



Yorkshire and Humber Neonatal ODN (South) Clinical Guideline

Title: Umbilical venous and arterial lines- indications, insertion, use and care of

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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.

A. Summary page and best practice points

This guideline is to ensure safe insertion and use of umbilical lines and their common and important complications.

Umbilical Arterial lines

Should be inserted and accessed with an aseptic technique	A/B
Should lie at T6-T10	C
Patency should be maintained using heparin infusion	C
Common complications are thrombosis and infection.	C

Umbilical Venous lines

Should be inserted and accessed with an aseptic technique	A/B
Should lie at the junction of the IVC and right atrium	C
Common complications are infection and thrombosis	C
Life threatening complications include cardiac tamponade which should be considered in infants with circulatory collapse and a central line	D
hepatic injury- parenchymal or haemorrhage. This should be treated symptomatically	D

B. Full guideline

1) Background

Umbilical venous and arterial lines are inserted into infants requiring intensive care to aid monitoring, blood sampling and infusions.

2) Aim

The aim of this guideline is to ensure safe insertion and use of umbilical lines, and list common complications

3) Areas outside remit

This guideline only refers to umbilical lines not peripheral or surgically inserted venous lines.

4) Evidence

The majority of evidence for this guideline is recommended practice from nationally accepted text books. There has been little research into this field of neonatology.

5) Core guideline

5.1 Umbilical arterial lines

5.1.1 Indications¹

Umbilical arterial lines are indicated for infants who require

- Frequent blood gas monitoring and blood sampling
- Invasive blood pressure monitoring
- Exchange transfusions
- Fluid infusions

See Early Care guideline for further guidance regarding which preterm infants may require lines.

Standard fluid infusions including blood products can be safely administered via umbilical arterial lines if necessary. Hyperosmolar and vasoconstricting solutions should be avoided (e.g. 15% dextrose, inotropes).

5.1.2 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 e.g. 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. The site for insertion should be cleaned using an appropriate skin cleanser.

Handling of the line should be kept to a minimum. The largest bore line possible should be inserted into the infant. The catheter should have end holes, since those with side holes have been associated with an increase in thrombosis possibly related to endothelial damage.

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 central line infections and the associated morbidity². (see appendix 2).

Once inserted, the line must be securely fixed (see appendix 6 for suggested method).

It may be appropriate to bridge the line immediately in babies weighing more than 1.5kg or with good skin integrity (more mature infants) See appendix 6 for information on bridging umbilical lines. For babies < 1.5kg or with poor skin integrity this should be done by Day 2/3 prior to cord separation or may be required earlier if the infant requires prone positioning or is to be nursed outside of the incubator (e.g. skin to skin or kangaroo care).

5.1.3 Location (see diagram in appendix 3)

Umbilical arterial catheters can be maintained in a “high” or low position. The catheter must not sit at the position of a main arterial branch e.g. coeliac axis, superior mesenteric artery. Any manipulation should be done in an aseptic manner and documented.

Their location should be reviewed and documented by a Consultant Paediatrician/Neonatologist or Radiologist within 24 hours of insertion⁷. Note that position should be reviewed frequently as catheters are known to migrate after insertion²⁶.

High position refers to T6-10. This is the position that has been proven to last the longest and be the safest for newborn infants³.

The low position (L3 to aortic bifurcation) can be used.

Below the aortic bifurcation must not be used due to the risk of thrombosis of the leg.

See appendix 4 for suggested length calculations.

5.1.4 Accessing

Accessing the line must be by using an aseptic technique such as the following procedure^{4,5}:

Clean trolley and allow to dry.

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 umbilical arterial line port using friction for 15 seconds and allow to dry for 30 seconds

Draw up flush using a filter needle. Heparin is not needed as a flush⁶

Access arterial line/aspirate blood as needed

If contamination of gloves/equipment occurs change appropriately

5.1.5 Line maintenance

5.1.5.1 The infant with an arterial line should be monitored due to the risk of haemorrhage and thrombosis. Observation of the distal limb and perineum/buttocks is necessary.

5.1.5.2 The infant should be nursed in a supine position for at least 24 hours following insertion. After that time, a risk analysis of the advantages (e.g. respiratory) of prone positioning versus the risk of haemorrhage can be undertaken, and if needed the infant nursed in a prone position with close monitoring¹. Bridging of the umbilical lines should be performed prior to nursing the patient prone (see Appendix 7 Bridging of umbilical lines).

