CAPILLARY BLOOD SAMPLING
AND VENEPUNCTURE IN
CHILDREN AND YOUNG PEOPLE

A WORKBOOK TO ASSIST PRACTITIONERS IN DEVELOPING
COMPETENCE
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Introduction

This workbook should assist practitioners in developing the knowledge that underpins safe practice in performing capillary sampling and venepuncture in children and young people. It should be used in conjunction with the document *Capillary Blood Sampling and Venepuncture in children and young people: An education and training competency framework* (RCN, 2005) and form part of a programme of learning.

In view of the considerable differences between children of varying ages we recommend that practitioners develop their competence within specific age bands according to their area of practice - 0-1 year, 1-5 years, 5 years and above.

Aims and objectives

- To assist practitioners to develop the underpinning knowledge to perform capillary blood sampling and venepuncture in children and young people competently
- To assist practitioners in identifying gaps in their knowledge where further study is needed
- To assist educators in assessing knowledge and competence.

How to use this workbook

Having blood taken can be a very painful and frightening experience for children. However, with appropriate preparation and support children can learn how to cope, and their fear and anxiety can be minimised. This workbook has its basis in some of the key learning outcomes described in the document *Capillary Blood Sampling and Venepuncture in Children and Young People: A Competency Framework for Education and Training* (RCN, 2005). In each section there is a brief introduction to the issues followed by self-directed activities for the student to undertake.
PROFESSIONAL AND LEGAL ISSUES

The ability of a nurse to perform capillary blood sampling and venepuncture can be beneficial to the child or young person. It can result in care being less fragmented and treatment given in a timely manner. Before training to perform this enhanced role you should ensure that other aspects of the care you give to children and young people will not be compromised. The Code of Professional Conduct (NMC, 2004), Guidelines for Records and Record-keeping (NMC, 2005) and your trust’s policies and procedures will assist you in understanding and exercising your professional accountability as you develop your skills in peripheral venous cannulation.

Activity 1

Read The Code of Professional Conduct (NMC, 2004) and your employer’s policies related to nurses performing capillary blood sampling and venepuncture.

Describe what you understand by the term “accountability” when applied to your actions in taking blood samples from a child or young person.

Describe a situation where it would be inappropriate for you to perform this procedure.

Gaining consent

Any informed and competent person can authorise a medical procedure once the implications, side effects and alternatives have been appropriately explained. Age is not necessarily a major factor for informed consent (British Medical Association, 2001), and if children are competent to give consent, you should seek consent directly from them (DH, 2001b). It should not be assumed that children with learning disabilities are not competent to make decisions; many children will be competent if information is presented in an appropriate way (DH 2001b). In most situations it is desirable to have the parent’s consent in addition to the child’s consent. Consent can be verbal, written or implied by the child’s actions, such as holding out an arm ready to have blood taken. Children sometimes refuse to have blood taken because of anxieties over pain during the procedure, or the thought of the needle going into their arm, rather than refusal to have the test performed on their blood.

Genuine refusal of treatment is based on awareness of the implications (BMA, 2001), rather than short term discomfort. Where the refusal appears consistent, valid and informed, but would be likely to result in serious and avoidable damage to the young person’s health, legal advice should be sought (BMA, 2001). It is also important to think about the ethical implications – which course of action will cause the least harm and the most benefit for the child.
For a child to be able to consent to a procedure, they must be allowed to participate in decision making. Encouraging children to make decisions by giving them information and explanations, and respecting their thoughts takes more time than just telling them what's going to happen, and the time factor is often used as an excuse for not adequately preparing children. However, the procedure itself may take longer and cause more distress if the child is not prepared, and their wishes have not been taken into account.

You should explain to the child and carer why the blood needs to be taken. Ensure verbal or implied consent has been given (written consent is required if the blood is to be used in research studies). The *Oxford Reference Dictionary* (1986) defines consent as “to express willingness or agree (to), to give permission, voluntary agreement”. Consent must be given willingly, without duress, force or fraud (Dimond, 1996).

