream with an occlusive dressing (for example, Tegaderm or saran wrap). *See Table 1, “Maximum Recommended Dosage of EMLA Cream According to Age.”* As a guide, 1 g dose of EMLA cream is achieved by squeezing a length of EMLA of approximately 3.5 cm from the tube.
4. Let the cream sit on the area for 60 minutes prior to attempting venipuncture or 60 minutes prior to attempting intravenous access, for adequate anesthesia to take place.
5. Remove the cream with gauze.
6. Cleanse the skin with an antiseptic prior to starting the procedure.
7. Topical anesthesia remains in effect for 4–6 hours with one application of EMLA.

**Table 1 – Maximum Recommended Dosage of EMLA Cream According to Age<sup>a</sup>**

Age	Maximum Total EMLA Dose	Maximum Application Time
Birth to 3 months or < 5 kg <sup>b</sup>	1 g on up to 10 cm <sup>2</sup> area for approximately 1 hour	1 hour
Infants 3 to 12 months and > 5 kg	2 g on up to 20 cm <sup>2</sup> area for approximately 1 hour	4 hours
Children 1 to 6 years and > 10 kg	10 g on up to 100 cm <sup>2</sup> area for approximately 1 hour	4 hours
Children 7 to 12 years and > 20 kg	20 g on up to 200 cm <sup>2</sup> area for approximately 1 hour	4 hours

a If a patient older than 3 months does not meet the minimum weight requirements, maximum dose should be based on weight.

b Minimal gestational age is 37 weeks.

**COMPLICATIONS**

- Transient local reactions such as paleness, erythema, edema and skin sensations (for example, tingling)
- Discrete local reactions of the skin at the site of application
- Allergic reactions, the most extreme being anaphylactic reaction
- In high doses prilocaine can cause increases in methemoglobin levels

**VENIPUNCTURE FOR SPECIMEN COLLECTION****SITES*****Preferred (Upper Extremity)***

- Forearm veins (for example, cephalic, basilic or median cubital); these are the best choices in all age groups, but can be difficult to find in chubby babies
- Veins on the dorsum (back) of the hand
- Tributaries of the cephalic and basilic veins, or the dorsal venous arch

***Other sites***

- Saphenous vein, just anterior to medial malleolus (lower extremity)
- Veins on the dorsum of the foot
- Small veins on ventral surface of wrist or larger one on inner aspect of wrist, proximal to thumb

## PROCEDURE

1. Practice universal precautions against contamination with child's body substances (for example, gloves, possibly goggles, safe disposal of needle).
2. Assemble necessary equipment.
3. Immobilize the child well, but avoid restraints if at all possible (*see "Restraint"*).
4. Take your time to identify the largest, most prominent vein you can find. It is sometimes easier to feel a vein than to see it. Always make your first attempt in this prominent vein.
5. Apply topical anesthesia if there are no contraindications (*see "Topical Anesthesia"*).
6. Apply tourniquet proximal to site; rubbing or warming the skin will help to distend the vein.
7. Cleanse the skin with antiseptic.
8. Stabilize vein by applying traction to skin.
9. Using a 25- or 23-gauge butterfly needle with syringe or evacuated tube device<sup>4</sup> attached, insert needle bevel up just far enough to get "flashback" of blood.
10. Apply gentle suction with the plunger to prevent the vein from collapsing or insert the evacuated tube into the device.<sup>4</sup>
11. If flow is very slow, try "pumping," by squeezing the limb above the site of the puncture or releasing the tourniquet to ensure it is not too tight. Reapply loosely if flow returns after removal.<sup>4</sup>
12. Remove the tourniquet as soon as sample is obtained.
13. Remove the needle and apply pressure to the site with gauze. Immediately cover needle with safety engineered device.<sup>4</sup>
14. If not done during the procedure, place blood into appropriate tubes. Gently invert each tube according to laboratory guidelines.

## INTRAVENOUS ACCESS

### SITES

#### **Preferred Sites (in order)**

- Dorsum of hand
- Feet
- Saphenous vein just anterior to medial malleolus
- Wrist
- Scalp: a good site in infants, as veins are close to the surface and are more easily seen than in the extremities; useful for administration of fluid or medication when the child's condition is stable, but rarely useful during full resuscitation efforts
- Median cubital veins (be careful to avoid brachial artery)

#### **Upper Extremity**

- Forearm veins (for example, cephalic, basilic or median cubital); these veins can be difficult to find in chubby babies
- Veins on the dorsum (back) of the hand
- Tributaries of the cephalic and basilic veins, dorsal venous arch