5.1.5.3 Heparin (at least 0.25 units/ml) should be infused to maintain patency of line. There is no evidence that this prevents thrombosis⁶.

5.1.5.4 Removal of the line should occur once it is no longer required. Robertson recommends discontinuing the heparin infusion for 30 minutes prior to removal. The line can then be removed, with the last 5cm removed slowly. If haemorrhage occurs, direct pressure for a few minutes will allow arterial spasm to occur.¹

5.1.6 Complications and their management

- 5.1.6.1 **Infection.** This is the most common complication and the risk should be minimized by the use of full aseptic precautions. Suspected sepsis should be managed as per late onset sepsis guidelines with antibiotics and consideration of removal of the line.
- 5.1.6.2 **Haemorrhage-** this can occur during line insertion or if line becomes dislodged. Treatment is haemostasis and transfusion as required.
- 5.1.6.3 **Ischaemia-** this can occur to the lower limbs or perineum. A fluid bolus (especially in infants with hypotension) can improve the perfusion, however if this persists, catheter removal may be necessary¹
- 5.1.6.4 **Thrombosis.** This is a common complication seen in between 1.5 and 95% of catheters, depending on the method used for detection. The majority are asymptomatic and require no treatment. However symptomatic or persistent thrombosis may require treatment. (see Y&H Management of line associated thrombosis guideline).
- 5.1.6.5 **Urachal cannulation.** This is seen if the urachal remnant is mistaken for an artery. Treatment is surgical intervention.
- 5.1.6.6 **Hypertension.** There is an increased incidence of hypertension, probably related to renal artery thrombosis (partial/total). This should be managed symptomatically unless the arterial thrombosis requires therapy (see Y&H Management of line associated thrombosis guideline).

5.2 Umbilical Venous lines

5.2.1 Indications

Umbilical venous lines are indicated for:

- Acute emergency resuscitation- these should be re-sited once the infant has stabilised with an aseptically inserted catheter
- Central access e.g. for TPN, inotropes, hyperosmolar solutions
- Exchange transfusions

5.2.2 Insertion

This should be done using a strict aseptic technique. Once inserted, the line should be checked that it is in a vessel by “bleeding back”. “Rail roading” of a second catheter is no longer recommended due to risk of vessel damage.⁷

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 e.g. 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. The site for insertion should be cleaned using an appropriate skin cleanser.

Handling of the line should be kept to a minimum. Double lumen catheters can be considered, to reduce the need for further peripheral venous lines. Several small studies confirm the reduction in need for additional access, however a small increase in catheter failure rate (clogging, leaking and breaking) in the double lumen group.⁸

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 central line infections and the associated morbidity² (see appendix 2).

Once inserted, the line must be securely fixed (see appendix 6 for suggested method).

It may be appropriate to bridge the line immediately in babies weighing more than 1.5kg or with good skin integrity (more mature infants) See appendix 7 for information on bridging umbilical lines. For babies < 1.5kg or with poor skin integrity this should be done by day 2/3 prior to cord separation or may be required earlier if the infant requires prone positioning or is to be nursed outside of the incubator (e.g. skin to skin or kangaroo care).

5.2.3 Location

Umbilical venous lines should lie at the junction of the inferior vena cava and right atrium. (see appendix 3 for diagram). Their location should be reviewed and documented by a Consultant Paediatrician/Neonatologist or Radiologist within 24 hours of insertion⁷. Note that position should be reviewed frequently as catheters are known to migrate after insertion²⁶. Any manipulation should be done in an aseptic manner and documented.

Lines should not lie in the cardiac silhouette due to the risk of pericardial tamponade. Lines withdrawn from this position must be re-xrayed to ensure they no longer sit within the heart. In some cases, it may be possible to review/confirm line position using ultrasound²⁷.

Hyperosmolar solutions should also not be infused into the hepatic veins. This can lead to hepatic necrosis, laceration, haemorrhage, TPN ascites.

The ideal position is **T8-T9** (junction of IVC and right atrium).

Low lying (**L2-L3**) can be accepted as a short-term alternative¹. There is no evidence of significantly increased complication rates as compared to centrally placed catheters in the short term³⁰. -Extra caution, particularly if using inotropes or PN³¹, in these circumstances it must be a consultant led decision to use if UVC in low lying position. Ideally replace low lying UVC within 24 hours or at earliest opportunity.

In a resuscitation scenario, line position will not be known. Once the infant is stabilised, the location should be assessed at a minimum. It may be optimal to replace the line in a more sterile manner.

