East of England Neonatal ODN

Extended clinical skills workbook and competency

for QIS nurses

Review Date July 2024

Name	
Signature	
Start date	
Designated preceptor / buddy	
Local Practice Development Nurse(s)	
Local Lead Nurse	

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Introduction

This evidence based workbook and competency has been adapted from TV&W Neonatal ODN to assist practitioners in developing the knowledge and skills to underpin safe practice in performing extended clinical skills in the neonatal population. The workbook can be used by any QIS neonatal staff within the East of England ODN. It is recommended that this workbook is commenced 6-12 months post QIS qualification. This will enable you to consolidate the new knowledge and skills from your QIS course before moving on to more extended clinical skills. This is of course negotiable with your local PDN. Following the completion of each section of the workbook, the practitioner is responsible for organising time to work with their identified supervisor to gain practical skills required and for the final competency assessment(s)

Purpose of the document

This document has been developed by the East of England Neonatal Practice Development group (adapted from TV&W neonatal ODN) for use by all qualified in speciality (QIS) staff in the East of England network. The purpose of this document is to take you through from novice to competence in extended skills performed in the neonatal setting. These skills include venepuncture, IV cannulation, arterial line sampling and blood gas analysis. You will be supported by your local practice development nurse(s) and designated preceptor(s) to develop your practice and deliver standardised evidence based care. This document is used in all 17 units across the East of England ODN.

Guidelines on completion of this workbook

Your practice development nurse(s) and preceptor(s) will work with you to ensure you are given the opportunity to complete all sections of this document. The time period for completion will differ from person to person depending on hours worked.

The skills covered within this document are:

- Venepuncture
- IV cannulation
- Arterial line sampling

- Blood gas analysis

A practice log is provided for each clinical skill. The number required will differ from person to person depending on your local setting, previous experience and confidence. This should be discussed with your preceptor for each individual skill. Following completion of each section of the workbook there is the associated competency assessment. Your preceptor will be competent in all of the dimensions and skills listed and will complete supervised practice and competency assessment(s).

Format of the workbook

This workbook is a blended tool of didactic knowledge provided for your learning and questions to review existing knowledge and promote further thinking. You are not expected to know all the answers but must attempt to find information on those areas you are less familiar with. Different resources are available to support you such as books, journals, policies, the internet, librarians and work colleagues. Prior to commencing this workbook you may need to have an Athens account. Your local librarian will help you with this.
There is no formal pass mark but if significant deficiencies in your knowledge become apparent you may be asked to complete further theory work before undertaking the practical skills.

Competency Assessment

In order to demonstrate competence in each individual skill you will need to:

- Observe the procedure in its entirety at least once
- Demonstrate knowledge of the following:
    - Indications and contraindications of the procedure
    - Risks and benefits of the procedure
    - Related anatomy and physiology
    - Consent (if applicable)
    - Documentation of the procedure
- Under the direct supervision perform the procedure successfully 3 times

- Be assessed by the mentor / preceptor as competent in all learning objectives.

The level required during final assessment is that of **competent practitioner.**

Benner taxonomy level 3

Novice – Taxonomy Level One

Novices have no experience of the situation they find themselves in, and they operate by closely following rules laid down by others. They perform a series of tasks without understanding, or referring to, the context within which they are operating.

Advanced Beginner – Taxonomy Level Two

Advanced beginners demonstrate a degree of flexibility in their performance and interpret the rules to meet the needs of the situation, maintaining throughout the safety of the patient, colleagues, others and self. They are able to relate to the current situation, based on prior learning.

Competent – Taxonomy Level Three

Competent practitioners are consciously aware of long-term effects of their actions. They are able to plan the most satisfactory outcome of a situation, and take the appropriate action to achieve the planned aims. This requires conscious, abstract, analytical contemplation of the situation.

- **Has detailed knowledge and awareness of polices/procedures/guidelines, which may be applied.**
- **Discriminate and choose which of the polices/procedures/guidelines apply within the situation.**
- **Conscious, deliberate planning. Anticipates outcomes and gives explanations for the interpretations made and the interventions used.**
- **Able to analyse and challenge research findings, evidence based practice and received opinion.**
- **Identifies priorities and key elements of problems.**
- **Performance is proficient and confident requiring minimum direct supervision.**

Proficient – Taxonomy Level Four

Proficient practitioners use their expertise to critically analyse and evaluate situations as a whole. They are able to identify the more important elements of a situation and make decisions based on a broad perspective.
Take a global or holistic view of the situation and relate it to ethics and professional practice, (creativity, innovation and change).

Expert – Taxonomy Level Five

Experts are able to focus on a relevant part of a situation without conscious consideration. They will use their intuition, based on vast experience; to follow a course of action which they 'know' is appropriate. An expert practitioner develops a feel for situations and a vision of possibilities. Not all members of the multi-professional teams are capable of reaching this level – it could be assisted by techniques such as critical incident analysis.

Your responsibilities

Whilst staff on the neonatal unit will support you to complete the learning outcomes in this document, **you** are ultimately responsible for your own learning. As such, you must ensure that:

- The document is available to your practice development nurse(s) or preceptor at all times. You should have this document with you during **every** clinical shift.
- You should arrange dates for meetings with your preceptor at least 2 weeks prior to the meeting.
- You must inform your practice development nurse(s) if you feel you are not getting the support you require during clinical shifts or if you are unable for any reason to arrange or complete the progress meetings with your preceptor.
- You attend any relevant training sessions that have been booked for you.
- You actively seek learning opportunities in order to complete the assessments.

Practice Development Nurse(s) / lead nurse responsibilities

The local lead nurse / practice development nurse(s) are responsible for:

- Allocation of a suitable preceptor(s)
- Requesting feedback from your preceptor(s) regarding progress and escalating concerns as required
- Ensuring that you are aware of the educational opportunities available on your local unit and across the ODN if applicable.

Preceptor responsibilities

Your preceptor(s) are responsible for:

- Keeping up to date with your progress.
- Completion of the record of meeting form.
- Ensuring that you are aware of the educational opportunities available on your local unit

Meetings with Preceptor

You should meet with your designated preceptor at the start of your learning journey and again at the end once all assessments have been completed. You may wish to meet more regularly to discuss progress.

Meetings can be more frequent if required and the reasons for this frequency should be indicated on the proforma.

The purpose of these meetings is to discuss progress towards your learning objectives. You and your preceptor should complete the proforma included on the following pages at the end of each meeting. Please include as much detail about your progress as you can, you may want to make notes between meetings so progress can be accurately assessed.

Record of meeting

Staff member name		**Staff member signature**	
Preceptor name		**Preceptor signature**	
Date of meeting		**Date of next meeting**	
Comments			
Summary of discussion of progress towards learning objective			
Agreed action plan (including timeframe)			

Record of meeting

Staff member name		**Staff member signature**	
Preceptor name		**Preceptor signature**	
Date of meeting		**Date of next meeting**	
Comments			
Summary of discussion of progress towards learning objective			
Agreed action plan (including timeframe)			

Professional and Legal Responsibilities

Discussion with your line manager/ practice development nurse should take place prior to undertaking extended clinical skills training and identified within a PDP. This is an enhanced nursing role and must not compromise other aspects of nursing care.

Continued proficiency

It is recommended that you perform each skill successfully a minimum of 3 times per year in order to demonstrate continued proficiency. Where this is not possible demonstration during simulation or in a skills lab could be considered. This will be monitored during annual appraisal.

Policies and guidelines

Practitioners must comply with the policies that apply to venepuncture and/or cannulation within their local Trust.
Local and ODN policies and guidelines are available to support you in your practice. ODN guidelines can be located at https://www.networks.nhs.uk/nhs-networks/eoe-neonatal-odn/guidelines. Your local practice development nurse(s) will inform you of where local guidelines can be located.

Suggested guidelines to be reviewed

Local Policy/ Procedure	**Date read**	**Initial**
Aseptic Non Touch Technique		
Bagging and labeling of laboratory specimens		
Infection Control - Hand Hygiene		
Intravenous devices policy with procedural guidelines		
Patient Identification		
Standard Infection Control Precautions		
Venepuncture; Blood Sampling and Requesting		
ODN guideline		
Umbilical venous catheter insertion		
Umbilical arterial catheter insertion		
Pain management		
Insertion of a Percutaneous Venous Catheter (PICC) In Neonates		

Accountability

Put simply, 'accountability' is about taking responsibility for your actions, always ensuring you are competent to do the activity you've been asked to perform, and always putting patients'/clients' interests first.
What it means in practice is that whatever you do in your work, you should be able to justify it as a sensible course of action. This means that whatever you do:

- you should know why you're doing it
- you should have been properly trained and assessed as being competent to do it
- you should be doing it as part of an agreed plan of care for the patient/client**.**

To be accountable, practitioners must:

- have the ability to perform the activity or intervention
- accept responsibility for doing the activity
- have the authority to perform the activity, through delegation and the policies and protocols of the organisation.

Question 1

How would you define accountability? (include sources)

Consent

For consent to be valid it must be given voluntarily by an appropriately informed person. The person giving consent must have the mental capacity to understand the nature of the proposed treatment based on information given in broad terms. Furthermore the capacity must extend into an understanding of the consequences of not agreeing to the proposed treatment (Fertleman and Fox, 2003). Consent is obtained from someone with "parental responsibility" and involves both communication and understanding by the parent. If the parents are married, valid consent can be obtained from either parent. If parents are not married, valid consent can only be obtained from the father if he is to be named on the birth certificate and the mother confirms she wishes him to have parental responsibility.

What information should be given?

The term **'explicit consent'** is used to describe the situation when the purpose and risks of an intervention are formally explained and consent, either verbal or written is obtained and recorded prior to the intervention.

'Implicit consent' is defined by its very nature is dependent upon the building up of rapport and trust between clinicians and parents. Implicit consent is used to describe situations where it is judged that the nature and risk of a procedure is to be less formal and often retrospective transfer of information about the intervention is considered sufficient.

BAPM (2011) *Good Practice Framework for Consent in Neonatal Care clearly states that: "It is a legal and ethical requirement to gain valid consent before examining and initiating any investigation and treatment for any patient. Failure to seek consent is not an option. However, in neonatal practice, there are frequently occasions, particularly soon after birth, when there is no-one available to provide valid consent and the clinician has to initiate treatment in its absence. It should always be possible later to justify the action to the parents and to reassure them that it was in the best interests of the baby" [p.1].*

Principles

1. Consent is obtained from someone with parental responsibilities; this will usually be the parents. The basis of valid informed consent is the establishment of clear two-way communication and is an on-going process. Consistent communication will increase the parents' trust and confidence in the medical and nursing team and decrease the likelihood of problems.
2. Consent is valid only when the information provided has been understood by the parents and explains why the intervention is recommended, its risks and the implications and options should consent is withheld.
3. It will not usually be practical to seek and document consent to routine and low risk procedures. However, you should remember that in law such consent is required.
4. In an emergency, if consent cannot be obtained (e.g. nobody with parental responsibility is available or the parents are too distressed to give valid informed consent), treatment may lawfully be started if clinicians believe it to be in the child's best interests.
5. Consent may be written, verbal or implied. Documentation indicating the information given to parents and their apparent understanding and agreement to proceed is the most important validation of consent. A signature does not of itself confirm informed consent.
6. The gaining of explicit consent, whether with or without a signature, should be witnessed and the name of the witness recorded.
7. Parents should understand that they can withdraw consent for investigations and treatments not yet completed.
8. Written material should be available for the parents of all babies admitted to the neonatal unit, describing the nature of low risk procedures, such as venepuncture, for which explicit consent would not normally be sought.
9. The availability of written material and the perception of a procedure as low risk do not obviate the need for the clinician to explain its purpose, any risks and the implications of withholding that procedure.
10. Counsellors and advocates should be available to support parents.
11. The assumption that implied consent has been gained must be made with caution in neonatal practice; whenever possible, all procedures should be explained to the parents.
12. If you have any reason to believe that consent might be disputed later, it should be documented in the notes even for a low risk procedure. In this situation, it is particularly important that the presence of a witness is recorded.

