

Yorkshire and Humber Neonatal ODN (South) Clinical Guideline

Title: Long line or PICC (peripherally inserted central catheter) - indications, insertion, accessing, care of

Author: Elizabeth Pilling, revisions by Anne Bean

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This clinical guideline has been developed to ensure appropriate evidence-based standards of care throughout the Yorkshire and Humber Neonatal ODN (south). The appropriate use and interpretation of this guideline in providing clinical care remains the responsibility of the individual clinician. If there is any doubt discuss with a senior colleague.

Best practice recommendations represent widely used evidence-based practice and high quality standards that all Neonatal Units across the Network should implement. Subsequent suggested recommendations may be put into practice in local units. However, alternative appropriate local guidelines may also exist.

1. Summary page

1. Aim of guideline

This guideline is to ensure safe insertion and maintenance of percutaneous long lines while minimising complications.

2. Summary

Insertion

This should be using an aseptic technique

Consideration should be given to the use of an insertion checklist

The tip of the long line should not lie within the heart

How to use Radio-opaque contrast to confirm line position

How to recognise unplanned arterial rather than venous placement of a line

Dressing

Lines should be dressed appropriately

Dressing should be changed if not intact

Accessing

Lines should be accessed as little as possible to minimise infection

When accessed, a full aseptic technique should be used

Removal

Aim to achieve 150ml/kg/day of enteral feed prior to stopping Parenteral Nutrition (PN) and line removal. There should be daily clinical review of the balance between the risk of lower nutrition and that of central line infection when considering earlier line removal

B. Full guideline

1. Background

Percutaneous long lines are used extensively in neonatal medicine as a means of central access for infusions and drugs.

2. Aim

To ensure safe insertion and maintenance of percutaneous long lines and minimise risk of complications including infection and avoidance of complications as a result of line malposition.

3. Areas outside remit

This guideline does not include surgical lines (e.g Broviac lines, PICC lines placed in theatre) or umbilical lines (arterial or venous)- see relevant guideline.

4. Guideline:

4.1 Insertion of long line

Indications for insertion of percutaneous long line:

- Need for central access to administer infusions that need to be given centrally eg inotropes
- Need for Parenteral Nutrition (PN) i.e. infants who are:
 1. <31 weeks' gestation
 2. Those born after 31 weeks gestation who do not make sufficient progress with enteral feeds within the first 72 hours
 3. Congenital gut disorders or critical illness at any gestation (as per NICE Neonatal Parenteral Nutrition guidance)¹
- 2. Need for long standing IV access when repeated cannulation is thought to be difficult

4.2 Method of insertion

This should be done in a strict aseptic technique.

The sterile procedure should include wearing a gown and double gloves. The area around the procedure trolley should be kept as clear from traffic as possible eg by using screens. This zone should not be entered by personnel not assisting with the procedure.

An assistant is required to prepare the equipment and in draping the infant. They also may be required to provide comfort to the infant during the procedure. An assistant is required for dressing the line (see Dressing).

The site for insertion should be cleaned using an appropriate skin cleanser. If insertion is not possible on the limb chosen, the procedure should be repeated, with new sterile gloves and new sterile drapes.

Handling of the line should be kept to a minimum. The largest bore line possible should be inserted into the infant.

Recent “care bundles” have encouraged the use of “insertion checklists” to ensure standard use of aseptic techniques and allow the procedure to be stopped if this is not followed. These care bundles have been associated with a significant reduction in long line infections and the associated morbidity. (see appendix 1)²

How to use of Radio-opaque contrast.

The use of radio-opaque contrast can be helpful in the assessment of correct line positioning. Its use can be considered, particularly when inserting a line in the lower limbs^{3,4}.