See appendix 4 for suggested catheter length calculations.

5.2.4 Accessing

Recent advice from Vygon following extravasations suggests the “distal” (green) lumen should be used for PN infusion and the proximal (yellow) lumen for bolus drugs or low volume drug infusions.

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Accessing the line must be by using an aseptic technique such as the following procedure ^{4,5}

Clean trolley and allow to dry.

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 umbilical venous line port using friction for 15 seconds and allow to dry for 30 seconds

Draw up flush using a filter needle.

Access line as needed.

If contamination of gloves/equipment occurs change appropriately

5.2.5 Management

The infant should be nursed in a supine position for at least 24 hours following insertion. After that time, a risk analysis of the advantages (e.g. respiratory) of prone positioning versus the risk of haemorrhage can be undertaken, and if needed the infant nursed in a prone position with close monitoring¹. Bridging of the umbilical lines should be performed prior to nursing the patient prone (see Appendix 7 Bridging of umbilical lines)

5.2.5 Removal

There is little evidence of when UVCs should be routinely removed in terms of risk of infection²⁸. Locally (Jessop Wing data), the risk of infection rises after 7 days (although the Cochrane data does not demonstrate a significant difference between day 7 and day 14).

Removal should be undertaken once the line is no longer required.

For UVCs that are being used for nutrition:

- If 120ml/kg/d of enteral feeds are reached by day 7, it would be prudent to continue PN for an extra 24 hours to achieve full feeds at 150ml/kg/d before removing the UVC³²
- If 150ml/kg/d of enteral feeds are not achieved/ not predicted to be reached by day 10, a longline should be sited and the UVC removed

5.2.6 Complications and their management

5.2.6.1 Infection. This is a common complication. It should be managed according to local policy. The risk can be minimised by the use of strict aseptic precautions, and removal of the line once it is no longer required. Suspected sepsis should be managed as per late onset sepsis guidelines with antibiotics and consideration of removal of the central line.

5.2.6.2 Thrombosis. This is seen in approximately 11% of infants with lines. See Y&H Management of line associated thrombosis guideline.

5.2.6.3 Cardiac tamponade. This is a rare but clearly described complication of UVCs¹¹. It can occur in correctly positioned lines and therefore 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.

5.2.6.4 Hepatic capsular injury. This can occur in correctly placed catheters following difficult insertion (possibly following misplaced attempts). The infant can present with cardiovascular collapse, abdominal distension or unexplained anaemia. Diagnosis is by

abdominal ultrasound. Treatment is symptomatic with correction of anaemia and coagulopathy. Even with prompt diagnosis and management, this can be fatal.¹²

5.2.6.5 Hepatic parenchymal injury. This can follow infusion of hyperosmolar solutions via a misplaced catheter. Necrosis of the parenchyma or extravasation of the infusate leading to ascites may occur. The treatment is symptomatic, with removal of the catheter.

5.3 Management of central line associated thrombosis

There is limited evidence to support any recommendations and much of the advice is based on extrapolation of adult studies, however the following is based on the American College of Chest Physicians, Evidence-based clinical practice guidelines¹³. Discussion with a paediatric haematologist is recommended prior to therapy.

5.3.1 Arterial thrombosis

For all infants line removal is recommended. If the line is felt to be essential, consider anticoagulation.

Mortality associated with arterial thrombosis is said to be up to 20% with significant morbidity also occurring.

<i>Asymptomatic</i>	Radiographic monitoring. Consider anticoagulation if extension occurs
<i>Symptomatic</i>	Anticoagulation is recommended for at least 5-7 days
<i>Limb or organ threatening</i>	Consider thrombolysis (i.e. including renal failure secondary to obstructed renal artery flow) (see below)

5.3.2 Venous thrombosis

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

Asymptomatic

Following line removal, radiological monitoring is recommended with use of anticoagulation for 6-12 weeks if extension of thrombosis occurs. If line removal is not possible, anticoagulation is recommended for up to 3 months or until the line is removed. Radiological monitoring may be a suitable alternative with treatment only if clot extension occurs or the neonate becomes symptomatic

Symptomatic

Following line removal, anticoagulation for 2-12 weeks with the treatment period guided by radiological monitoring. If line removal is not possible, anticoagulation is recommended at least until the line is removed.

Life/organ/limb threatening

Consider thrombolysis (see below)

5.3.3 Anticoagulation/Thrombolysis

Risk factors for bleeding must be carefully considered before starting anticoagulation or thrombolysis.