Question 2

List the procedures that you may undertake as a nurse that require consent

Pain assessment and relief

All neonates undergoing venepuncture and/or cannulation should be offered appropriate pain relief (according to local policy). Infants 32 weeks and above with stable blood sugar levels should be offered sucrose (as per network Guidelines). Neonates for whom this is not appropriate should be comforted using containment holding or non-nutritive sucking.

Sucrose 24% in 2ml plastic vials used together with non-nutritive sucking help minimize pain during routine invasive procedures.

Give the dose by dropping the prescribed dose onto a pacifier and gently place in their mouth, or carefully drop the prescribed dose onto the tip of the baby's tongue in a graduated manner. Alternatively a cotton bud can be used. (See Network Sucrose guideline for details.) Sucrose is ineffective if given via a naso/orogastric tube.

Infant gestation	**Dose**
27+1 – 32 weeks gestation	0.1 – 0.5ml 24% Sucrose solution
32+1 weeks gestation	0.5 – 1ml 24% Sucrose solution

WAIT 2 MINUTES then perform the procedure (Tomlin 2010).

Maximum of 4 administrations are recommended in 24 hours. If a neonate requires in excess of the recommended maximum dosage in 24 hours, review the neonate's current procedural pain management plan. Discuss with the nursing and medical team regarding additional sucrose dosing or alternative management.

Pharmacological pain relief may not be appropriate for most extubated babies, but it may be appropriate for ventilated babies to have a bolus of analgesia. Where pharmacological pain relief is inappropriate, the effect of painful stimuli may be reduced/shortened by non-nutritive sucking, swaddling and containment holding.

Infection Control

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 practitioners do not decontaminate their hands as often as they should or use incorrect technique so that areas of the hands are missed.
Visibly soiled hands should be decontaminated using liquid soap and warm water. Hands should be decontaminated before every episode of direct patient care and following any activity which could have resulted in contamination, as per 5 moments of hand hygiene(WHO)
Hand sanitiser is effective and convenient unless hands are visibly soiled or when dealing with suspected or confirmed infective diarrhoea as hand sanitizer is not effective against these (C.difficile , Norovirus) however hand washing should take place after several applications of hand sanitizer.

Aseptic non touch technique

Effective aseptic non-touch technique (ANTT) is essential for promoting good infection control practice in venepuncture and cannulation.

Question 3
What are the main principles of good ANTT practice?

Question 4

What are the 'key parts' you would use when cannulating?

Needlestick injury

Blood sampling is potentially hazardous for the practitioner. Needlestick injuries can occur before, during and after the procedure, if the baby is distressed or if you are careless with sharps. You have a responsibility for minimizing the risk of needlestick injury, by ensuring sharps are used safely and disposed of carefully and appropriately.

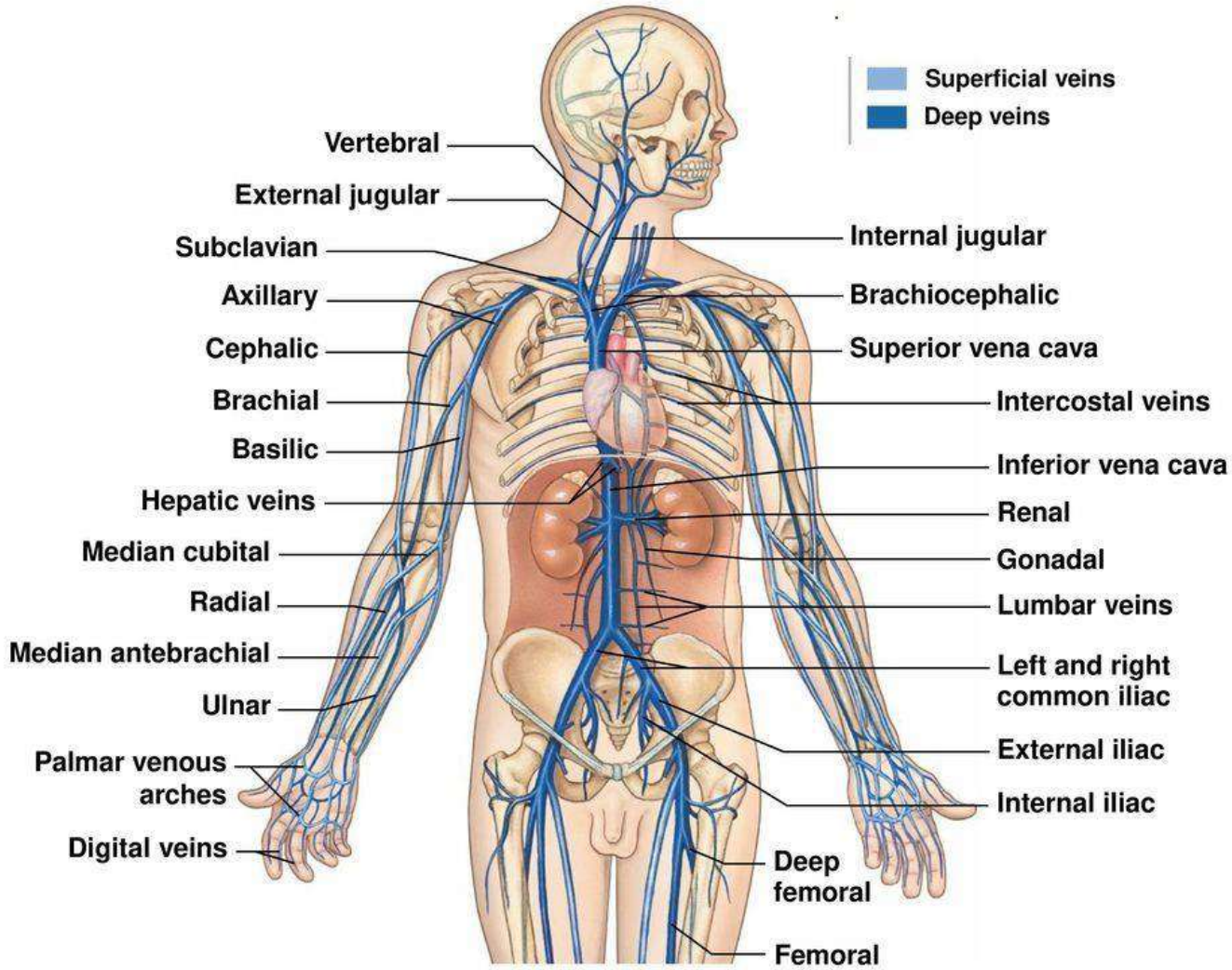
To minimize the risk you should ensure the following:

- Sharps are disposed of at the point of use
- Needles are not broken or bent before use or disposal
- Needles are never re-sheathed
- Needles and syringes are disposed of as a single unit
- Sharps containers are not filled to more than two thirds capacity
- Sharps boxes are stored safely away and from the public.

Question 5

What would you do if you sustained a needlestick injury while performing venepuncture or cannulation?

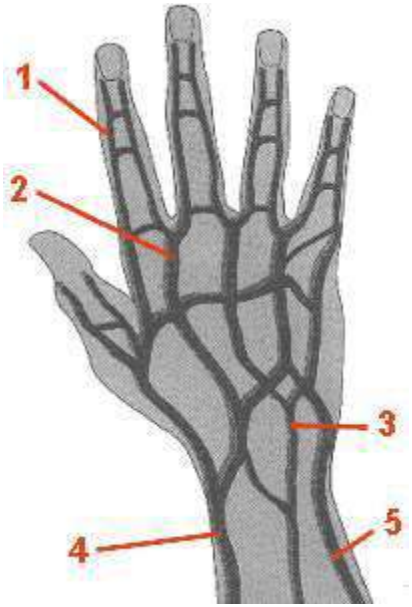
Anatomy of the Venous System


Superficial veins
Deep veins
Vertebral
External jugular
Subclavian
Axillary
Cephalic
Brachial
Basilic
Hepatic veins
Median cubital
Radial
Median antebrachial
Ulnar
Palmar venous arches
Digital veins
Internal jugular
Brachiocephalic
Superior vena cava
Intercostal veins
Inferior vena cava
Renal
Gonadal
Lumbar veins
Left and right common iliac
External iliac
Internal iliac
Deep femoral
Femoral

Question 6
Please label the following diagrams:

Veins of the Hand

1	
2	
3	
4	
5	

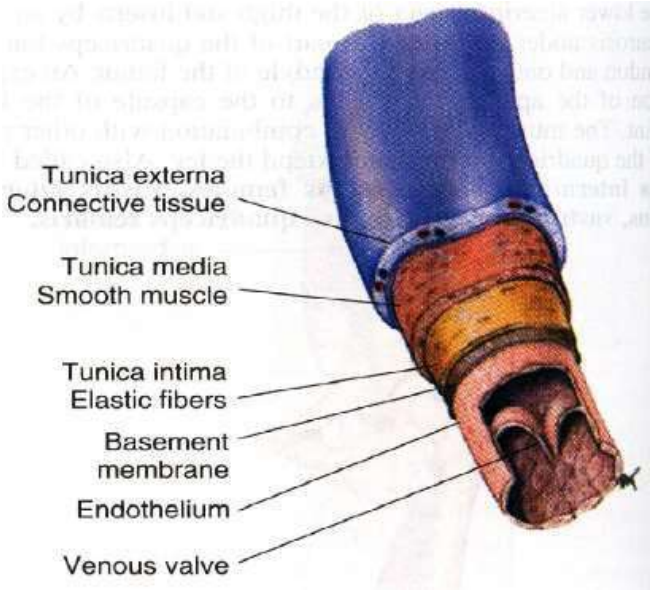


Anatomy of Veins

Tunica externa or *adventitia* (the outer layer) – A fibrous layer of connective tissue, collagen and nerve fibres that surrounds and supports the vessel.

Tunica media (the middle layer) – A muscular layer containing elastic tissue and smooth muscle fibres.

Tunica intima (the inner layer) – A thin, elastic layer of endothelium, which facilitates blood flow and prevents adherence of blood cells to the vessel wall. Trauma to the endothelium encourages platelet adherence and thrombus formation.



Question 7

What is a valve and why might it cause a problem when performing venepuncture or cannulation?

Question 8

What are the main anatomical differences between veins and arteries?

Veins	**Arteries**

Question 9

Which veins (anatomical names) are the best choices for venepuncture and cannulation?

Venepuncture

Venepuncture for Phlebotomy
Venepuncture or HeelPrick?

Many neonatal blood samples can be collected via the heel prick technique.
There are 4 main drawbacks to this technique:

1. May be more painful than venepuncture, as the sole of the foot is very sensitive.
2. Difficult to obtain more than 0.5ml via heelprick.
3. Without a good free flow, blood is more likely to haemolyse or clot. (Can also happen with poor venepuncture technique.)
4. In an oedematous baby, heelprick may produce a lot of serous fluid. This will contaminate the specimen and adversely affect results.

Effect on samples:
FBC: Capillary Hb>venous, sample prone to clotting.
U&E: Haemolysis can cause lower Na and higher K+ readings.
Calcium and Phosphate: Haemolysis causes higher readings.
Clotting Studies: Requires at least 1ml of blood and is prone to clotting therefore needs to be done by venepuncture.

These points can be counterbalanced by poor venous access and/or the need to preserve veins.
Choose the method which is likely to cause least overall distress to the baby, whilst providing a specimen that will give acceptable results.

Venepuncture Device Selection

- IV cannula
- Neosafe phlebotomy needles size G21/G22/G23
- **Never** use a broken needle

Assessing the condition of a vein

Any superficial vein of the limbs has the potential to be used for venepuncture.

Which vein you choose to use depends upon a combination of:

a. Suitability for its purpose: i.e. length, position, its condition, and that of the surrounding tissue.
b. The condition of the infant and the likelihood of need for further phlebotomy/IV therapy.
c. Good practice.