Non-ionic, water soluble contrast medium Iohexal (most commonly ‘Omnipaque 300TM’, GE Healthcare)

-The stylet or guidewire must be removed prior to injecting contrast^{5,6}

-Using a 3ml syringe, 0.5ml of contrast (Omnipaque 300TM) should be drawn up with 0.5ml of 0.9% sodium chloride (saline). This should then be mixed.

-For lines inserted in the lower limb veins, contrast should be injected slowly as the x-ray is being taken to ensure the direction of flow of contrast is seen and to ensure contrast is not seen in the lumbar veins, also known as the ‘cobweb sign’^{7,8}.

-Approximately 0.1ml-0.2ml should be injected through the line to fill it prior to the x-ray being taken (depending upon line gauge; 0.1ml for 1Fr and 0.2ml for 2Fr) and then around 0.1ml-0.2ml to be injected as the radiograph is being taken⁶.

-The person injecting contrast through the line must be wearing a lead protective gown and maintain sterility at all times.

-For lines inserted in the upper limb veins (either 1Fr or 2Fr) only 0.2ml of contrast medium should be injected just prior to the x-ray being taken, so as to avoid a contrast ‘jet’ obscuring the appearance of the line tip⁶.

4.3 Location

The line tip must not lie within the heart as per the department of health guidance to reduce the risk of pericardial extravasation and tamponade.⁹

Upper limb

Percutaneous long lines ideally should lie in the superior vena cava. The x-ray should be taken with the arm perpendicular (at 90 degrees) to the chest wall¹⁷.

Lower limb

The line tip should sit within the inferior vena cava ideally above L4/L5 if inserted in the lower limb¹⁷.

All long lines should be re-x-rayed after withdrawal if the line tip has been seen to lie within the cardiac silhouette.

Occasionally it will be necessary to leave a line in the subclavian or femoral vein, especially if access has been difficult. The main complication that may occur here is venous obstruction which can be treated with removal of the line.¹⁰

Lines that meet resistance during insertion suggests malposition. Ideally the line should freely aspirate blood although for the smaller lines this may be seen as blood “tracking” back from the insertion site rather than freely aspirating.

Image 1 shows a correctly placed long line in the IVC with contrast ‘jet’ seen.