See separate guideline for anticoagulation/thrombolysis advice.

6) Audit criteria

Line infection rate (UAC, UVC) per 1000 line days

Line position

Complications requiring treatment- thrombosis, haemorrhage

7) References

1. Robertson's textbook of Neonatology. 4th Edition 2005 Published Elsevier
2. Patient safety first- matching Michigan
<http://www.patientsafetyfirst.nhs.uk/Content.aspx?path=/interventions/relatedprogrammes/matchingmichigan/>
3. Barrington KJ. Umbilical artery catheters in the newborn: effects of position of the catheter tip. Cochrane Database of Systematic Reviews 1999, Issue 1. Art. No.: CD000505. DOI: 10.1002/14651858.CD000505.
4. Long line care guideline. Jessop Wing Neonatal unit June 2011
5. A statewide quality improvement collaborative to reduce neonatal central line-associated blood stream infections. Wirtschafter et al. J Perinatol 2010;30:170-181
6. Barrington KJ. Umbilical artery catheters in the newborn: effects of heparin. Cochrane Database of Systematic Reviews 1999, Issue 1. Art. No.: CD000507. DOI: 10.1002/14651858.CD000507
7. Use of central venous catheters in neonates –a framework for practice, December 2015.
http://www.bapm.org/publications/documents/guidelines/BAPM%20CVC%20final%20Dec15.pdf?utm_source=Royal%20College%20Of%20Paediatrics%20and%20Child%20Health&utm_medium=email&utm_campaign=6660520_BAPM%20information%20update%20148%20January%202016&dm_i=12S1,3YRAG,62UJ1L,EB8CP,1
8. Kabra NS, Kumar M, Shah SS. Multiple versus single lumen umbilical venous catheters for newborn infants. Cochrane Database of Systematic Reviews 2005, Issue 3. Art. No.: CD004498. DOI: 10.1002/14651858.CD004498.pub2
9. National survey of umbilical venous catheterisation practices in the wake of two deaths. Clare Hollingsworth, Paul Clarke, Alok Sharma, Michele Upton. Arch Dis Child Fetal neonatal Ed 2015 100 (4), p371
10. NTNN guideline day consensus. Based on international guidelines.
11. Acta Pædiatrica, 2005; 94: 626–633 Cardiac tamponade and pericardial effusion due to venous umbilical catheterization Traen, M, Schepens, E, Laroce, S, Van Overmeire, B.
12. Hepatic laceration because of malpositioning of the umbilical vein catheter: case report and literature review. Yiğiter M, Arda IS, Hiçsönmez A. J Pediatr Surg. 2008 May;43(5):E39-41
13. Antithrombotic therapy and prevention of thrombosis, 9th edition: American College of Chest physicians Evidence based clinical practice guidelines. Monagle. Chest 2012 141 (2) e737-e801
14. Evaluation and treatment of thrombosis in the neonatal intensive care unit. Edstrom CS, Christensen RD. Clinics in Perinatology 2000;27:623-641
15. British national formulary for Children <https://www.evidence.nhs.uk/formulary/bnfc/current/2-cardiovascular-system/28-anticoagulants-and-protamine/281-parenteral-anticoagulants/heparin/heparin>
16. Retrospective cohort study comparing activated partial thromboplastin time versus anti-factor Xa activity nomograms for therapeutic unfractionated heparin monitoring in paediatrics. Trucco et al. J Throm Haemostat 2015 May; 13, 788-94
17. Diagnosis and management of central line associated thrombosis in newborns and infants. Revel-Vilk. Seminars in fetal and neonatal medicine 2001; 16; 340-344
18. Guideline on the investigation, management and prevention of venous thrombosis in children. Chalmers. British Journal of Haematology 2011; 154; 296-207
19. Thrombolysis in children. Williams. British Journal of Haematology 2009; 148;26-36
20. The preterm infant with thrombosis. Bhat. Arch Dis Child Fetal Neonatal Ed. 2012 97; F423-F428
21. Neonatal haemostasis and the management of neonatal thrombosis. Will. British journal of haematology. 2015 169 324-332