For children to willingly allow someone to do something to them that is uncomfortable or painful, they must be able to control their anxiety, and trust the person performing the procedure. Preparing children for procedures and telling them the truth decreases their anxiety (Price, 1995). Conversely, withholding information regarding illness and treatment does not protect the child, they tend to come to conclusions on their own (Perry, 1994) and this can be more frightening than reality (Action for Sick Children, 1994). In order to prepare a child for a procedure, they must be given honest factual information about the procedure so that they have an understanding of what will happen to them, and what their role is.

Children younger than eight years of age can understand and make logical decisions about life-changing therapy (Alderson & Montgomery, 1996). In keeping with the philosophy of partnership in decision making with the child, and in encouraging their developing autonomy, the child should be informed of treatment plans, and his or her decisions should be taken seriously (Brykczynska, 1987).

**Activity 2**

Think about a child in your care who has had blood taken.

What steps were taken to ensure that the child understood the procedure and was able to give consent?

**PREPARING SELF, CHILD AND FAMILY**

Generally younger children respond to painful procedures with more distress than older children (Broome 1990). They mainly perceive pain as a physical experience and are generally unable to develop their own psychological coping mechanisms. These children need their parents and health professionals to help them cope by providing distraction and comfort as well as topical pain relief. Older children start to have an understanding of the
reasons for blood tests, have greater physical control, and are able to develop psychological coping mechanisms (Twycross, 1998).

Children’s temperament can play a part in their responses to venepuncture pain, and influence parents’ decisions to prepare them for painful experiences (Lee and White-Traut, 1996). Children who are more adaptable and positive in mood tend to be better prepared than more anxious children, possibly because parents are hesitant to evoke unpleasant reactions from their children.

For many children, the fear of needles is the most worrying aspect of attending hospital. A proportion of children display high levels of fear, pain and behavioural distress (Duff, 2003). As a nurse you play a major part in assessing the child’s anxiety and taking steps to minimise any distress.

You can do this by first introducing yourself to the child and carer when you check identity of the child. Then talk to the child to find out their developmental maturity and understanding. This is important in planning how to approach the child when taking blood.

Find out whether the child has had blood taken before. If he/she has, ask them how they felt about it previously. If this is the child’s first time, find out how the child responds to injury situations, such as grazes and scratches as this can be a useful guide to how the child will respond to venepuncture (Goodenough et al., 2000). Smalley (1999) suggests ways of assessing how the child will react to having blood taken (box 1); this can provide information when preparing the child for the procedure.

**Box 1**
Assessing the child’s coping skills (Smalley 1999).

- How much the child understands about the procedure
- If there are any factors that might influence the child’s level of anxiety
- What previous experiences of needle procedures has the child had
- The child’s social support system / family coping style.
- The child’s cognitive/developmental level
- The child’s coping style and how he/she perceives his or her ability to cope with the situation.

**Activity 3**

Describe how you personally cope with unpleasant procedures like going to the dentist. Compare your coping mechanisms with those of a 3 year old and an 8 year old.
Unless play preparation is required, assessment of the child’s coping behaviour should not take too long as the anticipation phase of the venepuncture is the worst part of the procedure for some children (Caty S, Ellerton ML and Ritchie JA, 1997). Providing information is important so that the child will know why the procedure is needed and what he or she will see, feel, hear and smell. If the procedure is more painful than the child expects, this may lead to anticipatory anxiety with future procedures. For young children you may need to show them on a teddy or doll and allow them to play with safe equipment. Children with extreme anxiety should have the procedure postponed if it is not urgent, in order to spend some time with the play specialist or child psychologist, getting used to handling safe blood taking equipment and working through their fears with dolls and teddies.