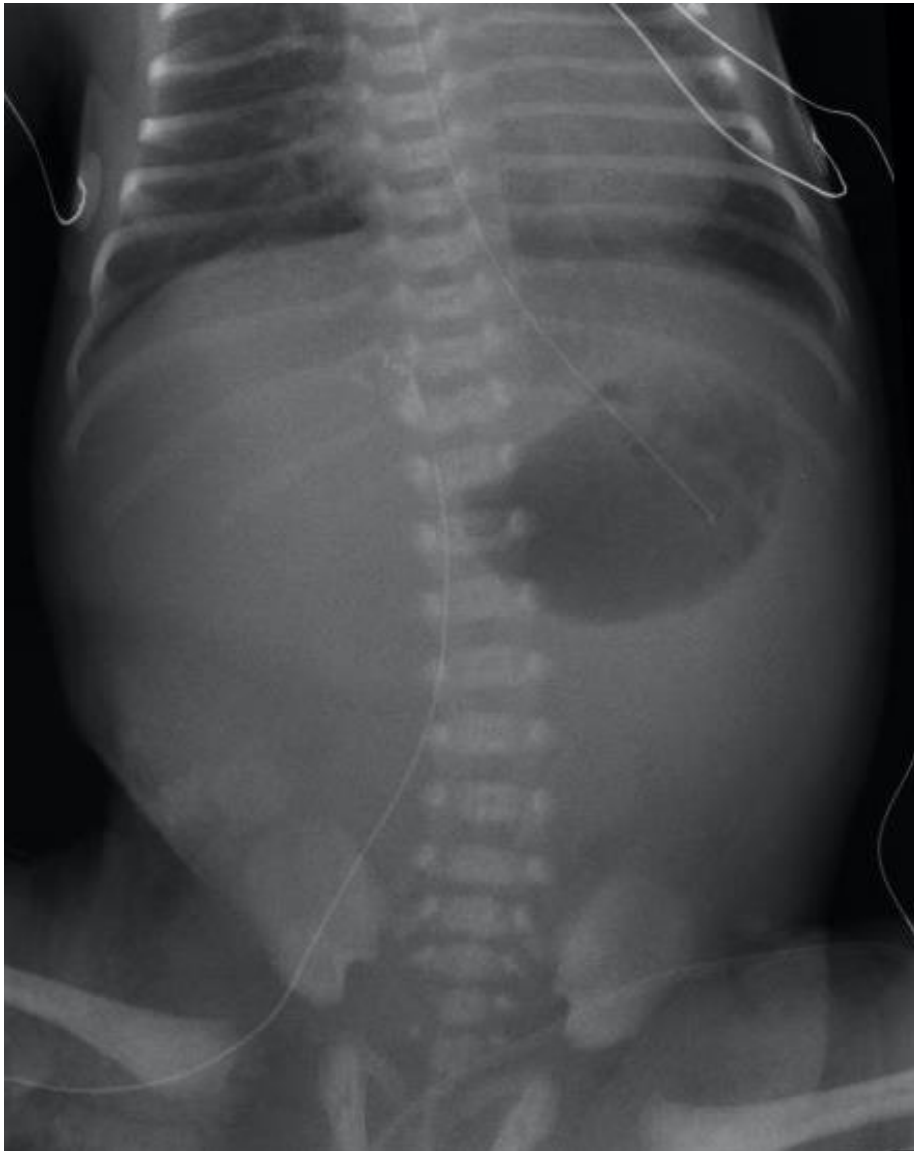
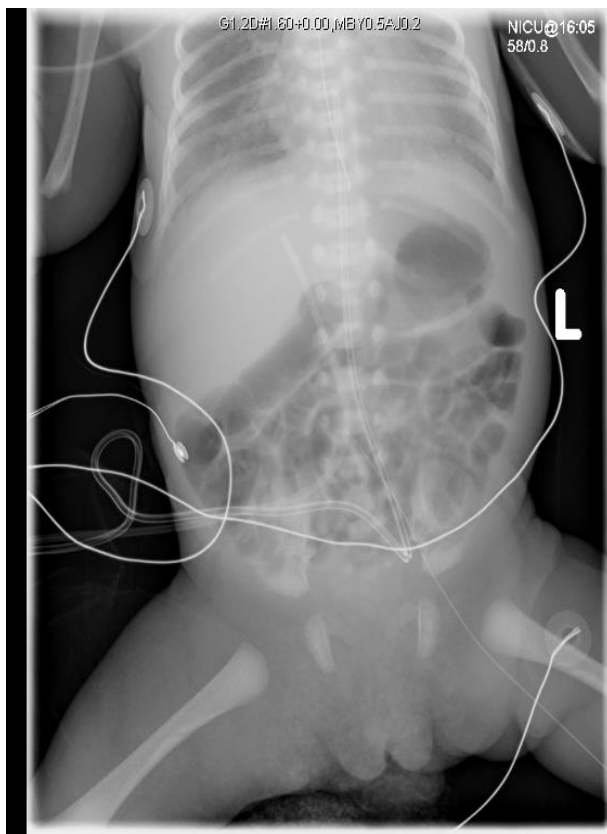


Image 1

Correctly placed PICC with contrast jet seen in IVC

Correct line positioning is important to avoid potential complications. In particular, lines sited in the lower limbs have the potential to be malpositioned in the ascending lumbar vein^{4,7}. This can be difficult to recognise on a plain x-ray without contrast (see images 2 and 3 below).