22. Guideline for the management of catheter associated arterial thrombosis. Sheffield Children's hospital 2011. Nigel Humphries, Jeanette Payne
23. Guideline for the use of anti-thrombotic treatment in children. Leeds General Infirmary. Dr Mike Richards
24. Recommendations for tPA thrombosis in children/ On behalf of the Scientific Subcommittee on Perinatal and Pediatric Thrombosis of the Scientific and Standardization Committee of the International Society of Thrombosis and Haemostasis. Manco-Johnson Thrombosis and Haemostasis 2002 88 157-158
25. Treatment of neonatal thrombus formation with recombinant tissue plasminogen activator: six years experience and review of the literature. Hartman. Arch Dis Child Fetal Neonatal Ed. 2001; 85; F16-22
26. Migration of Central Venous Catheters in Neonates: A Radiographic Assessment. Gupta R¹, Drendel AL², Hoffmann RG³, Quijano CV⁴ Uhing MR¹. Am J Perinatol. 2016 May;33(6):600-4.
27. Ultrasound-guided umbilical catheter insertion in neonates. Fleming SE¹, Kim JH. J Perinatol. 2011 May;31(5):344-9.
28. Early planned removal of umbilical venous catheters to prevent infection in newborn infants. Gordon A¹, Greenhalgh M, McGuire W. Cochrane Database Syst Rev. 2017 Oct 10;10:CD012142. doi: 10.1002/14651858.CD012142.pub2.
29. BAPM update November 2018
30. Ters NE, Claassen C, Lancaster T, Barnette A, Eldridge W, Yazigi F, Brar K, Herco M, Rogowski L, Strand M, Vachharajani A; Central versus Low-Lying Umbilical Venous Catheters: A Multicenter Study of Practices and Complications. Am J Perinatol 2019; 36(11): 1198-1204
31. Hollingsworth C, Clarke P, Sharma A, *et al*. National survey of umbilical venous catheterisation practices in the wake of two deaths. *Archives of Disease in Childhood - Fetal and Neonatal Edition* 2015;**100**:F371-F372.
32. NICE Guideline (NG154) Neonatal Parenteral Nutrition. Published 26th February 2020

C. Appendices

Appendix 1 Grades of recommendation

Grade	
A	Requires at least one meta analysis, systematic review or RCT rated as 1++, and directly applicable to the target population, and demonstrating overall consistency of results
B	Requires a body of evidence including studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 1++ or 1+
C	Requires a body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; or extrapolated evidence from studies rated as 2++
D	Evidence level 3 or 4; or Extrapolated evidence from studies rated

	as 2+
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Appendix 2

UMBILICAL line insertion checklist

If one of the criteria is not achieved please either

Correct the error OR Stop the procedure

NB THIS LIST NEEDS TO BE COMPLETED DURING THE PROCEDURE

Time procedure started (ie incubator entered)

		:		
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Temperature monitoring (see page 2 interventions) to record

Time (min)	Pre	0:15	0:30	0:45	1:00	1:15	1:30	1:45
Temp								

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		
Antibiotics (if required) prescribed and given once blood aspirated		
Clean trolley and allow to dry		
"Sterile zone" created with screens around trolley, consideration of thermal control		
Theatre hat worn		
Wash hands and forearms with CHLORHEXIDINE WASH for 2 minutes. Dry with sterile towel. Gown and 2 pairs sterile gloves put on without contamination		
Equipment (correct size UAC) and incubator port holes opened by assistant		
Area DABBED with chloraprep sponge and allowed to dry.		
Abdomen NOT cleaned (risk of burns)		
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		
Appropriately completed 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", e.g. while waiting/reviewing x-ray. Changes equipment, gloves or gown if contamination occurs		
Lines fixed individually with zinc oxide tape and sutures		
Fluids attached to central line (by inserter or assistant) within 15 mins of line insertion (to prevent occlusion) Antibiotics given via line if indicated (STERILE)		

Time procedure completed (awaiting x-ray)

		:		
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Time all complete (adjustments following x-ray)

		:		
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PTO

Line type; UAC UVC

Thermoregulation interventions

Intervention	Hat	Change incubator temperature	Increase room temp	Transwarmer	Suspend procedure
Used?					

Note: humidity will not change core temperature while plastic drape is in situ

	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:

Re-adjusted? Please document final length if moved.