#### **Lower Extremity**

- Saphenous vein, just anterior to medial malleolus
- Median marginal vein
- Dorsal venous arch on the foot

## TYPES OF NEEDLES

### OVER-THE-NEEDLE CATHETERS

- Cathilons or IV catheters are the most stable
- 24- or 22-gauge needle is usually used in infants

#### **Advantages**

- More comfortable than butterfly needle
- Frequency of infiltration into interstitial space is lower
- Required for volume resuscitation efforts

### BUTTERFLY

- Especially useful for scalp veins
- 25- to 27-gauge needles are most commonly used in infants

**Advantages**

- May be used to obtain blood samples
- Design (for example, the wings) facilitates insertion because there is a handle to be gripped
- Wings allow the needle to be taped more securely in place

**Disadvantages**

- Tend to be inserted interstitially more frequently
- Should not be used for primary venous access in volume resuscitation efforts

**PROCEDURE**

1. Practice universal precautions against contamination with child's body substances (for example, gloves, possibly goggles, safe disposal of needle).
2. Assemble necessary equipment.
3. Immobilize the child well, but avoid restraints if at all possible (*see "Restraint"*).
4. Take your time to identify the largest, most prominent vein you can find. It is sometimes easier to feel a vein than to see it. Always make your first attempt in this prominent vein.
5. If a scalp vein is chosen, you may have to shave the skin around it.
6. Apply topical anesthesia if there are no contraindications (*see "Topical Anesthesia"*).
7. Cleanse the skin with antiseptic.
8. Apply tourniquet proximal to site, if appropriate; rubbing or warming the skin will help to distend the vein.
9. Stabilize the vein by applying traction to skin.
10. If using an over-the-needle catheter, insert it through the skin, bevel up, at an angle of 30° to 45°, 0.5–1 cm distal to the intended site of entry to the vein.<sup>5</sup>
11. Once the needle is through the skin, adjust the angle of the cannula so that the angle is 15° to the skin, and advance it slowly into the vein far enough to get "flashback" of blood, then go in another millimeter or so to ensure that the plastic catheter is also in the vein.
12. Advance the catheter into the vein, holding the stylet steady.<sup>5</sup>

13. Remove the tourniquet.
14. Place pressure over the catheter in the vein to prevent backflow of blood. Retract the needle and ensure it is immediately covered with the safety engineered device.<sup>5</sup> If using a retractable needle catheter, activate the protective casing by pressing the button.
15. Quickly release pressure over vein and attach IV infusion set. Make sure there are no air bubbles in the tubing before connecting it.
16. Run in some IV fluid. If the IV line is patent, tape the needle and catheter securely in place.

These small catheters are fragile. Avoid bending them, and always tape them securely, preferably using an arm board and half a plastic medicine cup to cover the site.

**COMPLICATIONS****Local**

- Cellulitis
- Phlebitis
- Thrombosis
- Hematoma formation
- Hemorrhage
- Extravasation of IV fluids into interstitial spaces

**Systemic**

- Sepsis
- Air embolism
- Catheter fragment embolism
- Pulmonary thromboembolism

**INTRAOSSUEOUS ACCESS****GENERAL**

- Used to temporarily<sup>6</sup> administer IV fluids and medications when attempts at IV access have failed
- For use in emergency situations only
- Should be discontinued as soon as reliable vascular access is established<sup>6</sup>

### Indications

Intraosseous access can be attempted in children of all ages<sup>6,7</sup> and can be used when venous access cannot be achieved within three attempts and when rapid access (60–90 seconds) is required such as when encountering:

- Multisystem trauma with associated shock or severe hypovolemia (or both)
- Severe dehydration associated with vascular collapse or loss of consciousness (or both)
- Unresponsive child in need of immediate drug and fluid resuscitation: burns, status asthmaticus, sepsis, near-drowning, cardiac arrest, anaphylaxis

### Contraindications

- Pelvic fracture
- Fracture, previous intraosseous attempt or vascular interruption in the extremity chosen for the intraosseous access<sup>6</sup>

### SITES

#### Preferred Sites

- Anteromedial<sup>7,8</sup> (flat) surface of the proximal tibia, 1–3 cm (one finger's breadth) below and 1 cm medial to the tibial tuberosity

#### Other Possibilities<sup>6</sup>

- Distal femur, 3 cm above lateral condyle in the midline
- Distal tibia, 1–3 cm above the medial malleolus on the surface of the tibia near the ankle (believed by some to be the best site in older children because of the greater thickness of the proximal tibia relative to the distal tibia)