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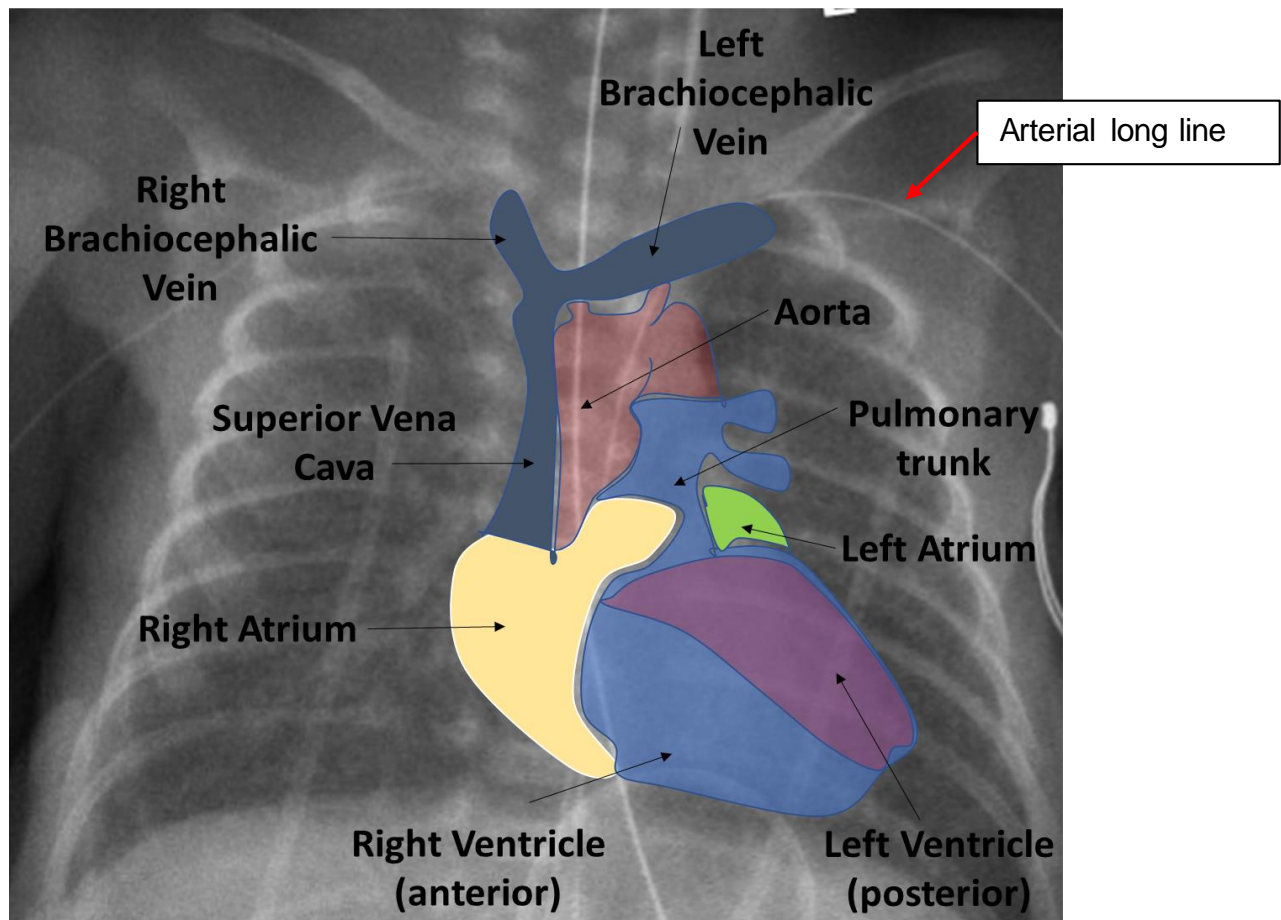


Image 2
PICC line placed in left lower limb (umbilical lines also in situ); plain radiograph image without contrast

Image 3
Same PICC line inserted as seen in Image 1 but with radio-opaque contrast and after removal of umbilical lines. Note contrast seen in vertebral veins showing 'cobweb' sign and therefore misplacement of line.