Repeat x-ray (if needed)- result:

Line position checked and any additional notes e.g. reason for suboptimal position accepted;

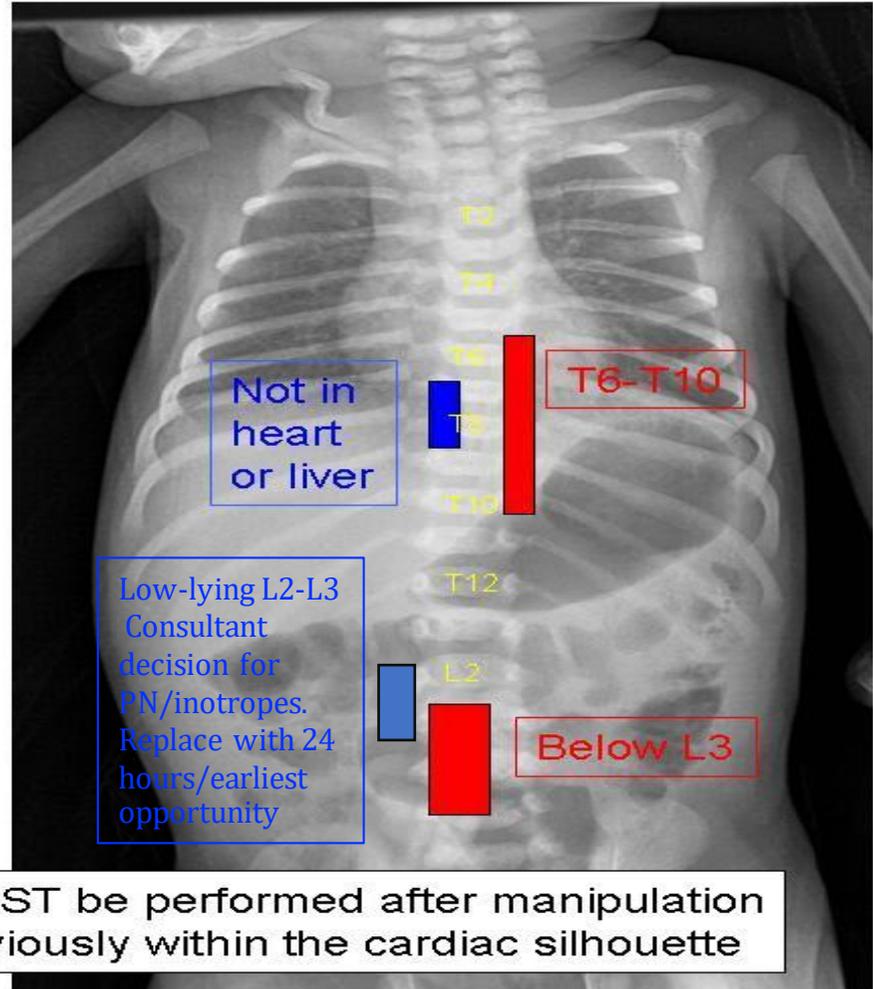
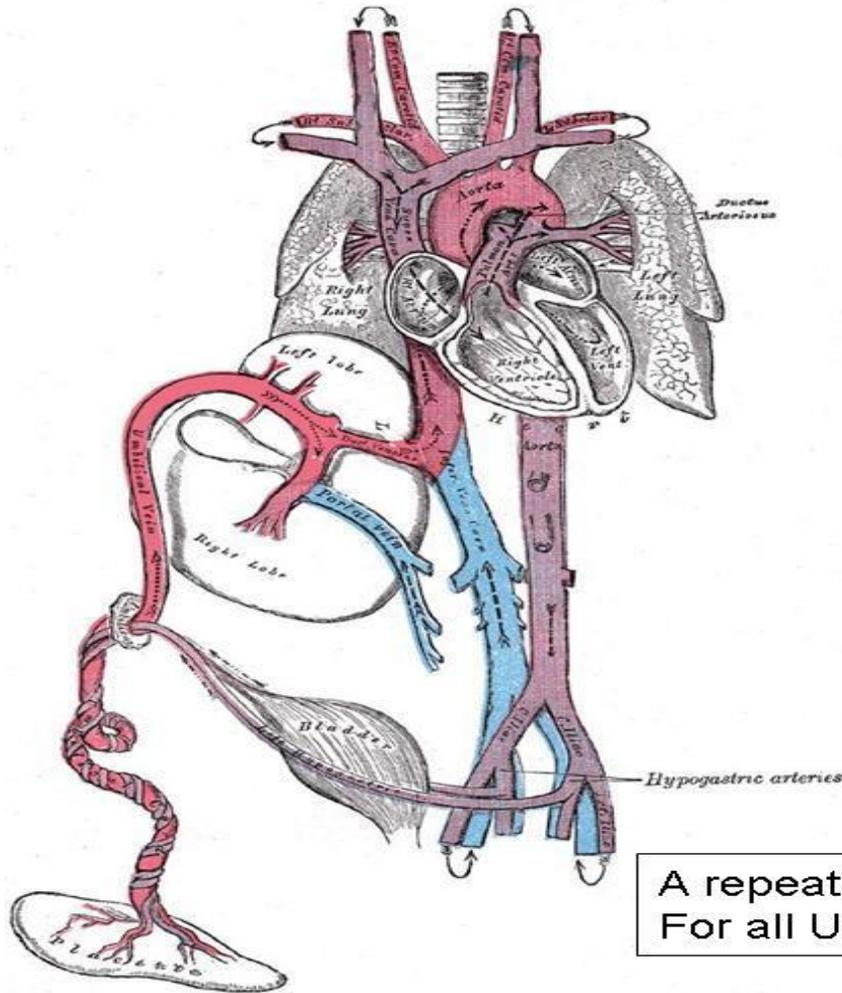
Consultant Signature/Name