Neonatal veins are often difficult to palpate, therefore we usually rely on visibility, either with the naked eye or by use of a cold light. A good vein refills when depressed and has a large lumen.

Veins for Phlebotomy

As the needle does not have to enter far into the vein, the choice of site for phlebotomy is greater than that for cannulation. However, the large veins and those suitable for cannulation (see veins for cannulation), should be avoided if possible, especially if the baby may need repeated cannulation. Getting into the habit of using shorter veins is good practice.

The short veins of the back of the hands are probably the easiest to access, as the hand can easily be held firm, reducing movement of the vein. The hub of the needle will also lie at an angle that enables easy filling of sample bottles.

Other good sites are the digital veins on the proximal phalanx, and the shorter veins of the feet. These are slightly trickier as holding the vein taut can be more difficult, and the angle of the hub may make blood collection more difficult. In instances where babies have been having regular venipuncture, however, these veins may be the only appropriate ones accessible, and it is good practice to get used to using them.

Question 10

Please complete the chart with the characteristics of suitable veins for venepuncture/ cannulation. Look at your own veins.

Suitable vein	**Unsuitable vein**
• *Soft*	• *Hard*

Question 11

What factors should you consider when selecting a vein for venepuncture?

Question 12

How would you tell if you had inadvertently punctured an artery instead of a vein? What would you do to manage this?

Never attempt venepuncture or cannulation:

- After two previous attempts
- If unable to check the baby's identity
- On sites close to an existing cannula
- On sites covered with scar tissue
- On a paralysed limb
- From a renal fistula

Remember:

- Take your time selecting the most appropriate vein so that your first attempt is more likely to succeed.
- Size of the device should be decided according to the size of the vein i.e. the needle should fit in the vein
- Remember the smaller the gauge, the bigger the bore

Troubleshooting

These skills can prove difficult even to the experienced practitioner. It is important to recognise when you are experiencing difficulties and to summon help. In order to prevent unnecessary trauma to the infant, only **two** attempts at venepuncture should be made by the same person before calling for help.

Potential problems include:

Problem	**Possible cause**	**Solution**

Insufficient engorgement of the vein	Limb not supported correctly or securely enough	Reposition ensuring a secure hold
Bleeding outside the vein	Failure to release holding of limb.	Release hold on limb.
Vein injury and bruising	Lack of confidence and stop start, hesitant approach	Firm and confident approach, practice!
Needle/cannula pushes the vein aside	Inadequate vein anchorage	Firm traction on the skin to stretch and anchor the vein
Opposite wall penetration	Advancing cannula too far	Without releasing the hold on the limb 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. Vesicant medicines should not be given in these circumstances as extravasation can occur through the punctured vein wall
Lack of backflow	Vasospasm	Warm the limb
Bruising	Poor technique Sometimes unavoidable	Take extra care to stabilise needle/ cannula
Haematoma or leaking from the insertion site	Often occurs in infants with small veins	Stop the procedure and start again with new cannula
Mechanical Phlebitis	Trauma or irritation from cannula itself Inadequate fixation	Avoid bony prominences and joints Ensure secure dressing

Unable to advance cannula over stylet	Cannula not in vein Valve obstructing path of cannula	Stop the procedure and start again with new cannula

Tissue Viability

On selection of site for either cannulation or phlebotomy, care should be taken to inspect the integrity of the skin before proceeding. Thought should be given to the maturity of the skin considering both gestation and days of life, and if necessary implement a tissue viability screening tool and maintain observation of these areas.

Timing and Patient Preparation for Venepuncture

Timing obviously to some extent depends on how urgent the procedure is. Even when timing can be planned, assessing the best time for that baby can be difficult. There is evidence to show that babies have a higher threshold of tolerance, and settle more quickly after painful stimuli, if they are disturbed when drowsy or asleep (Sparshott, 1989). Evidence also suggests that periods of rest are beneficial to improve health and growth, and that an increase in the length of time of each handling episode adversely affects infant stress levels. Each episode of handling should be limited to 10-15 minutes, and should be followed by a period of rest to allow recovery.

The practice of single handed venepuncture should be discouraged, as a second person should be present to comfort the infant and help provide gentle containment thus reducing the risk of failure.

Venepuncture Phlebotomy Technique

Prior to venepuncture, you must compress the proximal part of the vein so that the distal part will distend with blood. Over-compression will reduce the arterial and venous supply and therefore defeat the aim. A well compressed vein distends, and the surrounding skin becomes redder. An over compressed vein will recede and the skin becomes pale.

The vein also needs to be held still whilst the needle is used to puncture it. Veins tend to wiggle about in the superficial fascia (because newborn babies have very little fat). The easiest way to hold them stable is by stretching the surrounding skin taut with your free hand. When using the dorsum of the baby's hand, all this can easily be achieved with one hand. For other sites, you may require an assistant to act as a tourniquet and/or help stretch the surrounding skin.

Once the needle is in a vein, blood should flow back. There is a tendency, especially when holding hands and feet, to grip too tightly, if blood flow is slow, or stops, you may need to release your grip. Pumping the vein, (gentle alternating release and pressure) may be required if flow is

slow.

Equipment required

Disposable Tray
Neonatal Phlebotomy needle size
Appropriate bottles
Gauze swabs
Alcohol (or similar) wipe

Method

Prior to starting, it is worth checking with the medical team that no other specimens are required. Ensuring that the baby is unlikely to shortly require cannulation is also good practice.

1. Identify the Baby.
2. Following hand washing, gloves should be worn.
3. Choose the venepuncture site.
4. If you are having difficulty identifying a vein because of oedema, it may help to gently squeeze an area for about a minute to disperse the fluid. A strong light or cold light may be useful.
5. Have an assistant if at all possible
   a. to console the baby
   b. to act as a tourniquet if required
6. Clean the site that you have chosen with a cleaning swab for a minimum of 30 seconds, allow to dry for a further 30 seconds to facilitate coagulation of the organisms, prevent stinging, and needle slippage. This will also prevent any alcohol from affecting the specimen. Remember not to palpate or touch the area again unless further cleaning takes place.
7. Tense the skin around the vein so that it is held steady. This is important because the veins will otherwise tend to move out of the way of the incoming needle. Inset the needle with the bevel pointing toward the ceiling. Go in at the most acute angle possible, (approximately 10- 12^{o} to the skin surface) so that you will only puncture the upper wall of the vein. With experience you will be able to feel the needle puncturing the vein.

You can puncture the skin surface 3-5 mms distally to, and in a straight line with the vein, then advance the needle slowly until you puncture

the vein, or puncture the skin surface directly above the distal end of the vein. You will find which method works best for you. Do not be tempted to run the needle up the lumen of the vein more than 1-2 mm because you will almost certainly puncture the opposite wall, and this will cause a haematoma.
Starting at the distal end of the vein may allow you to re-attempt entering the vein at a higher point, if you are not successful on your first attempt.

8. Once the needle is in the vein, the blood will flow along the lumen and is quite rapidly seen at the end of the neonatal phlebotomy needle. Try to keep a good flow (if necessary by pumping), this will help to prevent clotting in the needle lumen.
9. If after the initial blood is seen, no flow is forthcoming, the reason may be that you are gripping too tightly. Try releasing your grip slightly and gently pump the vein. Alternatively, you may have gone through the vein. Try withdrawing the needle slightly to see if you can re-enter the vein. (Sometimes you can see that you have gone through the vein, by observing a small haematoma at the site of the needle bevel.)

If neither of the above methods is successful, or the haematoma is increasing in size, or the baby appears to be experiencing increased pain, withdraw the needle completely.
Blood may then flow onto the skin surface. You may be able to scoop the blood into the specimen container, especially if you gently pump the vein. This method is more likely to induce haemolysis and/or clotting, especially if the blood is 'scraped up'. It will depend upon the specimen and the information required from it, as to whether this method will suffice. (See section on effects on samples.)

10. If you are convinced that you have not entered the vein (you may be able to see the vein move away, or appear at a higher or lower level than you needle bevel) withdraw the needle completely and try again (if appropriate).

11. Once you have collected the specimens, remove the needle and press gently on the vein with a small piece of gauze, for about a minute. Pressure will ensure that the haematoma is as small as possible and also that the vein is more likely to be available for re-puncture in the future. It is best to use a small piece of gauze to ensure that the pressure is applied directly over the puncture site. With care it is often possible to take blood from the same vein every day.
12. Finally ensure the infant is settled and in a developmentally suitable position following the procedure.

Notes

Order of Draw:
Adhere to local guidelines, but usually: Citrate (Coagulation screening); Heparin/Heparin Gel (Biochemistry, eg U&E's, gentamicin levels); EDTA (Blood) (FBC, DCT, Group & screen); Fluoride (Glucose & lactate).
It is best practice to take blood cultures first, from a newly inserted cannula.
Take care not to accidentally dislodge the needle when collecting specimens; this can easily happen if you knock the specimen bottle against it.
NB: No more than a maximum of 2 attempts at venepuncture should be made by any one person.
If access is limited, or you fail at the second attempt, let the baby rest, and escalate to someone who is likely to be successful.

Blood sampling

Correct labeling of specimens is essential and this is your responsibility as the person collecting the sample. You should label the specimen immediately after collection.
Tops of bottles should be tightly closed to avoid leaking. There must be no trace of blood or other body fluids on the outside of the specimen container.
You must familiarise yourself with the common blood bottles used in your area and the tests they are for. Clinical areas should have tube guides available or refer to the Pathology Laboratory Handbook, which may be online.

Question 13

Why should blood transfusion samples be hand written?

Question 14

What factors can lead to incorrect test results?

Venepuncture

Aim:
Is able to safely and effectively use venepuncture to obtain blood sample

Learning objectives:

- Identify the need for the procedure
- Correctly identify the infant and sample needed
- Select and prepare suitable equipment including correct size needle and correct blood bottles required for sample requested
- Explain the need for the procedure to the family (if present) and gain informed consent
- Select and administer appropriate method of pharmacological and / or non-pharmacological pain relief
- Demonstrate effective hand hygiene and use of gloves
- Select suitable site for venepuncture and is able to explain why to avoid other sites
- Demonstrate strict ANTT technique during procedure
- Demonstrate safe practice including:
    - extension of the limb,
    - application of pressure / tourniquet,
    - palpation and anchorage of the vein,
    - insertion of the needle at correct angle with bevel edge uppermost,
    - stabilisation of needle with non-dominant hand,
    - smooth drawing of blood,
    - gentle needle removal and application of pressure to avoid unnecessary blood loss
    - Use of an approved dressing
- Respond to any difficulties during procedure
- Dispose of equipment including sharps and clinical waste appropriately
- Document procedure
- Recognise own limitations in relation to number of attempts if unsuccessful and seek help when required

Venepuncture practice log			
Date	**Site Used**	**Successful / unsuccessful**	**Comments / reflection**

Venepuncture competency assessment		
Name:		
Local unit:		
Date of assessment:		
Relevant section in workbook completed and knowledge of relevant anatomy / physiology / indications / risks demonstrated:	**Yes / No**	
Competence achieved in all learning objectives (above)	**Yes / No**	
Staff member: I agree I have sufficient knowledge and have achieved all of the learning outcomes to undertake this enhanced clinical skill.	**Name:**	
	Signature:	
	Date:	
Assessor: The practitioner has successfully demonstrated all of the criteria for	**Name:**	
	Signature:	

assessment at the required level of competence.		
	Date:	

Intravenous cannulation

Veins for Cannulation

Cannulae that are sited and cared for correctly last longer, are safer and more comfortable for the child. The risks of phlebitis and extravasation can be reduced if the correct procedure is used. Any superficial vein on the limb can be used for cannulation, providing that it can be held securely, and is at an appropriate angle to allow introduction of the cannula.
Preferably the vein should be long enough to allow the whole of the length of the cannula to be sited within the vein. This reduces the risk of kinking or leakage back of IV substances. However, in babies with poor venous access, this is not always possible, and a small portion of the cannula may have to be left above the skin surface. This commonly happens when the tip of the cannula meets a junction, and will not progress further.
The long Saphenous and those over the antecubital fossa, the Basilar, Cephalic and Median Cubital veins should be avoided if possible, as these large veins are often required for long line access. Occasionally these veins may have to be used for cannulation but you should check with senior medical staff before using them.
The easiest veins to access are those on the dorsum of the hand, as the hand can be flexed and held in a good position, which helps to stabilise the vein. Each baby's venous network will be slightly different, but usually 2 to 3 good veins are accessible.
The next place to look is probably on the outer aspect of the foot and around the dorsal arch. The foot is slightly more difficult to hold in a good position, and you are more likely to need an assistant to help hold.
Other common sites for cannulation are over the medial aspect of the forearm, (the lower ends of the basilar and cephalic veins and their tributaries), these tend to be slightly deeper and are more difficult to stabilise. You will probably need an assistant to provide a human tourniquet and help contain the infant, whilst you hold the skin taut from each side.
Occasionally, a vein can be found on the medial aspect of the wrist. These are often quite small and short, but it is worth looking. Approach to these veins should be from a very acute angle though, as they are in close proximity to the ulna and radial arteries and the ulna nerve.