Lines may also be inadvertently inserted into peripheral arteries. In the smallest infants this can be difficult to identify, even with contrast. On x-ray the course of the line should be closely reviewed.

- Venous upper limb **left sided long lines should cross the midline,**
- Venous upper limb **right sided long lines should not cross the midline**
- Non-rotated films are key for aiding correct identification of line course
- Doppler can be a very useful adjunct to aid identifying venous versus arterial placement
- Review line position on every x-ray taken (lines can migrate/ but also acts as a 'second' check)
- Possible clinical signs of inadvertent arterial insertion:
 - Bleeding excessively at insertion site
 - Signs of arterial compromise distal to insertion once infusing: pale or dusky digits



4.4 Dressing the line

The line should be dressed in an aseptic manner, using 2 operators. The dressing must:

- Protect the limb (eg use of gauze under hub)
- Fully cover the line
- Not encircle the limb
- Be clean and intact (i.e. no visible blood on dressing, not peeling off)

The dressing should be inspected daily as part of routine nursing line checks. If the dressing is not intact, eg visible blood, peeling dressing, or line not covered, it should be replaced. Redressing the line is a 2-person procedure, under aseptic precautions.

4.5 Accessing the long line

Long line infections are a very significant cause of morbidity and mortality. Repeated accessing of lines increases the chances of infection therefore must be minimised. Lines can be used for the following infusions/drugs only. Any deviation from this MUST be made by a senior clinician.¹³

MUST be given centrally (Long line or UVC)	Should be given via longline or UVC if available	CANNOT be given by long line as they will block lumen. (but CAN go via UVC/broviac line)
>12.5% dextrose infusion	Adrenaline infusion (standard)	Cryoprecipitate
Adrenaline infusion (Concentrated)	Alprostadil	Fresh frozen plasma
Dopamine (concentrated) (standard (60mg in 50mL) can be given peripherally while central access gained. Max conc 3.2mg/mL peripherally)	Atracurium infusion	Packed red blood cells
Concentrated "central" PN*	Calcium Infusions#	Platelets
	Dextrose infusion	
	Dobutamine	
	Dopamine (standard)	
	Fentanyl infusion	
	Insulin	
	Isoprenaline infusion	
	Lidocaine infusion	
	Morphine infusion	
	Potassium chloride (Must be central if >0.04mmol/mL)	
	Sodium bicarbonate (In an emergency can give peripherally but ideally give via CVAD up to 4.2%)	
	TPN	

*peripheral PN may be used peripherally. This has a glucose concentration of no more than 12.5% and no calcium or phosphate added.

#calcium infusions can be given peripherally under the following conditions (as per BNFC): 0.5mL/kg of calcium gluconate can be given over 5 to 10 mins as a single dose for urgent

correction, but for infusion recommends a concentration of at least 45 micromols in 1mL, for neonates infused at 22 micromols/kg/hr.

Calcium Chloride: neat solution should be administered centrally (if possible). Diluted can be given peripherally

Ca gluconate: Concentrations greater than 0.045mmol in 1mL should be given via a central venous access device. In emergencies can give via large peripheral vein

Accessing the line must be by using an aseptic non touch technique such as the following procedure ^{14,15}.

This is a two person procedure

Clean trolley and allow to dry and consider creating a sterile zone with screens

Assemble all equipment on trolley using a non-touch technique

Wash and dry hands with sterile towel

Apply sterile gloves

Open incubator doors using elbow technique

Clean long line port using friction for 15 seconds and allow to dry for 30 seconds

Draw up flush using a filter needle

Access long line

If contamination of gloves/equipment occurs change appropriately

4.6 Removal of long line

For long lines used for nutrition:

Stopping Parenteral Nutrition

Infants should reach 150ml/kg/d of enteral feeds before stopping PN - this is a pragmatic decision based on the risk of central line infection.