Date/time

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

Appendix 3 Umbilical line insertion guide

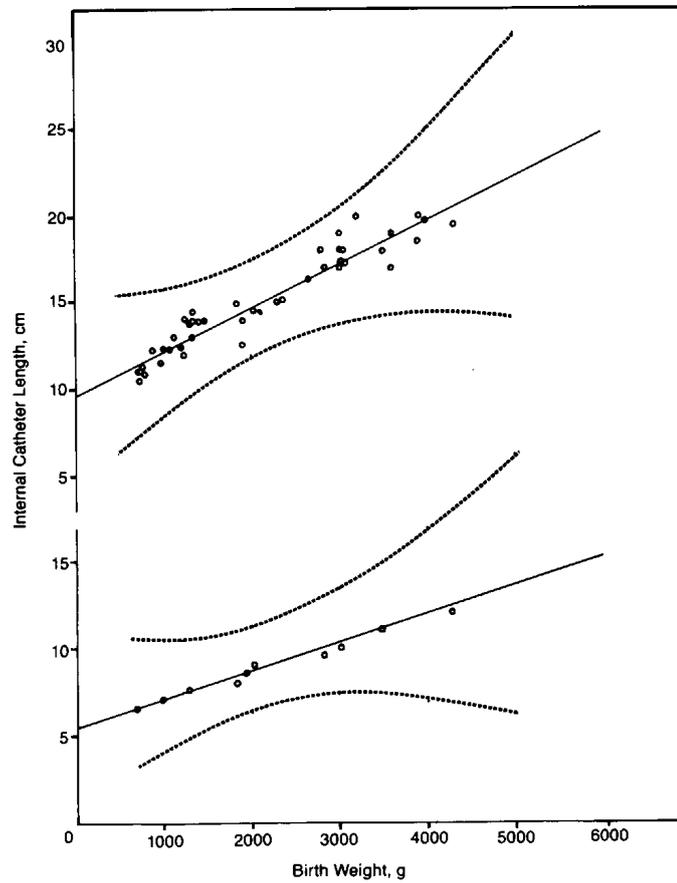
Acceptable UVC and UAC line positions



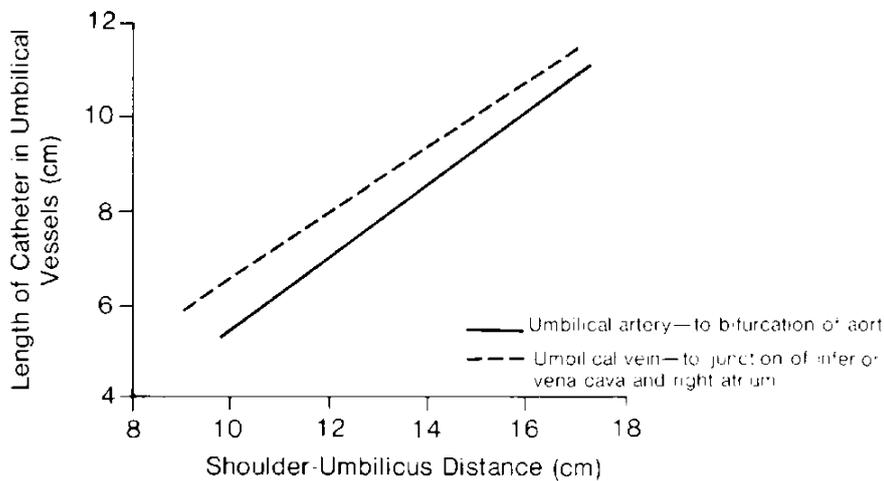
A repeat xray MUST be performed after manipulation
For all UVCs previously within the cardiac silhouette