A site not often used is the basilar vein, at a point where it runs over the wrist. Again, the angle of approach can be difficult, but if overcome, access can be gained to a large vein.

In order to prolong cannula survival time, promote patient comfort and prevent complications, it is important to limit movement of the cannula within the vein and maintain asepsis. The cannula should be connected to an extension tube which allows remote access without movement of the cannula,
To minimise the incidence of phlebitis, the use of a transparent, sterile, semi permeable dressing is recommended for cannulae that are expected to remain in place for 24 hours or more. (Campbell H & Carrington M, 1999)

Sites to Avoid

- Long line sites – large veins (See veins for cannulation). Areas of broken skin/inflammation/infection.
- Limbs with restricted arterial circulation.
- Limbs where there is an underlying abnormality or missing digits etc.
- Femoral veins should not be used because of the risk of thrombosis and/or septic arthritis of the underlying hip joint.

Sometimes a good vein can be found under the site of a bruise, and can be re-cannulated. Repeated cannulation of veins can lead to thrombosis and fibrosis. These veins should be avoided if possible, but in a neonate requiring long term care, many veins may be temporarily or permanently damaged in this way, and there may be no option but to try and re-cannulate them.
It can be difficult to distinguish a thrombosed vein from a healthy vein. The thrombosed vein may feel harder, and does not empty and refill easily on compression. The fibrosed vein often looks thick and wiggly under the skin. Fibrosed veins are usually extremely difficult to cannulate, as the tortuous path makes it difficult for the cannula to thread.

Points to consider

1. Does the baby need the cannula?
2. How long is it likely to be required for?
3. What products will be given via the cannula?

The answer to points 2 and 3 may influence your choice of vein. Larger lumen veins tend not to extravasate as readily as smaller ones, and are therefore better for more corrosive substances. Similarly, smaller veins may not readily accommodate large hourly volumes of viscous products i.e. packed cells.

Inotropes, in particular Dopamine, should ideally be given via a longline/central line in-order to prevent localised vascular constriction.

Other products more suited to central infusion are: High concentration glucose >12.5%
Large Potassium volumes THAM
Having decided that a cannula is required, whether or not you attempt it yourself should depend upon.

a. your own level of expertise
b. the number of venous sites available
c. the known level of difficulty of access in that baby

Where access is limited or difficult, you should discuss with a senior member of the medical team before going ahead.

NB: Until you become skilled and confident, no more than a maximum of 2 attempts should be made at cannulation of any one baby.
When you have been given authority to practice unsupervised and your experience has increased, a maximum of 3 attempts may be made.
It is your responsibility to assess the likelihood of your success at any attempt and decide whether to continue or hand over to someone who is likely to be more successful. This will usually, but not always, be a senior member of the medical team.

Choice of Cannula

There are 3 24g cannulae available,

1. Jelco winged
2. Jelco non-winged
3. The Neoflon

Equipment

Plastic Tray or trolley	Alcowipe (or equivalent)
Cannulas	T-Piece
Syringe with 0.9% sodium chloride	Splint
Bionector	Gauze swab
Steristrip	Adhesive Tape

Remember if you are taking blood and a culture at insertion you will need the extra materials.

The technique is similar to the venepuncture phlebotomy method, except that you will need to feed the cannula into the vein and therefore, your choice of vein may be different. (See section on which veins to use.)

1. Preload syringe with saline and connect T-piece. Flush through.

NB: If not taking blood specimens at the same time, the venflon can also be flushed with saline. This may enable you to see a flashback earlier. Some people prefer to remove the end bung of the cannula as this may improve speed of flashback.

2. Follow steps 1-6 for phlebotomy venepuncture. At step 3 you will also need to ascertain the direction of the flow of the vein. Usually this will be obvious as venous blood flow is usually up the limb. Occasionally a vein appears to cross a limb, especially across the dorsal arch of the foot. To assess, gently stroke the vein in each direction. If it empties under and behind your finger then rapidly fills, and does not appear any fuller in front of your finger, then you are massaging it in the direction of flow. If it appears to bulge (it may even appear to wiggle) in front of your finger, then you are massaging against the flow. Alternatively, by massaging the vein and emptying an area, you may be able to see the direction of the return of flow.

3. The idea of placing the cannula in the same direction as the flow is to minimise the risk of IV fluid running back out of the puncture site.

4. Tense the skin around the vein, as you would do for venepuncture phlebotomy. Again, as with phlebotomy, insert the cannula at as an acute an angle as possible. You may feel the cannula puncture the vein; at this stage you should stop and wait for a flashback. In

practice, this will happen very quickly if you have entered the vein. You may not always feel the vein puncture; therefore it is important to keep an eye on the filling chamber for any sign of blood.

Not all veins bleed back profusely, therefore you may not experience more than an initial small flashback as you enter the vein. Conversely this could also mean that you have gone through the vein.

You will become more experienced at judging the above, but initially, once any flashback has been seen, it is worth moving onto the next stage.

Note: When skin is tough, the pressure required in order to pierce it, can then mean that the cannula progresses rapidly forward through both walls of the vein. You will need to learn to control the cannula to prevent this happening. This becomes easier with practice, but cannot always be prevented.

5. The next stage is the most difficult. The metal introducer (the stylet) is longer than the plastic cannula, so it is necessary to insert the cannula a little further, (perhaps 1 mm depending on the brand) into the vein. This ensures that both parts of the cannula are in the vein. (See diagram.)

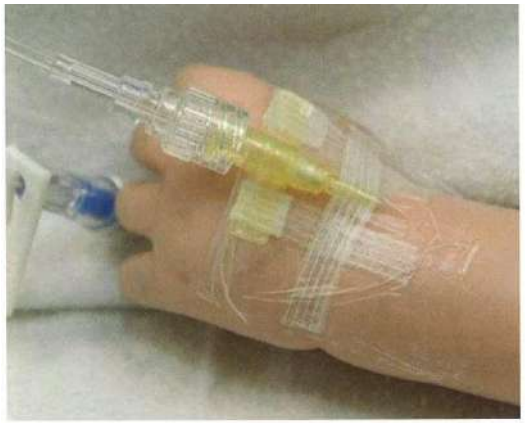
Level the cannula slightly to avoid puncturing the back wall of the vein. If you push too far at this stage the level is likely to puncture the lower wall of the vein, causing a haematoma, and it will be difficult to enter the vein again.

In practice, by the time you have seen the flashback, you will probably have already advanced the cannula sufficiently into the vein. Again, practice will allow you to gauge this better.

6. Once you have the introducer and cannula in the vein, you should hold the introducer steady and slide the plastic sleeve into the lumen of the vein. (See diagram). With experience, you will be able to feel the difference between a cannula running inside the lumen of a vein, compared with one running incorrectly in the superficial tissues.

7. After having inserted the cannula, release the tourniquet, and then reapply pressure over the site of the cannula. This will reduce blood flow. You can then remove the stylet, attach the T- piece and try a flush.

8. If all is well – tape in the usual way, a splint may be used to assist in keeping the cannula secure.



9. A resistance to flush does not necessarily indicate extravasation. The tip of the cannula may be at a junction/wall, impeding flow. Try pulling back the cannula slightly and flush again. Also try changing the angle of the cannula in a horizontal and vertical plane. If this improves flow, try to anchor it in this position.

If you pierce both sides of the vein, you may notice a small haematoma collecting at the site of the bevel. Try drawing the cannula back slightly, lower the angle and try to rethread.

Sometimes you will miss the vein altogether, you may be able to see the vein wriggle away, or appear at a level higher or lower than the level of the bevel. If so, withdraw the cannula to the point of insertion and try again.

NB: Do not re-insert the stylet into the cannula, as it may shear off the cannula and lead to a catheter embolism. A reattempt should be made with a new cannula, as the old one will be contaminated, less sharp, and prone to the cannula end fraying.

Complications of Cannulation

Question 15

What are the local and systemic complications possible with cannulation?

Local Complications	Systemic Complications

Phlebitis affects the inner endothelial layer of the vein and results from chemical, physical or mechanical irritation. It is characterised by pain and tenderness along the course of the vein, erythema, inflammatory swelling and warmth at the site.

The length of time a cannula is in situ is thought to have an impact upon the incidence of infusion phlebitis. Recommendations state that a cannula should ideally be changed every 48-72 hours to minimise the risk of infusion phlebitis. It is common practice in paediatrics however, to leave a cannula longer than 72 hours in some cases. This is acceptable providing **all** of the following conditions are met:

- Discussion has taken place with medical team re length of treatment etc.
- VIP score is NESS /0 score (trust specific)

- No pain evident on flushing the cannula
- A transparent, sterile, semi permeable dressing is in place
- Recannulation would be considered (via risk assessment) to cause undue distress to the infant.

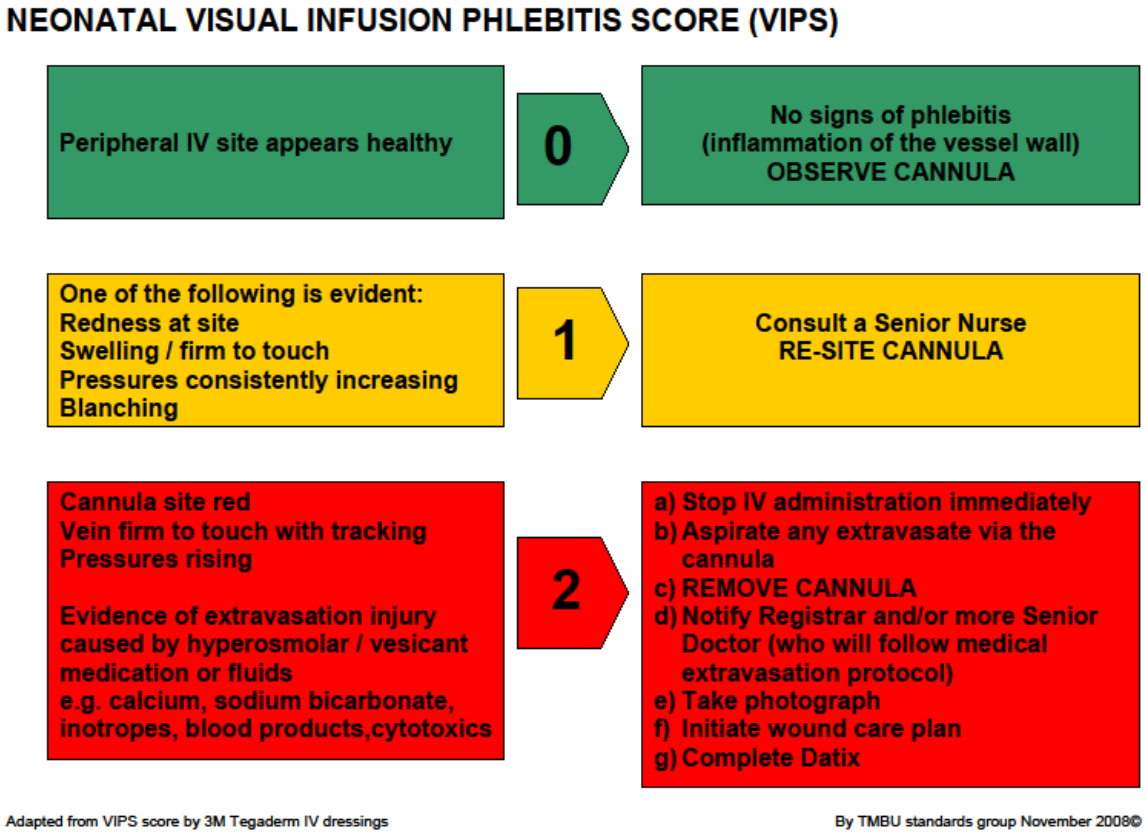
Causes of Phlebitis

Chemical phlebitis	Physical or mechanical phlebitis

Infection is rare in causing phlebitis. However, if a vessel is phlebitis and the cannula is left in situ, this may increase the risk of infection.