Needle phobia

‘Needle phobia is a term used in practice to describe an anticipatory fear of needle insertion.’ (Thurgate C, Heppell S, 2005). If pain and anxiety are poorly managed, there can be significant negative consequences. The child’s memory of traumatic venepuncture experiences can lead to extreme anxiety and physiological responses such as venous constriction during later procedures (Vessey JA et al., 1994). Although in many people needle phobia can be traced to a negative experience they had when they were younger, some children and young people may have been conditioned by the fears of relatives or friends concerning needle procedures (Smalley 1999). Children who display signs of needle phobia should be referred to a play specialist and/or child psychologist.

Restraint

If a child is wriggling and screaming, you can assume they have not consented to the procedure. Restraining a child means forcefully holding them against their will; holding a child still is done with their cooperation, and some children feel more secure when they are gently held. Being restrained can be more distressing for a child than the pain involved in the procedure (Collier & Robinson 1997). Restraining a child for venepuncture should be the last course of action envisaged for an essential and urgent sampling of blood, or establishment of venous access. When the rights of the child are considered it becomes clear that alternatives to restraining should be available and used (Royal College of Nursing, 2003b). Only when the child’s safety and well-being may be compromised by delay should restraining be the preferred option. When appropriate, nurses and parents may gently hold a child’s arm in position during venepuncture and this, in conjunction with other techniques, may be comforting for the child as well as help to ensure the child’s safety. If holding the child still is ever undertaken, its ill-effects may be minimized by preparing the parent and child as far as possible in the situation. The child can also subsequently be given further information and offered the chance to discuss events so that they may be able to begin to make sense of what has occurred. Very young children can be held securely, but not too tightly.
Wrapping a young child or infant in a light blanket while cuddling and talking to them may be comforting as well as providing effective restraint.

On occasion, in the intractable but non-urgent situation, sedation might be considered as a safe and alternative technique (Scottish Intercollegiate Guideline Network, 2002).

‘All healthcare staff working with children should understand the importance and benefits of distraction techniques and know how to use them effectively. They are not interventions to be carried out just by a play specialist.’ (Pearch, 2005)

Activity 4

Find and read two articles about restraining children. This should include the document Restraining, holding still and containing children (RCN, 2003)

Describe the steps you would take to keep a five year old still during capillary blood sampling or cannulation.

Pain relief

You should take active steps to reduce any pain during capillary blood sampling or venepuncture.

Ametop gel and Emla cream

Other than in emergency situations where time is important, local anaesthetic cream should be offered to all children and young people. Ametop gel and Emla cream are two preparations providing local anaesthesia. They act by causing a reversible block to conduction along the nerve fibres. Both should be applied in accordance with the manufacturer’s instructions.

Emla is not licensed for use in children under 1 year, whereas Ametop is licensed for use in children over who are 1 month older than their expected date for delivery.

For both Emla cream and Ametop gel a thick layer should be applied to intact skin and covered with an occlusive dressing, preferably by the person performing the procedure in order that the appropriate sites can be identified. Side effects can include erythema, itching and oedema of the site.
Emla cream should be applied at least 60 minutes before the cannula is inserted. It is effective for up to 5 hours, but this only lasts for 10 – 20 minutes after removing the cream.

Ametop gel should be applied 30 minutes before anaesthesia is required for venepuncture. It must be removed after 45 minutes, although its effect will last for 4 - 6 hours.

**Ethyl Chloride**

Nerve impulses cannot be generated in an area of skin cooled to below 10°C, however, adjacent pain receptors are stimulated which produces the sensation of freezing. The application of a cold substance to the skin (e.g. ice or ethyl chloride spray) can act as a local anaesthetic (Tortora, 1997). Ethyl chloride when sprayed onto the skin for 5 - 10 seconds quickly evaporates and cools the skin down to below 10°C. However, it is not recommended for use in children under the age of five.

If you ask the child, they will usually tell you when their skin is cold and numb enough. Armstrong P, Young C, and McKeown D (1990) recommended ethyl chloride as a method of producing instant skin anaesthesia and DeJong et al. (1990) reported that its efficacy when used for peripheral intravenous cannulation in children is comparable with Emla cream.