Appendix 4 - Umbilical line length calculations

Example 1- Birth weight based
 Top line- arterial line
 Bottom line- venous line



Example 2 - Based on measurement from shoulder to umbilicus
 Note this only takes UAC to bifurcation - recommend longer lines



Example 3 - Formula based on birthweight

Umbilical venous line length
 $1.5 \times \text{birth weight} + 5.6$
 Umbilical arterial length
 $2.5 \times \text{birth weight} + 9.2$

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. Long lines 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: May 2019 Author: Consultant Paediatric Lead Neonatal Unit

How to fix umbilical lines



1. Place the first suture close to the line and tie a knot



2. Tie the suture around the line- could create a loop (eg around an instrument)



3. Tie the suture around the line, ascending with further knots (like a "ballet shoe")



Close up view- ensure knots are tight but not restricting flow through line (these are a bit loose)



4. Place further suture in cord and tie a knot



5. Place zinc oxide tape on line

- Place close to umbilical line entry site
- ensure all sutures are stuck to tape



6. Pinch tape closed, ensuring it is well stuck to sutures and line. Note you are now not sterile (as Zn tape is not sterile)



7. Lines should now be secured- check with "push pull" test

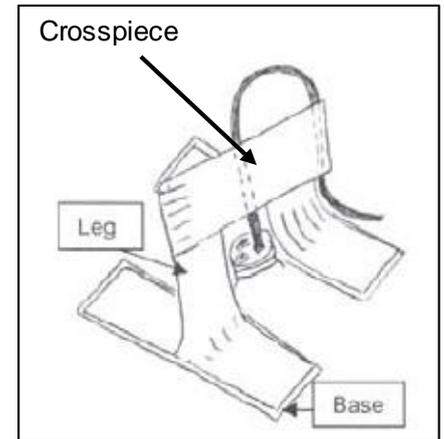
Each line should be independently secured
If the line needs adjusting (OUT only)

- Carefully remove the tape (use Appeel)
- either cut the sutures/loop and repeat or pull through "ballet shoe" ties
- Re apply zinc oxide tape

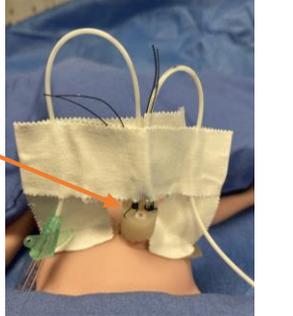
Appendix 7 Bridging umbilical lines

UAC and UVC lines should be bridged to ensure they are secure and reduce the risk of dislodgement. Ideally lines should be bridged prior to babies being placed prone or coming out of the incubator for kangaroo care, although this may not always be possible. In larger (>1.5kg) / more mature babies, this should be done at the time of insertion. In smaller (<1,5kg) / and extreme preterm babies, this should be delayed until skin integrity improves, usually from 2 days onwards.

Duoderm should be used as a base to the bridge to protect the skin. Zinc oxide tape should be used to form the legs and crosspiece. The legs are best constructed prior to entering the incubator and should be of roughly equal length. The UAC and UVC should be taped separately within the bridge to allow easy access for repositioning or removal at different times. The bridging will also include the sutures used to secure the line (appendix 6). Both the legs and cross piece should be close to the umbilical stump, with each umbilical line being either S-shaped or curled to reduce the risk of dislodgement.



Step-by-step guide

<p>1. Attach duoderm to the skin immediately adjacent to the stump</p>		
<p>2. Create a leg by folding a piece of zinc oxide tape so that it is just longer than the umbilical stump, with 2 sticky ends exposed at one end. Attach the sticky ends to the duoderm on the abdominal wall. Repeat on the other side.</p>		
<p>3. Cut a piece of zinc oxide that is twice the length between the 2 legs of your bridge.</p>		
<p>4. Place this on one side of the lines and sutures. Ensure the crosspiece is as close to the stump as possible to prevent lines looping and being dislodged at this site. The umbilical lines should be looped within the 'sandwich' of zinc oxide as you fold it over.</p>		
<p>5. Squeeze around umbilical lines and sutures to ensure the zinc oxide is well affixed.</p>		