Visual Infusion Phlebitis (VIP) score

Should be assessed and documented with every use or a minimum of 12 hourly if the cannula is being used for bolus drug administration. The cannula should be assessed and score documented hourly if it is being used for a continuous infusion.



Treatment of Phlebitis

Preterm and sick term infants requiring intravenous fluids and medications are vulnerable to tissue injury secondary to extravasation that is, leakage of fluid into the surrounding tissue. Such injury can result in scarring with consequent cosmetic issues and, in some infants, functional

limitation. Remedial surgical intervention may be required for some babies. Saline flush out, with or without prior infiltration of hyaluronidase (a protein that helps the breakdown of barriers that hold tissue planes together), is widely used in the management of severe extravasation injury in neonates and aims to prevent or reduce complications following the extravasation. Conservative treatment with normal wound care and various topical dressings is commonly used. We planned to examine if saline flush out with or without prior hyaluronidase infiltration into the injured area resulted in better short and long-term cosmetic and functional outcomes when compared to normal wound care. We did not find any study that currently answers this question; therefore specific unit protocol should be followed following an extravasation. (Cochrane, 2012)

- Remove cannula if indicated, on discussion with medical team.
- Inform IV team/medical team.
- If not settled with 24-48 hours consider other possible cause (infection, thrombosis).
- Give paracetamol as and when required

Infiltration

Question 16
How would you define infiltration?

Damage may occur to the tissues due to infiltration. Other problems associated with infiltration include failure to receive drug therapy and reduction of venous access sites.

Causes of infiltration	Treatment of infiltration
• Dislodgement of the cannula tip into the surrounding tissues • Phlebitis • Poor insertion technique • Constriction distal to the cannula tip increases venous pressure and allows fluid to leak from the hole in the vein around the cannula	• Stop the infusion and if necessary resite cannula • Assess the affected area • Elevate the limb to encourage fluid absorption • Explain what has happened to the family • Document incident in the patient's medical and nursing notes

Extravasation

Question 17

How would you define extravasation?

Extravasation can lead to serious tissue necrosis, requiring plastic surgery and in the worst cases, amputation of the affected area. Extravasation can cause reduction in cannulation sites, scarring and tendon and nerve damage leading to problems with contraction of the

limb.

Causes of extravasation:	Treatment of extravasation

• As infiltration plus: • The nature of the drug being infused. Some extreme pH type drugs are known to lead to extravasation.	• Immediately stop the infusion. • Refer to local policy for management of extravasation injury and washouts. • Aspirate as much of the residue drug as possible. • Remove the cannula in case of swelling around the site. • Provide analgesia if necessary. • Explain what has happened to the infant's family. • Document incident in baby's medical and nursing notes and complete a datix (adverse incident) form.

Question 18

What extra factors should you consider when selecting a vein for cannulation?

Question 19

Identify the peripheral intravenous cannulae and dressings commonly used on your ward? Describe the situations where they are used. What factors influence the choice of cannula and dressing?

Record-keeping

Record keeping is an essential part of professional practice. When performed well it provides written evidence of the care process, particularly any identified problems and actions taken to address them. Children's medical records can be kept for up to 25 years. Consequently, they should be a clear, accurate and reliable source of information.

When documenting care the information should be factual and consistent. Black ink should be used and any alterations dated, signed and timed. Your signature should also be clear.

When recording care concerning cannulation you should specifically document:

- The date and time of the procedure.
- The type of peripheral venous access device used and serial number.
- Site of insertion.
- Number of attempts.
- Any problems and actions taken.
- Type of dressing used.
- Date and time of removal.

Activity 20

Read your Trust's policy or guidance on record-keeping in relation to peripheral Intravenous cannulae.

Devise a questionnaire for checking whether the standards are being met. Use this to audit five sets of patient records.

Cannula care and removal

Your hospital should have a policy detailing the frequency with which observations of a peripheral venous cannula site should be made and recorded. Some hospitals have specific forms for this purpose. As a minimum this should include checking the insertion site regularly for signs of redness or swelling.

After inserting a peripheral intravenous cannula, you should ensure the nurse caring for the child or young person has an appropriate care plan and understands any specific care needs resulting from the procedure.

See High Impact Intervention Peripheral intravenous cannula care bundle, which advocates the use of care bundles in practice as a method of tracking cannulation history and insertion details.

Cannulation can result in inflammation of the vein (phlebitis). **Mechanical phlebitis** can be caused by trauma or irritation from the cannula, particularly if not secured effectively. It can be minimised by avoiding cannulation over bony prominences and joints and applying a stabilising dressing. **Chemical phlebitis** is caused by medicines or infusions.

The risk of infection leading to sepsis can be reduced by ensuring good hand hygiene; always using gloves; maintaining asepsis and using alcohol wipes to clean the site. The cannula should be removed if there are any signs of infection or inflammation.

IV cannulation

Aim:
Is able to safely and effectively insert an intravenous cannula

Learning objectives:

- Identify the need for the procedure
- Select and prepare suitable equipment
- Explain the need for the procedure to the family (if present) and gain informed consent
- Select and administer appropriate method of pharmacological and / or non-pharmacological pain relief
- Demonstrate effective hand hygiene and use of gloves
- Select suitable site for cannula and is able to explain why to avoid other sites
- Demonstrate strict ANTT technique during procedure
- Demonstrate safe and effective cannulation of the vein including:
    - extension of the limb,
    - application of pressure / tourniquet,
    - palpation and anchorage of the vein,
    - insertion of the cannula at correct angle with bevel edge uppermost,
    - stabilisation of cannula with non-dominant hand,
    - checking for flashback of blood,
    - secure flush,
    - check patency of cannula with flush,
    - Secure cannula firmly using an approved fixation method / dressing
- Respond to any difficulties during procedure
- Dispose of equipment including sharps and clinical waste appropriately
- Document procedure
- Recognise own limitations in relation to number of attempts if unsuccessful and seek help when required

IV cannulation practice log			
Date	**Site Used**	**Successful / unsuccessful**	**Comments / reflection**

IV cannulation competency assessment		
Name:		
Local unit:		
Date of assessment:		
Relevant section in workbook completed and knowledge of relevant anatomy / physiology / indications / risks demonstrated:	**Yes / No**	
Competence achieved in all learning objectives (above)	**Yes / No**	
Staff member: I agree I have sufficient knowledge and have achieved all of the learning outcomes to undertake this enhanced clinical skill.	**Name:**	
	Signature:	
Assessor: The practitioner has successfully demonstrated all of the criteria for assessment at the required level of competence.	**Name:**	
	Signature:	

Arterial line sampling

Arterial lines are frequently used in the neonatal intensive care setting in the management of critically ill infants, and can be inserted into either central (umbilical) or peripheral arteries. They are referred to as UACs (umbilical arterial catheters), or PALs (peripheral arterial lines), and are used for invasive blood pressure monitoring and arterial blood sampling.

They are inserted by Doctors or ANNPS (Advanced Neonatal Nurse Practitioners) using an aseptic or non- touch technique (NTT), and can remain in place for several days. There are a number of complications associated with the use of arterial lines, so careful observation and management is needed. As there is very little research evidence surrounding the use of arterial lines in neonates, this package outlines 'best practice'.

Patient group/Indication

Arterial blood sampling in neonates needing mechanical ventilation
Frequent blood sampling in preterm or ill neonates
Invasive blood pressure monitoring
Aspiration of blood during exchange transfusion

Cautions/Contraindications

UACs and PALs

Bleeding disorders
Localised infection at insertion site

UAC

Evidence or risk of buttock / lower limb vascular compromise when inserting UAC
Surgical condition likely to need correction at site of insertion i.e. abdominal wall defect
Evidence of significant gut hypoperfusion / compromise e.g. necrotising enterocolitis

PAL

Circulatory insufficiency to extremity
Skin damage at insertion site
Malformation / deformation of limb
Previous PAL attempted / inserted in same limb

Prior to procedure

Check with nursing staff caring for the infant that timing is appropriate i.e. baby has not just had cares or suction
Ensure the gas machine is working if sample to be used for blood gas or blood sugar analysis

Equipment

Clean trolley and sterile field if sampling from UAC / PAL
Use a Dressing pack
Well-fitting sterile gloves if dressing pack gloves to small
Alcohol wipe
2 or 3 ml syringe
Heparinised syringe for gas machine
2 or 3 ml syringe and bottles for other samples
2 or 3 ml syringe filled with sodium chloride flush as prescribed

Procedure for obtaining sample

There are various procedures used across the network which include the open and closed systems. Both are listed here but you will need to follow your own individual trust guidance.

Procedure 1:

- Check colour and perfusion distal to insertion site
- Wash and gel hands (sterile if sampling from UAC)
- Put gloves on
- Ask assistant to suspend alarms
- Clean red Bionector on 3 way tap with alcohol wipe and clean 15 secs allow to dry approx. 30 secs as per ANTT
- Turn 3 way tap so it is off the infusion but open to baby and the red Bionector – this will cause temporary loss of the BP trace
- Attach empty syringe to red Bionector (syringe 1)
- Aspirate 1-2 ml blood at the rate of 1ml/30 seconds and put syringe in tray
- Attach heparinised syringe (syringe 2) to red bung if blood gas / blood sugar analysis needed – fill to 0.3 ml line at the rate of 1ml/30 seconds, then remove and put in tray
- Attach empty syringe (syringe 3) to red Bionector and remove just enough blood for other blood tests if needed at the rate of 1ml/30 seconds, then put in tray * see below
- Attach syringe 1 and slowly replace blood that was aspirated from line at start of procedure at the rate of 1ml/30 seconds, then remove
- Attach syringe containing sodium chloride (syringe 4) and gently flush just enough to clear any blood from line and cannula at the rate of 1ml/30 seconds ♯ see below
- Turn 3 way tap back so it is open to the infusion and to the baby but off to the red Bionector
- Clean red Bionector again
- Ensure the alarm is reactivated
- Ensure the blood pressure transducer is still working (visible trace on monitor)
- Check colour and perfusion in lower limbs and buttocks (UAC), or limb, hand or foot or digits (PAL)
- Fill sample bottles and label at cot side
- Ensure flush volume documented on nursing observation charts
- Run sample through gas machine (As per point of care training)

- Safely dispose of sharps and equipment according to Trust policy

* Coagulation samples taken from heparinised lines may have a falsely prolonged APTT. It is recommended to take 2mls of 'waste' blood before taking sample blood to reduce the risk of contaminating the clotting sample.