### PROCEDURE<sup>6,9,10</sup>

1. Practice universal precautions against contamination with child's body substances (for example, gloves, possibly goggles, safe disposal of needle).
2. Assemble necessary equipment.
3. Immobilize the child well, but avoid restraints if at all possible (*see "Restraint"*).
4. For proximal tibial site, place the child in the supine position on a firm surface, flex knee, and externally rotate the leg to display the medial aspect of the extremity.
5. Identify the landmarks for needle insertion (*see "Sites"*).
6. Cleanse the skin with antiseptic.
7. If the child is conscious or semi-conscious, use local anesthesia around the insertion site (*see "Local Anesthetics for Suturing"*).
8. Use an intraosseous needle, a bone marrow aspiration needle (for example, Jamshidi), or if the others are not available, a 19- or 21-gauge butterfly needle can be used in infants. Align the bevels of the stylet and the outer needle.
9. Grasp the proximal tibia above and lateral to the insertion site with the nondominant hand to stabilize it. Ensure no part of this hand rests behind the insertion site.
10. Angle the needle slightly away from the joint. Insert the needle at a 90° angle, through the skin and subcutaneous tissue.
11. When the needle reaches the bone, exert firm downward pressure, while rotating the needle in a clockwise manner. Be careful not to bend the needle.
12. When the needle reaches the marrow space, the resistance will drop (indicated by a "give" sensation). Stop advancing the needle and remove the stylet from the needle.
13. Attach a 10 mL syringe and aspirate some blood and marrow to determine if the needle is correctly positioned. You may not be able to do this. Other indicators of correct positioning: the needle will stand upright by itself, IV fluid flows freely, no signs of subcutaneous infiltration are apparent.
14. Irrigate the needle to prevent obstruction while slowly infusing 10 mL of normal saline to check for signs of soft tissue circumferential swelling or increased firmness, or increased resistance to injection.
15. If test infusion went well and did not indicate signs of infiltration, attach an IV infusion set. Make sure there are no air bubbles in the tubing before connecting it. If test infusion did not go well, remove the needle and try again at another site.
16. Secure needle in place with tape and gauze.
17. Use as you would a regular IV line. For example, fluids can be infused quickly for resuscitation of a child who is in shock.

**COMPLICATIONS**<sup>6</sup>

- Extravasation
- Tibial fracture
- Osteomyelitis
- Epiphyseal injury
- Hemorrhage
- Fat embolism
- Lower extremity compartment syndrome
- Obstruction of needle with marrow, bone fragments or tissue
- Skin necrosis
- Subcutaneous abscess

**NASOGASTRIC OR OROGASTRIC TUBE INSERTION****GENERAL**<sup>11</sup>

- Used to analyze gastric contents, decompress the stomach and/or to deliver tube feedings

**Route**<sup>11</sup>

- Use orogastric route if facial injury, skull fracture or abnormal facial anatomy is present. Also use nasogastric route in infants less than 6 months old who are obligate nose breathers

**Tube Size**<sup>12</sup>

- Estimate length of nasogastric tube needed by extending the tubing from the tip of the child's nose to the ear lobe and then to the xiphoid process, and mark this spot. The length of orogastric tube needed is estimated by extending the tubing from the corner of the mouth to the ear lobe and then to the xiphoid process
- Neonates (3–9 kg): size 5–8 French
- Young children (10–14 kg): size 8–10 French
- Child (15–22 kg): size 10–14 French
- Older child (24 kg–adult): size 14–18 French

**CONTRAINDICATIONS FOR A NASOGASTRIC TUBE**<sup>13</sup>

- Severe facial trauma
- Recent nasal surgery
- Coagulation abnormality (relative contraindication)
- Esophageal stricture (relative contraindication)
- Alkaline ingestion (relative contraindication)

**PROCEDURE**<sup>11,13,14,15,16</sup>

1. Practice universal precautions against contamination with child's body substances (for example, gloves, possibly goggles).
2. Assemble required equipment. Stiff tubes are easier to insert. Tubes will stiffen if placed in ice water.
3. Explain procedure to child (if he or she is able to understand) and parents or caregiver.
4. Check for nasal septum deviation and nare patency.
5. Immobilize the child well, but avoid restraints if at all possible (*see "Restraint"*).
6. Position child in sitting position with neck slightly flexed if possible.
7. Lubricate tip of tube with sterile, water-soluble lubricant and slide it into the nostril along the base of the nose or following the natural curve of the tongue,<sup>11</sup> advancing the tube slowly. Try to have the child assist by swallowing sips of water or have infants suck on a pacifier. Once the tube has been advanced the desired distance, check the position by aspirating gastric contents and testing for a pH < 4.
8. If possible, confirm placement by x-ray.
9. Tape the tube in place to the nose or cheek.
10. Attach to drainage bag.
11. Withdraw the tube if choking or coughing occurs during placement.