No specific duration is given for use of a longline. There should be daily clinical review and the risk of lower nutrition balanced against the risk of infection.

Post-operative surgical babies may not tolerate /absorb feeds; therefore, the line may be needed for longer in this group.

4.7 Complications

4.7.1 Infection. This is the most common complication. The risk can be minimised by the use of full aseptic technique. Treatment is as per infection guidelines, guided by the organism causing the infection. Line removal may be required.

4.7.2 Thrombosis. This can be commonly seen with percutaneous long lines, however is rarely symptomatic. This should be discussed with a haematologist on a case by case basis.

Line removal is recommended, however 3-5 days of anticoagulation is recommended prior to line removal to reduce the risk of paradoxical emboli.

Asymptomatic Following line removal, radiological monitoring. If extension of thrombosis occurs use anticoagulation for 6-12 weeks. If line removal is not possible, consider anticoagulation however solely radiological monitoring may be appropriate with addition of treatment if clot extension occurs.

Symptomatic Following line removal, anticoagulation for 6-12 weeks. If line removal is not possible, anticoagulation is recommended at least until the line is removed.

Anticoagulation/Thrombolysis

See network guideline for more details on anticoagulation/thrombolysis.

4.7.3 Cardiac tamponade. This is a rare but clearly described complication of percutaneous central lines. It most commonly occurs in lines sited within the cardiac silhouette. It should be considered in any infant with a central line who undergoes unexplained cardiorespiratory collapse. Diagnosis is by echocardiography if the expertise is available. Treatment is emergency cardiac paracentesis with aspiration of the effusion.

5. Minimum standards

A guideline should be available for the insertion, accessing and care of percutaneous long lines.

6. Audit criteria

- Long line infection rate (expressed as infections/1000 line days)
- Long line insertion checklist completion
- Use of long lines (indications, length of time of use)
- Complications of long lines (e.g. extravasation)

7. References

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August 2018
<https://www.bapm.org/sites/default/files/files/BAPM%20CVC%20final%20Jan16%20%28addition%20Aug%202018%29.pdf>

Long line insertion checklist

If one of the criteria is not achieved please either
Correct the error OR Stop the procedure

Stickie
NAME

DOB

Hospital number

NB THIS LIST NEEDS TO BE COMPLETED **DURING** THE PROCEDURE

Time procedure started (ie incubator entered)

		:		
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Criteria	Achieved	Comments
Assistant available for whole procedure to complete list, ensure all steps completed and assist with securing		
Xray notified of procedure and requested on ICE		
Clean trolley and allow to dry		
"Sterile zone" created with screens around trolley, consideration of thermal control for baby		
Theatre hat worn		
Wash hands and forearms with CHLORHEXIDINE WASH for 2 minutes. Dry with sterile towel		
Gown put on without contamination		
2 pairs of sterile gloves put on without contamination		
Equipment and incubator port holes opened by assistant		
ENSURE CORRECT LINE SIZE AND LENGTH OPENED, withdraw guide wire 2mm to ensure freely moves		
Area DABBED with chloraprep sponge and allowed to dry.		
Drapes applied without contamination of sterile field/gloves NOTE this requires the incubator door to be opened. Drape must NOT be inserted through port holes. Observer is necessary to check contamination does not occur		
For infants both <28 weeks AND <7 days, cleaning fluid washed off after 1 minute		
Top layer of gloves removed		
Wee light/cold light if used, placed in sterile glove		
Appropriately completes procedure without contamination of the sterile field, equipment and gloves. Hands must NOT touch body at any point- this is no longer sterile after leaning against incubator		
De-scrubs and rescrubs if leaves sterile "zone", eg while waiting/reviewing xray, Changes equipment, gloves or gown if contamination occurs. If site changed, NEW drapes and gloves used		
Line dressed appropriately ie ●2 person technique, assistant wearing gown/gloves ●Dressing not encircling limb, ●Dressing covering line and steristrips ●Dressing clean		
Line flushed with 10ml syringe only (not smaller)		
Fluids attached to central line (by inserter or assistant) within 15 mins of line insertion (to prevent occlusion)		

Time procedure completed (awaiting xray)

		:		
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Time all complete (adjustments following xray)

		:		
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Line location; right left lower limb upper limb

Other (specify).....