♯ Alternatively, the purge or bolus facility on the pump may be used to flush the line. This is useful if blood has flowed back into the line or into the BP transducer, but should only be carried out by somebody who has completed a competency assessment in use of the pumps

Procedure for KidsKit system

1. Check blood sample request form or rationale for blood gas.

2. Check request form against baby's name band

3. Decontaminate hands as described in the Trust hand hygiene policy (2017).
Effective hand decontamination is essential to ANNT and should take place prior to and after all invasive techniques and after removal of gloves.

4. Clean tray according to Trust policy

5. Gather equipment
   - Tray and dressing towel or drape.
   - Appropriate sample containers (see medical guidelines for required amounts of blood for investigations)
   - Alcohol wipe (2% chlorhexidine in 70% alcohol)
   - Appropriate syringes (1ml / 2.5ml) / capillary gas tube
   - Medex Needle free access device

- Prepare a general aseptic field

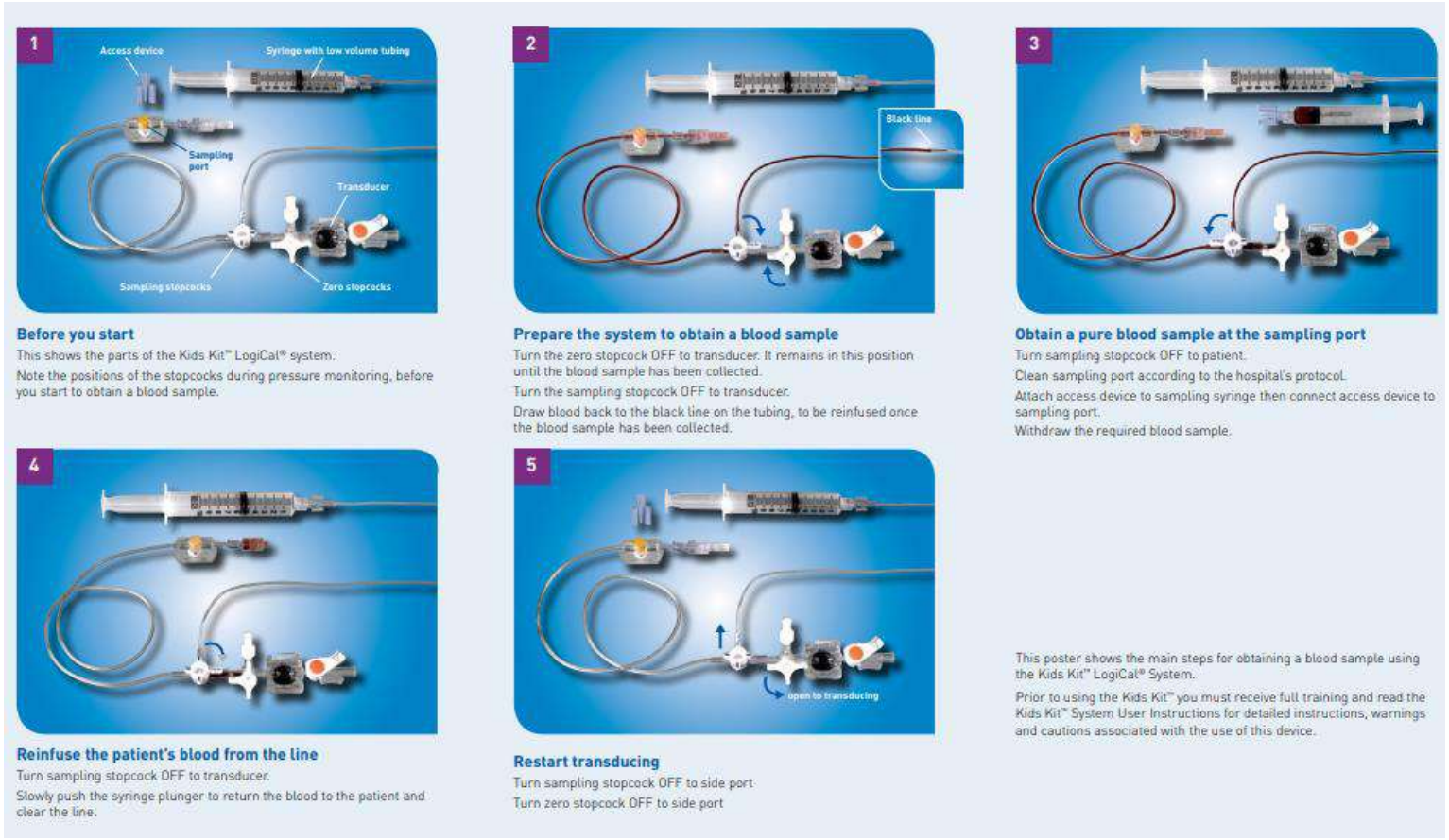
This field is used when the procedure key parts are easily and primarily protected by micro critical aseptic fields (caps and covers). The main aseptic field that promotes asepsis during procedures, by providing basic protection from the procedure environment. *.East and North Herts NHS Trust ANNT Policy (2017)*

5. Ensure the infant is comfortable and at rest prior to the procedure.

6. Perform hand hygiene

7. Apply non sterile gloves and plastic apron (use sterile gloves if key parts or key sites need touching directly).

8. Silence blood pressure monitoring alarm.



The procedure to be performed using standard aseptic non touch technique (ANNT).

Key principles

- **A** lways clean hands effectively
- **N** ever contaminate 'key parts'
- **T** ouch non key parts with confidence

- **T** ake appropriate infection prevention precautions (use of standard precautions)

9. Turn 10ml flush syringe (containing heparin 1unit/1ml in Sodium Chloride 0.9 %) open to baby and off to transducer and infusion pump as demonstrated. Aspirate blood from arterial line to black marker on the patient line. (*as shown*)

10.Turn the sampling line 3-way tap to a 45 degree angle so that it is off to both hepsal syringes.

11. the sampling port with the alcohol wipe and allow to dry. Attach the needle free access device to sample syringe.

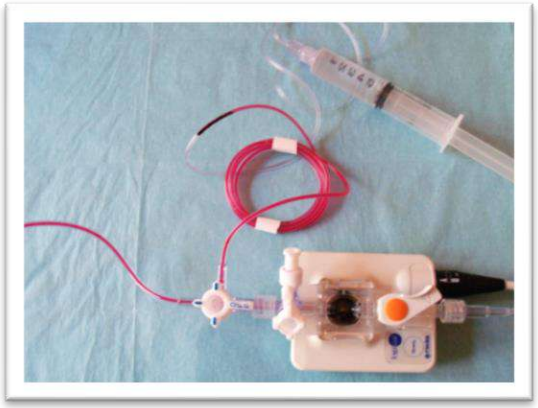
12. Connect both onto the sampling port, locking into the grooves on both the access device and sampling port. This requires a firm push to open the seal and will only fit one way.

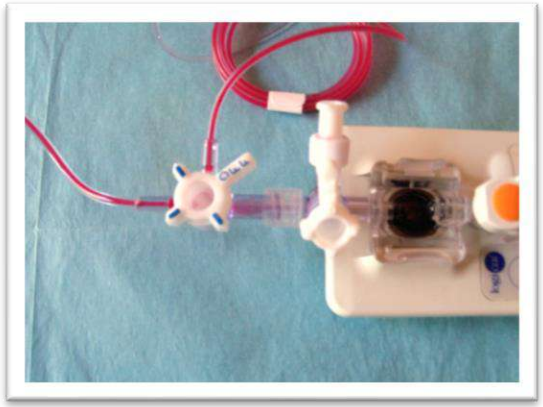
13. Collect sample. To reduce amounts of blood obtained from preterm or low birth weight infants it is common practice to take the minimum required amount of blood.

14. Once sample is obtained remove both syringe and access device as shown. Never leave needle free adapter on the sample port due to risk of blood loss.

15. Turn the sampling 3-way tap back off to transducer and flush patient line until clear. It is not uncommon to observe intermittent blanching at a peripheral arterial cannula site during flushing, this can be minimised by flushing the line slowly. When the flush is complete, check for any prolonged blanching, discolouration or swelling around the catheter site and in the fingers or toes distal to the catheter. Any abnormality should be reported to the medical staff and documented in the patient case notes including the date and time of the event.

16. Turn the sampling tap off to 10ml syringe and open to transducer and heparin infusion. Ensure infusion pump is on and running. Check arterial pressure tracing has returned.





17. Some staining of the sampling line with blood is to be expected and the use of excessive amounts of heparinised saline to clear the line should be avoided.

18. Fill appropriate blood containers, complete request form and send sample to appropriate department. Record the procedure in nursing notes. Dispose of clinical waste as per hospital policies.

19. Dispose of gloves and apron.

20. Wash hands

21. Document volume of blood taken in the appropriate section on the ITU chart.

Troubleshooting

Loss of BP trace or unable to sample from line

- Check colour and perfusion distal to insertion site
- Ensure line has not dislodged or fallen out
- Reposition splint / limb if PAL
- Check giving set and BP transducer for back flow – flush line if necessary
- Try and gently aspirate then flush line again
- Adjust BP scale on monitor
- Allow artery time to recover – may be in spasm from previous attempt. Check colour and perfusion of buttocks / lower limbs or limb, hand or foot and digits after 2-3 minutes. If satisfactory, gently try to aspirate / flush the line again
- Remove PAL dressing to check and / or reposition cannula if needed
- Remove line if BP will still not trace as problem with line likely

Monitoring / Observation

UAC and PAL

Hourly observations of heart rate, respiratory rate, blood pressure, oxygen requirement, oxygen saturation
Hourly observation of site for bleeding, inflammation, signs of infection
Type of line (UAC or PAL) and fluid infusing documented on nursing observation chart
Frequents checks of the connectors
Hourly observations of infusion rate, hourly volume infused, total volume infused, and line pressure documented on nursing observation chart
Daily review of line site and dressing (PAL) documented in MDT notes

UAC

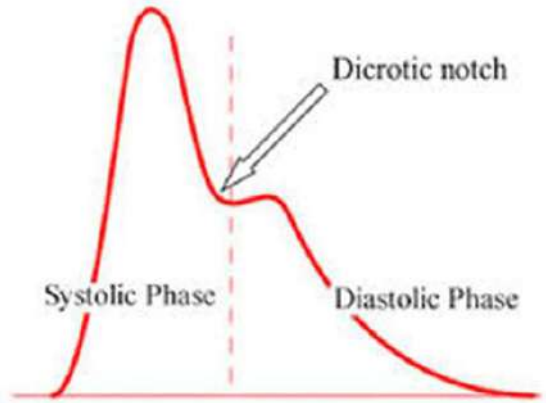
Nurse baby supine or in lateral position with open nappy so umbilicus easily seen
Observe the colour and perfusion of buttocks / lower limbs hourly
Record on nursing observation chart or W/P (warm and pink) if satisfactory

PAL

Nurse so limb and site of PAL easily seen

Observe limb, hand or foot and digits distal to PAL hourly

Record on nursing observation chart or W/P (warm and pink) if satisfactory



Normal arterial pulsation wave form.

Complications

Question 21

Identify the complications and complete the table

UAC / PAL	UAC	PAL

Impaired perfusion

UAC

Impaired perfusion to the buttocks or lower limbs is a rare complication associated with the use of UACs. It presents initially as dusky discolouration of the buttocks and lower limbs, followed by white discolouration, skin which is cool to touch, and weak or absent pulses.
NEC resulting from poor perfusion of the gut has also been associated with the use of umbilical lines, in particular UACs. However, there are no recent high quality studies that have found increased this increased risk and indeed many do start early feeds with these in place .
Commencement of feeds with a UAC in situ should be a consultant decision. If impaired perfusion to the buttocks or lower limbs is suspected, or there are suspicions of NEC, urgent line removal must be considered.