There have been reports of solvent abuse with ethyl chloride (Broussard et al., 2000, Yacoub et al., 1993) leading to confusion, hallucinations, ataxia, short term memory impairment, cardiac dysrhythmias, respiratory arrest and death. Care should be taken to avoid inhalation, and it should be stored in a secure place.

**Nitrous oxide (Entonox®)**

Although distraction techniques and topical anaesthesia are more usual for relieving the distress of venepuncture, in some cases nitrous oxide has been shown to be effective. However, Nitrous oxide mixture is reported to be less effective for pain relief during venepuncture in children under the age of four years, than in older children (Gall O, Annequin D, Benoit G, Glabeke EV, Vrancea F, Murat I, 2001).

When nitrous oxide is combined with oxygen in a 50:50 concentration, analgesia rather than anaesthesia is produced and respiratory depression is avoided (Fisher & Harrison, 2000). It has a rapid onset of about four minutes (Fisher & Harrison, 2000) and produces effective, short acting pain relief (Beh et al., 2002). It should be used with care by staff that have undergone specific training in its use and side effects.
PERFORMING CAPILLARY BLOOD SAMPLING AND VENEPUNCTURE

CAPILLARY BLOOD SAMPLING

The main advantages of capillary blood sampling are that it prevents the need for venepuncture, requires small amounts of blood and is a relatively quick procedure. However, there are some disadvantages: Heel punctures are the most common painful invasive procedure performed on neonates; skin trauma can result in bruising, haematoma or scarring. More extreme complications can be infection leading to cellulitis and osteomyelitis as the result of too deep or repeated punctures. If an incorrect technique is used, it can lead to localised swelling, tenderness or increased hypersensation.

When choosing a site you should remember that the posterior curvature of the heel must not be used as this can result in growth disturbances of the hind part of the foot. In neonates, the fingers can be damaged by capillary sampling and this should be avoided.

On occasions a second site needs to be punctured to obtain adequate blood for analysis. If the puncture site is `milked', this can result in a haemolysed sample, giving abnormal and inaccurate potassium levels.

Activity 5

List the ways in which pain during capillary blood sampling and venepuncture is minimised in your clinical area.

What are the advantages and disadvantages of these methods of pain relief?

Describe how you would use each of these to best effect.

Activity 5a

If you will be taking blood from neonates and infants describe the differences in their care and pain relief.
SELECTING A SITE

The following are some key points to remember when choosing a site.

- Heel pricks should only be performed on babies under four months of age.
- The technique cannot be performed on poorly perfused, oedematous, inflamed or swollen tissues.
- Never obtain a sample from the fingers of neonates as they will become damaged due to their delicate nature.
- Do not use a previous puncture site as the blood flow will be reduced and tissue damage can occur to the finger or heel.
- When obtaining a sample from the heel the most medial or lateral portion of the heel should be identified. Punctures should never be made on the posterior curvature of the heel below the Achilles tendon, where the bone is closest to the skin or the arch of the foot. Poor procedural technique can result in growth disturbances of the hind part of the foot.

Correct puncture site for a heelprick:
Correct puncture site for a fingerprick:

VENEPUNCTURE

SELECTING A VEIN

Only a small amount of the needle needs to enter the vein before the blood can be drawn but many children feel anxious that the whole needle will go into them, or the health professional will have to ‘wiggle’ it around to get the blood out.

Once the procedure has begun, it should be carried out as calmly, efficiently and as quickly as possible; for many children, including the oldest age group, the threat may not be over until the needle has been removed from the vein (Caty et al., 1997). In addition to preparation before the procedure, children’s distress can be further reduced if they are told what is happening during the procedure and what sensations they will feel (Broome 1990, Caty et al., 1997).