Number of attempts

	Name	Signature	Date	Time
Line inserted by				
Assistant check list				

Attach cut down set sticker here:

Line type/size (and sticker):

Length inserted to:

Xray position:

Was contrast used? Yes No

Readjusted? Please document final length if moved.

Repeat xray (if needed)- result:

Line position checked and any additional notes eg reason for suboptimal position accepted;

Consultant Name/Signature

Date/time

IT IS THE RESPONSIBILITY OF THE LINE INSERTOR TO FILE THIS DOCUMENTATION IN THE MEDICAL NOTES WITHIN THE CONTEMPORARY SECTION (LEFT) SIDE

Umbilical Arterial Catheter/Umbilical Venous Catheter/Peripheral Longlines – Information for parents/carers

(courtesy of North Lincolnshire and Goole Hospitals NHS Foundation Trust)

This leaflet has been designed to give you important information about your baby's condition, and to answer some common queries that you may have.

What is an Umbilical Arterial Catheter (UAC)?

A UAC is a special line which is sited through an artery in your baby's umbilical cord. A UAC is very useful for taking blood samples and monitoring your baby's blood pressure.

What is an Umbilical Venous Catheter (UVC)?

A UVC is a special line which is sited through a vein in your baby's umbilical cord. A UVC is useful for giving your baby fluids or medication.

What is a long line?

A long line is a thin catheter which either goes into a vein in your baby's arm, leg or neck. Longlines are helpful to administer total parenteral nutrition (TPN). TPN is intravenous feeding and is usually used when babies are unable to tolerate feeding into the stomach. Medication can also be given through a longline.

How are these lines inserted?

All the above lines are inserted under sterile conditions on the Neonatal Unit. It is extremely important to ensure they are in the correct place. Your baby will therefore have an x-ray to check their position after they have been inserted. In order to reduce the risk of clots forming a drug called Heparin, which helps keep the blood thin, may also be passed through the lines.

How long do the lines remain in for?

The insertion of lines into your baby can carry risks, therefore in order to reduce these risks and the chances of complications the lines will be taken out as soon as they are no longer needed. Nursing or medical staff will keep you updated.

What are the benefits?

All of the lines are invaluable in the management of sick babies. The UAC/UVC lines reduce the need to handle poorly babies. They also reduce the need for repeated pricking of your baby with needles so that blood samples can be taken or medication given.

If your baby is receiving TPN via a longline this will help your baby receive the calories they need to help them grow.

What are the risks?

There is a risk of complications; however medical/nursing staff will discuss these risks with you explaining the complications against the need for ensuring your baby receives the appropriate care and treatment.

Below are some of the known complications:

- Infection
- Clot formation with the possibility of the clot being carried to other areas in the body.
- Migration – the line extending to beyond where it was thought to be
- Reduced blood supply to the intestines
- Artery spasm with discoloration of the skin of toes.
- Cardiac tamponade (perforation of the heart muscle with fluid in the sac around the heart).

Staff will carry out regular inspections of the site of the lines and if necessary the lines will be removed.

Are there any alternatives?

There are currently no alternatives. If you are concerned about lines being inserted please discuss your concerns with medical or nursing staff.

Additional Information

If you require any additional information, please do not hesitate to speak to a member of medical or nursing staff on the Neonatal Unit.

Concerns and Queries

If you have any concerns/queries about any of the services offered by the Trust, in the first instance, please speak to the person providing your care.

Review Period:

Author: Consultant Paediatric Lead Neonatal Unit