PAL

Poor perfusion associated with the use of PALs is the most frequently reported incident associated with the use of arterial lines.. It presents initially as dusky discolouration of the extremities with a prolonged capillary refill time. The affected area will then become white and cool to touch. Over a period of time, it may turn black and become necrotic, resulting in tissue loss, loss of digits, hands or feet or in extreme situations, partial loss of a limb.
If poor perfusion is suspected, the PAL should be removed immediately. If a perfusion injury does occur, after removal of the line:
Inform the parents / carers
Inform the duty Neonatal Consultant
Complete an incident form
Request serial photographs by medical photography to monitor progress
Refer to tissue viability
Consider referral to plastic surgeon

Arterial line sampling

Aim:
Is able to safely sample from indwelling arterial line (UAC / PAL)

Learning objectives:

- Identify the need for the blood sample
- Correctly identify the infant and sample required
- Select and prepare suitable equipment including correct size syringes and correct blood bottles required for sample requested
- Explain the need for the procedure to the family (if present)
- Demonstrate effective hand hygiene and use of gloves
- Demonstrate strict ANTT technique during procedure
- Demonstrate safe practice including
    - Ensure local guidance is adhered to
    - Clean key parts with alcohol wipe and clean and allow to dry for 30 secs as per ANTT guidance
    - Slowly withdrawing and replacement of blood and saline
    - Ensure the alarm is reactivated
    - Ensure the blood pressure transducer is still working (visible trace on monitor)
    - Check colour and perfusion in lower limbs and buttocks (UAC), or limb, hand or foot or digits (PAL)
    - Fill sample bottles and label at cot side
    - Ensure flush volume documented on nursing observation charts
    - Run sample through gas machine (As per point of care training)
    - Safely dispose of sharps and equipment according to Trust policy
- Respond to any difficulties during procedure
- Dispose of equipment including sharps and clinical waste appropriately
- Document procedure including flush volume on fluid chart
- Recognise own limitations and seek help when required

Arterial line sampling practice log			
Date	**Arterial line used (UAC / PAL)**	**Samples required**	**Comments / reflection**

Arterial line sampling competency assessment		
Name:		
Local unit:		
Date of assessment:		
Competence achieved in all learning objectives (above)	**Yes / No**	
Relevant section in workbook completed and knowledge of relevant anatomy / physiology / indications / risks demonstrated:	**Yes / No**	
Staff member: I agree I have sufficient knowledge and have achieved all of the learning outcomes to undertake this enhanced clinical skill.	**Name:**	
	Signature:	
Assessor: The practitioner has successfully demonstrated all of the criteria for assessment at the required level of competence.	**Name:**	
	Signature:	

Blood gas analysis

Sampling sites:-

a) Arterial - usually from a UAC. Arterial samples give the most accurate result.

b) Capillary - usually from a heel prick.
Less accurate than an arterial sample, but more accurate than a venous sample. Warm the limb before sampling, to "arterialise" the capillaries and optimise the result.

c) Venous - taken during cannula insertion. The least accurate site, as venous blood is deoxygenated & contains the acidic waste products of metabolism.

Important! – wait 15 - 30 mins after any change before sampling, to enable the body to adjust and settle - for more accurate results. Eg. After making changes to ventilator settings, or after disturbing the baby for cares or to change their position.

Sampling Errors

Beware of:-

- A poorly perfused limb – If the circulation is poor, your sample won't reflect the true acid-base status in the rest of the body, and it's likely to give a 'poor' result. Warm a cold foot first and beware of sampling from a blue-tinged foot.
- Bubbles or clots in the sample, which will affect the accuracy of the result. Try to avoid air bubbles when sampling and remove any air bubbles before analysing.
- Leaving your sample lying around. Analyse your sample immediately, as it will start to deteriorate straight away, and any delay will affect the result.

Be aware of the previous blood gas result and repeat your sample if the sample result you get is not what you expected.

Interpretation of Blood Gases

Why do we analyse blood gases?

1. To assess respiratory status
2. To assess metabolic status

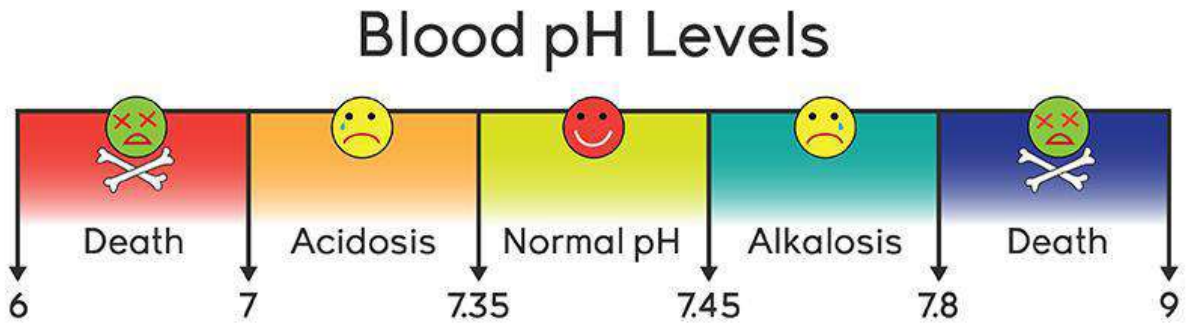
Assessing Respiratory Status

- Tells us what's happening in the lungs.

Assessing Metabolic Status

•Tells us what's happening in the kidneys. i.e. How the kidneys are reacting to changes in acid- base balance.

It's all about Acid -Base Balance in the body



* For the body to work effectively the pH of arterial blood needs to be 7.4
* Usually only small variations of 0.05 can be tolerated without causing ill effects
* However, in neonates, wider variations are clinically tolerated – down to 7.25.
  (The rationale for accepting this lower pH in neonates is to avoid over-use of mechanical ventilation, thereby reducing the risk of lung damage due to volutrauma and barotrauma.)

Buffering

CO_2 carried in solution renders our blood acidic.

This is down to the following reversible reaction, called the carbonic anhydrase reaction - after the enzyme that catalyzes the conversion of carbon dioxide & water into carbonic acid :-

$$H_2O + CO_2 \leftrightarrows \underset{\text{Carbonic acid}}{H_2CO_3} \leftrightarrows H^+ + HCO_3^-$$

Adding more CO_2 pushes the reaction to the right, releasing more H^+ (hydrogen) ions, therefore increasing acidity. Adding more bicarbonate pushes the reaction to the left, mopping up H^+ ions, thereby reducing acidity.

Bicarbonate is a base (alkali) that counteracts (buffers) the acidity.

Role of Lungs & Kidneys in Acid Base Regulation

The lungs and the kidneys are a double act, working together to regulate acid-base balance. If the lungs are not working well, the kidneys can adjust by excreting or retaining bicarbonate.

Lungs regulate acid-base by retaining or blowing off CO_2 (ACIDIC in solution in blood)

This is a rapid response – it can take seconds, with just a few slower or faster breaths.

pCO_2 is therefore called the **Respiratory Parameter**

Kidneys regulate acid-base balance by:-

1) Excreting H^+ ions (ACID) (as ammonium, NH_4^+, giving urine its characteristic smell)

2) Retaining bicarbonate (BASE / ALKALI)

This is a much slower response, which can take hours

Bicarbonate is called the **Metabolic Parameter**

The Blood Gas Parameters

pH

pCO2

pO2

Bicarbonate

(Base Excess)

Definitions

pH : Scale of acidity from 1-14. Reflects the hydrogen ion concentration.

pCO2 / pO2: Partial pressure of carbon dioxide / oxygen.
Equivalent to the concentration of gas dissolved in blood.
(A note about notation: 'a' = arterial gas, eg. paCO2, whereas 'A' = Alveolar Gas, eg. pACO2)

Base Excess: A number calculated by the gas machine to indicate how much base needs to be added or removed to return the pH to normal. Used as a relative marker to assist in blood gas interpretation, hence shown in brackets.
Negative (-) = base deficit, Positive (+) = base excess

Lactate

An ACIDIC by- product of anaerobic metabolism – ie produced in the body during episodes of hypoxia. It is measured and reported by blood gas machines, and in the newborn is a useful indicator of whether the infant has been septic, or significantly hypoxic just before birth. A useful clinical tool to use alongside blood gas results.

- Early indicator of hypoxic insult
- Early warning for sepsis
- Lactate levels have been shown to correlate with pH and Base Excess in blood gases.

- Significantly raised lactate levels (>7.5 mmol/L) close to time of birth = good early predictor of adverse neurological or systemic outcome.

(Refs: Labrecque L et al J Obstet Gynaecol Can. (2014) Jul;36(7):598-604. **Correlation of cord blood pH, base excess, and lactate concentration measured with a portable device for identifying fetal acidosis.**
Nadeem, M., Clarke, A. & Dempsey, E.M. Eur J Pediatr (2010) 169: 667. doi:10.1007/s00431-009-1085-y)

Normal Values

There are many slight variations on the definition of "normal values" for the purposes of blood gas interpretation. These are the ones chosen for the purposes of this workbook.

Parameter	Normal Value
pH	7.4
pCO2	4.5 – 6.5 kPa
pO2	10.0 kPa
Bicarbonate	22 -26 mmol/L
Base Excess	-2 to +2

A Simple 4 - Step Approach to Blood Gas Analysis

Following these 4 steps will enable you to perform a simple blood gas analysis. There are other factors to take into account which we'll look at later – but these are the first steps to take.

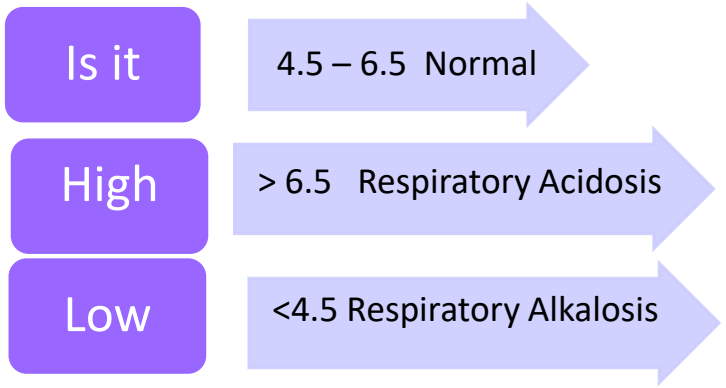
Step 1: Examine the pH
Step 2: Examine the pCO2

Step 3: Examine the HCO3
Step 4: Decide which parameter (pCO2 or Bicarbonate) matches the pH?

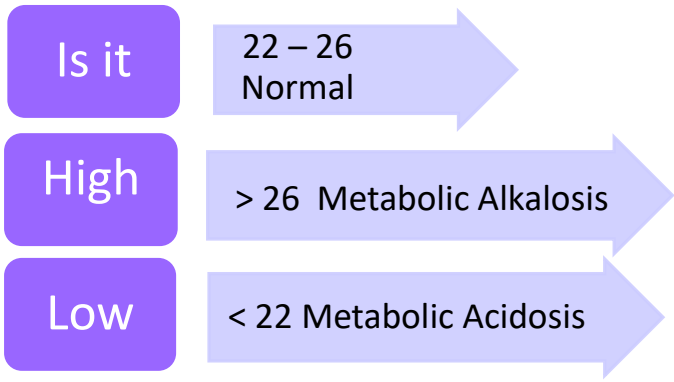
The Parameter that matches the pH is causing the primary disorder.

Step 1: Examine the pH

Step 2: Examine the pCO_2



Step 3: Examine the Bicarbonate



Step 4: Which parameter matches the pH?

- pCO2 ? (Respiratory cause)
- or
- Bicarbonate? (Metabolic cause)

Examples to Practice

1.

- pH 7.23
- PCO_2 7.5kPa
- PO_2 6.8kPa
- HCO_3 24mmol/L
- BE +1
- SaO_2 87%

Step 1: pH Normal/Acidotic/Alkalotic……

Step 2: pCO_2Normal/High/Low……

Step 3: Bicarb Normal/High/Low……

Step 4: Which parameter matches the pH?……

Answer……

2.