If the child has had blood taken previously, ask them where their best vein is, or where they prefer it to be taken from. Spend time selecting the most appropriate vein so that the first attempt will be successful. Talk to the child and encourage them to help in choosing a vein. You may need to apply the tourniquet briefly or get the carer to squeeze the child’s arm while you look for an appropriate vein.
The best veins for venepuncture are usually around the antecubital fossa region (the median cubital, basilic and the median cephalic veins), although these may be difficult to locate in well nourished infants and care needs to be taken to avoid the brachial artery (Das & Sharma, 2002). With young infants, transillumination of the palm of the hand with an otoscope can help in identifying suitable veins for venepuncture (Goren A, et al., 2001) Children with spina bifida and little or no sensation in their legs and feet may prefer the veins in the feet to be used.

If it is likely that the child will need a peripheral venous cannula, if possible smaller veins should be used in order to preserve larger veins for cannulation.

If topical anaesthetic cream is being used it should be applied to at least two potential sites, just in case the first attempt fails. When it has been in place for a suitable length of time you need to remove it and clean the area before re-examining for suitable veins.

**Activity 6**

Look at the veins on your arms, hands and feet. Which of your veins would be most suitable to use if you needed to give a blood specimen?

Observe health professionals on your ward / unit taking blood by peripheral venepuncture. Make a list of the sites used, and the advantages and disadvantages of these sites.

**COLLECTING BLOOD SAMPLES**

Blood sampling for diagnostic testing is an important aspect of care and treatment. It can confirm a diagnosis; indicate that treatment is working and may lead to treatment changes. Results must, therefore, be reliable and results available as soon as possible. When taking blood samples you will be the first link in a chain.

The specimen must arrive the laboratory in a good condition. Your hospital’s laboratory service should give clear instructions on sample requirements and when blood should be taken.

Specimen bottles vary according to the test required. You should familiarise yourself with the more commonly used bottles. When drawing samples you should ensure they are collected in the correct order to prevent samples that need to clot are not contaminated by an anti-coagulant.

It is essential that specimens are labelled correctly. This is the responsibility of the person collecting the sample. You should label the specimen immediately after collection.
Activity 7
In your ward or department
Locate and read information regarding laboratory tests.
Locate information on types of specimen bottles and identify where the different bottles are kept.

TROUBLESHOOTING
There are many situations where capillary blood sampling and venepuncture can prove difficult, even to the experienced practitioner. It is important to recognize when you are experiencing difficulties and to summon assistance from someone else. Your hospital should have a policy outlining the number of failed attempts at venepuncture, usually two or three, that you can have before asking someone else to perform the procedure.

Potential problems include:

Improper tourniquet placement – too high/low/loose/tight leading to insufficient engorgement of the vein.

Failure to release the tourniquet – when the needle has been placed sufficiently, may cause bleeding outside the vein as the result of increased intravascular pressure.

A “stop start” approach – when beginner’s lack confidence. This can injure the vein and cause bruising.

Inadequate vein stretching – allowing the needle to push the vein aside.

Opposite wall penetration – may not be immediately obvious. If you suspect this has happened act quickly in an attempt to save the vein. Without removing the tourniquet, retract the cannula slightly until blood flashback appears again indicating the cannula is in the vein lumen. Quickly advance the cannula into the vein and remove the cannula.

Lack of backflow – suggests vasospasm. This is common in young patients who are anxious.

Occasionally the patient, especially teenagers, and parents may experience light headedness. They may even faint. It is possible that you may be so focused on the procedure that you don’t realise. Even when you are learning, try to be aware of the child’s reaction to the procedure.
RISKS AND HAZARDS

INFECTION CONTROL

Healthcare associated infection affects an estimated one in ten NHS hospital patients each year. Over 60% of blood infections are introduced by intravenous feeding lines, catheters or similar devices. This is because microorganisms on the patient’s skin (either those naturally present or those acquired whilst in hospital) can gain entry to deeper tissues or the bloodstream when a cannula or catheter is inserted into a vein.

Hand hygiene is widely acknowledged to be the single most important activity for reducing the spread of disease, yet evidence suggests that many health care professionals do not decontaminate their hands as often as they need to or use the correct technique which means that areas of the hands can be missed.

Activity 8

Find the Wipe it Out campaign on the Royal College of Nursing website www.rcn.org.uk

Read the section on hand hygiene and check your hand-washing technique.