**COMPLICATIONS**<sup>16</sup>

- Intracranial, esophageal or bronchial insertion
- Perforation with hemorrhage
- Epistaxis
- Aspiration

## WOUND CLOSURE

### LOCAL ANESTHETICS FOR SUTURING

#### General

- Lidocaine (1%, without epinephrine) is the local anesthetic of choice
- To avoid systemic toxic effects, instil no more than 3 to 4 mg/kg (0.3 to 0.4 mL/kg of a 1% solution without epinephrine)
- Although rare, an allergic reaction to lidocaine is possible; ensure access to an anaphylaxis kit
- Use a 28- or 27-gauge needle (the size found on insulin syringes) and inject slowly

For detailed information on wound management and suturing see “Skin Wounds of Traumatic Origin” in the chapter, “Skin” within the Adult Care section.

### TISSUE ADHESIVE FOR WOUND CLOSURE<sup>17,18</sup>

#### General

- Efficient and less invasive method of wound closure
- Does not require anesthesia unless needed for cleaning
- Cosmetic appearance the same or better than with suturing
- Lacerations need to be clean, with minimal bleeding or dry for effective Tissue Adhesive (TA) use

#### Indications

- The laceration is above the fascia
- Acute wounds (< 12 hours old)
- Wounds from blunt or sharp trauma
- Laceration of 5 cm or less in length and 0.5 cm or less in width, if edges can be approximated easily and with no or minimal tension
- Scalp or hair-bearing areas having lacerations may require hair snipping along wound edge and the use of Hair Apposition Technique (HAT) (see “Procedure”)

#### Contraindications

- Lacerations crossing joints or mucocutaneous junctions
- Puncture wound
- Wounds that have been present longer than 12 hours
- Human or animal bite
- Stellate lacerations (that is, arranged or shaped like a star; radiating from a centre), as they have a higher infection rate than smaller, linear lacerations
- Non-linear wounds
- Jagged or frayed edges
- Pressure ulcer wounds
- Skin grafts
- Dental repair wounds
- Wounds with higher likelihood of infection
- Client cognitively impaired or under the influence of drug or alcohol
- Comorbidity such as a behavioural disorders (for example, schizophrenia)

#### Procedure

1. Practice universal precautions against contamination with child’s body substances (for example, gloves, possibly goggles). This will also help avoid gluing your own skin to the client’s skin or hair.
2. Assemble required equipment.
3. Immobilize the child well, but avoid restraints if at all possible (see “Restraint”).
4. Clean the wound well, and dry thoroughly.
5. Position the client to avoid leakage of the Tissue Adhesive (TA) from gravity onto intact skin and to allow for TA to drain away from skin surfaces such as eyes, mouth or nose.
6. Cover surrounding skin, eyes, nose or mouth with gauze to avoid exposure to TA. Use Band-Aids to cover surrounding skin in young children.
7. Approximate the wound edges. They may be stretched slightly at top and bottom of the wound.
8. For scalp wounds, the Hair Apposition Technique (HAT) consists of tying a strand of hair from each side of the laceration and maintaining it in place with a drop of TA. Surrounding hair can be made wet to isolate a few stands around laceration.
9. Apply small amounts of TA (droplets) along the wound edges and extending 0.5 cm past wound ends.
10. Let droplet of TA penetrate for a few seconds before moving further along the edges.

11. Reapply TA twice more, waiting 15–30 seconds between applications.
12. Hold wound in approximated position for at least one minute after final application to allow sufficient drying time.
13. If accidental skin closures occur, use petroleum jelly, polysporin or Adaptic (Johnson & Johnson) non-adhesive dressings several times a day to dissolve the TA. Care must be taken to avoid the edges of the recently closed lacerations as this will cause dehiscence of the wound. Acetone can be used to remove TA from work surfaces.
14. If a glove accidentally gets glued to the wound, cutting the portion of the glove off and leaving it in the wound will not delay healing.

### Monitoring and Follow-Up

- Protect the wound for 48 hours from water
- No soaking/washing of the wound or swimming for 7–10 days
- No application of creams or ointments to the wound
- No pulling or picking at the wound
- Complications may include signs of infection, pain or dehiscence
- If a chronic illness is present, monitor the wound more closely
- The TA will come off by itself after 7–10 days

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