- pH 7.2
- pCO_2 4.5kPa
- pO_2 10.6kPa
- HCO_3 10.3mmol/L
- BE – 7
- SaO_2 96%

Step 1: pH Normal/Acidotic/Alkalotic……

Step 2: pCO_2 Normal/High/Low……

Step 3: Bicarb Normal/High/Low……

Step 4: Which parameter matches the pH?……

Answer:……

3.

* pH 7.51
* pCO_2 2.4kPa
* pO_2 13.6kPa
* HCO_3 24mmol/L
* BE +1
* SaO_2 100%

Step 1: pH Normal/Acidotic/Alkalotic……..
Step 2: pCO_2 Normal/High/Low……
Step 3: Bicarb Normal/High/Low……
Step 4: Which parameter matches the pH? ……..
Answer: ……

4.

* pH 7.52
* pCO_2 4.8kPa
* pO_2 11.0kPa
* HCO_3 35mmol/L
* BE +10
* SaO_2 96%

Step 1: pH Normal/Acidotic/Alkalotic……
Step 2: pCO_2 Normal/High/Low……..
Step 3: Bicarb Normal/High/Low……..
Step 4: Which parameter matches the pH? ……..
Answer: ……

5.

* pH 7.37
* pCO_2 4.8kPa
* pO_2 11.7kPa

Step 1: pH Normal/Acidotic/Alkalotic……
Step 2: pCO_2 Normal/High/Low……
Step 3: Bicarb Normal/High/Low……

* HCO_3 24mmol/L
* SaO_2 97%
* BE +1

Step 4: Which parameter matches the pH? .....
Answer: .....

* **So far so good! However, it can get a little more complex!**

Compensated or Otherwise?

* Uncompensated – the body hasn't corrected the pH – as with our gases so far.
* Compensated or Partially Compensated – the body has attempted to correct the pH
* Sometimes a gas is 'Mixed' – the alteration in pH has both respiratory & metabolic causes.
* DON'T WORRY - You can deduce all these quite simply using the same approach!

How do you know whether a gas is fully or partially compensated, or of mixed metabolic and respiratory cause?

So far only one of our parameters has been abnormal, so our gases have been uncompensated.

If two parameters – ie both pCO_2 & Bicarbonate – are abnormal, the gas is either compensated or mixed.

Both abnormal, only ONE MATCHES the pH = FULLY or PARTIALLY COMPENSATED

Both abnormal & BOTH MATCH the pH = MIXED

Let's look at some compensated gases.

* pH 7.35	Step 1: pH normal but on the acidotic side of 7.4
* pCO_2 7.5kPa	Step 2: pCO_2 = High
* pO_2 6.8kPa	Step 3: Bicarbonate = High (& Base Excess positive)
* HCO_3 32mmol/L	Step 4: Which parameter matches the pH?
* BE +6	The pCO_2! This is the culprit!
* SaO_2 87%	**Fully Compensated Respiratory Acidosis**

The gas above is described as fully compensated, because the pH has been returned to normal. (Note the positive base excess, which doesn't fit with acidosis, further indicating metabolic compensation.)

* pH 7.21	Step 1: pH = Acidotic
* pCO_2 3.2kPa	Step 2: pCO_2 = Low
* pO_2 13.6kPa	Step 3: Bicarb = Low (& Base Excess negative)
* HCO_3 14mmol/L	Step 4: Which Parameter matches the pH?
* BE -6	Bicarbonate. So this is the culprit!
* SaO_2 97%	**Partially Compensated Metabolic Acidosis**

This gas is described as partially compensated because, although the body has tried to compensate for the acidosis by blowing off CO_2, the pH hasn't returned to normal. Note that there is a base deficit. (Which can also be called a negative base excess because of the notation, the base excess 'BE' being shown as a negative number.) This indicates a shortage of base & therefore fits with the metabolic acidosis.

A gas with Mixed Respiratory & Metabolic Cause:

* pH 7.21
* pCO_2 8.1kPa
* pO_2 6.3kPa
* HCO_3 14.1mmol/L
* BE -7.7
* SaO_2 83.9%

Step 1: pH = Acidotic
Step 2: pCO_2 = High
Step 3: HCO_3 = Low (& Base Excess negative)
Step 4: Which Parameter matches the pH?
Both CO_2 & Bicarbonate
Mixed Respiratory & Metabolic Acidosis.

Both the pCO_2 and the Bicarbonate are abnormal, both matching the acidotic pH, so this gas shows a mixed metabolic and respiratory acidosis.

More blood gas examples to try

6.

* pH 7.21
* pCO_2 9.9kPa
* pO_2 6.1kPa
* HCO_3 38.7mmol/L
* BE +7.0
* SaO_2 93%

Step 1: pH Normal/Acidotic/Alkalotic……..
Step 2: pCO_2 Normal/High/Low……
Step 3: Bicarb Normal/High/Low……..
Step 4: Which parameter matches the pH?
Answer: ……..

7.

* pH 7.502
* pCO_2 3.56kPa
* pO_2 8.71kPa
* HCO_3 23.2mmol/L
* BE -2.2
* SaO_2 99%

Step 1: pH Normal/Acidotic/Alkalotic……
Step 2: pCO_2 Normal/High/Low……
Step 3: Bicarb Normal/High/Low……
Step 4: Which parameter matches the pH?
Answer: ……

8.

* pH 7.122
* pCO_2 7.95kPa
* pO_2 4.73kPa
* HCO_3 15.4mmol/L
* BE – 9.9
* SaO_2 65%

Lactate 13.4mmol/L
Step 1: pH Normal/Acidotic/Alkalotic……
Step 2: pCO2 Normal/High/Low……
Step 3: Bicarb Normal/High/Low……
Step 4: Which parameter matches the pH?
Answer: ……

9.

* pH 7.291
* pCO_2 12.1kPa
* pO_2 5.17kPa
* HCO_3 36.7mmol/L
* BE 17.2
* SaO_2 92%

Step 1: pH Normal/Acidotic/Alkalotic……
Step 2: pCO_2 Normal/High/Low……
Step 3: Bicarb Normal/High/Low……
Step 4: Which parameter matches the pH?
Answer: ……

10.

* pH 7.279
* pCO_2 8.31kPa
* pO_2 3.83kPa
* HCO_3 23.4mmol/L
* BE 2.4
* SaO_2 85%

Step 1: pH Normal/Acidotic/Alkalotic……

Step 2: pCO_2 Normal/High/Low……..

Step 3: Bicarb Normal/High/Low……

Step 4: Which parameter matches the pH?

Answer: ……

Aim:
Is able to accurately interpret capillary, venous and arterial blood gas and suggest changes in respiratory management according to the result

Learning objectives:

- Explain the need for the procedure to the family (if present)
- Obtain blood sample using technique(s) above
- Run sample through blood gas analyser (separate competency relating to specific blood gas analyser available locally) to obtain sample result
- Determine if results are within normal / acceptable parameters for individual infant
- If results are not within acceptable parameters determine if the sample is acidotic or alkalotic, metabolic or respiratory
- Consider what changes are required to return the parameters to acceptable parameter
- Discuss the changes with the relevant medical team / ANNP
- Document appropriately

Blood gas analysis practice log			
Date	**Type of sample (capillary / arterial) and current ventilation**	**Results interpreted and actions taken**	**Comments / reflection**

Blood gas analysis competency assessment		
Name:		
Local unit:		
Date of assessment:		
Relevant section in workbook completed and knowledge of relevant anatomy / physiology / indications / risks demonstrated:	**Yes / No**	
Competence achieved in all learning objectives (above)	**Yes / No**	
Staff member: I agree I have sufficient knowledge and have achieved all of the learning outcomes to undertake this enhanced clinical skill.	**Name:**	
	Signature:	
Assessor: The practitioner has successfully demonstrated all of the criteria for assessment at the required level of competence.	**Name:**	
	Signature:	

References and Suggested Reading

Ashworth, C., Briggs, L (2011) Design and implementation of a neonatal tissue viability assessment tool on the newborn intensive care unit, Infant; 2011 7(6), 191-94.

Brighton and Sussex University Hospitals NHS Trust (2005) C0030- Venepuncture in paediatrics by nursing staff/phlebotomist.

Dougherty, L., Lamb, J (2008) Intravenous therapy in nursing practice. 2nd ed Oxford Blackwell.

Great Ormond Street Hospital for Children (2009) Paediatric Venepuncture Workbook. [Online]
https://www.goshgold.org/learning_opportunities/online_programmes/documents/Paediatric%20vene puncture%20workbook%202009.pdf

Great Ormond Street Hospital for Children (2009) Paediatric Cannulation Workbook [Online]
https://www.goshgold.org/learning_opportunities/online_programmes/documents/Paediatric%20cann ulation%20workbook%202009.pdf

NHS institute for innovation and improvement (2011) High Impact Intervention 2: Peripheral intravenous cannula care bundle, NHS, London.

Lavery I Ingram P (2005) Venepuncture: best practice Nursing Standard 19 (49) 55-65 Nursing and Midwifery Council (2015) Code of Professional Conduct London: NMC
Nursing and Midwifery Council (2005) Guidelines for records and record keeping. London: NMC

P N Gopalakrishnan., N Goel, Sujoy Banerjee (2012) Saline irrigation for the management of skin extravasation injury in neonates, The

Cochrane Neonatal group, UK

Rennie, J., Robertson, N (2012) textbook of neonatology, Fifth ed, Churchill Livingstone, London.

Royal College of Nursing (2005a) Capillary blood sampling and venepuncture in children and young people- A workbook to assist practitioners in developing competence. London: RCN

Royal College of Nursing (2005b) Peripheral venous cannulation in children and young people- A workbook to assist practitioners in developing competence. London: RCN

Royal College of nursing (2005c) Good practice in infection control, RCN guidance for nursing staff, London, RCN

Royal College of nursing (2005d) RCN Competencies: an education and training competency framework for capillary blood sampling and venepuncture in children and young people. London: RCN

Skills for Health (2010) National Occupational Standard CHS132: Obtain venous blood samples. [Online]. Accessed 07/06/11. Available from: http://www.skillsforhealth.org.uk/

Skills for Health (2010) National Occupational Standard CHS22: Perform intravenous cannulation. [Online]. Accessed 07/06/11. Available from: http://www.skillsforhealth.org.uk/

Sparshott, M (1989) Minimising Discomfort of Sick Newborns, Nursing Times, 85:42, 9-42.

Stevens B, Yamada J, Lee GY, Ohlsson A (2013) Sucrose for analgesia in newborn infants undergoing painful procedures, neonatal group, Cochrane database, London.

Tomlin S Guys and St Thomas Paediatric Formulary 8th Edition, Guys and St Thomas Foundation Trust, London 2010.

UKCC (1992) The Scope of Professional Practice (Booklet). UKCC, London. UKCC (1992) Code of Professional Conduct (Booklet). UKCC, London.
Weinstein S (1996) Pluners principles and practice on intravenous therapy. 6th Ed USA: Lippincot Williams & Wilkins

Western Sussex Hospitals (2011) Neonatal Venepuncture and Cannulation Workbook, NHS trust, Sussex

Wynsberghe D Noback R Carola R (1995) Human Anatomy and Physiology. 3rd Ed. London: McGraw Hill

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Adapted with permission from the Thames Valley and Wessex ODN phlebotomy and cannulation workbook.

East of England Neonatal Operational Delivery Network

Collaborative working to deliver high quality care to our babies and their families

EOE Neonatal ODN Education

Confirmation of completion

This certifies that

Name:

Date:

Local Hospital:

Clinical Skill:

Staff member	Name:	Signature:
Assessor	Name:	Signature:

PDN Name: Signature:

Has successfully completed the above named skill from the East of England Neonatal ODN Extended clinical skills workbook and competency document

Version Control:

Version	**Date**	**Details**	**Author(s)**	**Comments**
1	July 2019		EoE PDN forum	
Review Date:				