Needlestick injury

Blood sampling is potentially hazardous for the practitioner. Between 1997 and 2002 there were 1,550 reports of blood-borne virus exposures in health care workers, of which 42 per cent were nurses or midwives.

Needlestick injuries can occur during and after the procedure if the child is distressed or if sharps disposal policies are not adhered to. You have a responsibility for minimising the risk to yourself and others of needlestick injury, by ensuring sharps are used safely and disposed of carefully.
Capillary blood sampling and venepuncture have a higher risk of causing injury. To minimise the risk you should ensure the following:

- sharps are not passed directly from hand to hand
- handling is kept to a minimum
- needles are not broken or bent before use or disposal
- syringes or needles are not dismantled by hand and are disposed of as a single unit
- needles are never re-sheathed
- you take personal responsibility for any sharps they use and dispose of them in a designated container at the point of use. The container should conform to UN standard 3291 and British Standard 7320
- sharps containers are not filled by more than two thirds and are stored in an area away from the public
- sharps trays with integral sharps bins are in use
- sharps are disposed of at the point of use
- sharps boxes are signed on assembly and disposal
- sharps are stored safely away from the public and out of reach of children
- you are aware of inoculation injury policy.

Activity 9

Find a copy of the Royal College of Nursing document Good Practice in Infection Prevention and Control: guidance for nursing staff. www.rcn.org.uk

Describe the key actions you would take to prevent infection to patients and staff when performing capillary blood sampling or venepuncture.

Accidental arterial puncture – this can result from a poor cannulation technique causing pain and spasm. If the artery has been puncture the blood will be brighter, fast flowing and may spurt. You should remove the cannula immediately, apply pressure for 5 minutes, assess and dress the site and observe the limb frequently.

Blood spillage – You should follow your hospitals’ policy.
Activity 10

Reflect on your learning and knowledge so far and undertake the following:

- Identify the areas where you feel your knowledge is at a level where you can practice safely.
- Identify areas where you need more information and support in developing your knowledge and skill.
- Consider what actions you will take to continually develop your skill in peripheral intravenous cannulation.

FURTHER LEARNING

Your expertise in capillary blood sampling and venepuncture in children and young people will develop gradually and you will become more confident in your practice. From your learning so far, including any supervised practice you have undertaken, you should have a good understanding of the knowledge and skills you will need to practice safely in this area.

The RCN fully supports members in raising concerns regarding the care of children and young people, and the protection of their rights as individuals.

If you feel compromised - for example if training provided by your employing organisation is inadequate and you are not getting the help you need - contact RCN Direct on 0845 772 6100 or ring your local RCN Office (contact numbers can be found in your RCN Diary and Members Handbook).
REFERENCES AND SUGGESTED READING


Department of Health (2001a), Building a safer NHS for patients: Implementing an Organisation with a memory. London: DH.


Department of Health (2004), National Service Framework. Children and Young People who are ill, London: DH.


Franklin L (1998) Skin cleansing and infection control in peripheral venepuncture and cannulation, Paediatric Nursing, 10 (9), pp. 33-34.


National Patient Safety Agency (2004b) *Seven steps to patient safety*, London: NPSA.


Useful websites

www.actionforsickchildren.org.uk  Action for Sick Children
www.dfes.gov.uk  Department for Education & Skills
www.dh.gov.uk  Department of Health (England)
www.epic.tvu.ac.uk  Evidence-based practice in Infection Control
www.hse.gov.uk  Health and Safety Executive
www.icna.co.uk  Infection Control Nurses Association
www.npsa.nhs.uk  National Patient Safety Agency
www.nahps.org.uk  National Association of Hospital Play Staff
www.nmc-uk.org  Nursing and Midwifery Council
www.nes.scot.uk  NHS Education for Scotland
www.rcn.org.uk  Royal College of Nursing
www.skillsforhealth.org.uk  Skills for Health
www.rcpch.org.uk  Royal College of Paediatrics and Child Health