

Peripheral Arterial Access in Neonates

Amendments

Date	Pages	Comment (s)	Approved by
March 19		New guideline	NGG

Primary Author: **Dr Mohammed Hafez** **Clinical Fellow**
 Sara Jane Robertson **Matron**

Contact for comments: **Sara Jane Robertson**
 sararobertson@nhs.net

Status: Approval date: March 2019
 Ratified by: Neonatal Guidelines Group
 Review date: March 2024

Patients first ▪ **Personal responsibility** ▪ **Passion for excellence** ▪ **Pride in our team**

Neonatal Guideline	Current Version is held on the Intranet	First ratified: March 2019	Review date: March 2024	Issue 1	Page 1 of 15
-----------------------	--	-------------------------------	----------------------------	------------	--------------

Executive summary

Indications

- Frequent blood sampling, for example arterial blood gases.
- Continuous arterial blood pressure monitoring
- Premature removal (or failure to insert) an umbilical artery line (UAC)
- Removal of blood during an exchange blood transfusion.

Contraindications

- **Failed Allen's test** because of recent cannulation or attempt of another artery in the same limb.
- Local skin infection
- Bleeding disorder
- Malformation of limb

Complications

- Thromboembolism/ Vasospasm/ Thrombosis, which can lead to compromise of arterial circulation, blanching, necrosis or gangrene of tissues or extremities.
- Blanching and partial loss of digits (Radial artery)
- Infection
- Reversible occlusion of artery
- Haemorrhage or Haematoma
- Air embolism

If in doubt, please discuss immediately with the consultant.

Neonatal Guideline	Current Version is held on the Intranet	First ratified: March 2019	Review date: March 2024	Issue 1	Page 2 of 15
-----------------------	--	-------------------------------	----------------------------	------------	--------------

Sites for peripheral artery catheters

- Radial artery (most commonly used) and will be discussed in this guideline
- Posterior tibial artery

Other sites of insertion (rarely used)

- Dorsalis pedal artery
- Ulnar artery (only if ipsilateral radial artery has not been attempted)

Start the procedure by performing and documenting Allen's Test

Risk management

- Peripheral arterial line insertion is a high-risk procedure: It is a consultant decision to insert the line.
- Parents should be informed before the insertion and document this in the notes.
- If any concern about digital perfusion, have a low threshold to remove and discuss with the consultant immediately before removal.
- **Benefits of insertion should outweigh risks:** UAC should be used in preference to peripheral arterial line where possible.

Neonatal Guideline	Current Version is held on the Intranet	First ratified: March 2019	Review date: March 2024	Issue 1	Page 3 of 15
-----------------------	--	-------------------------------	----------------------------	------------	--------------

Contents

SECTION	Page
Executive Summary.....	2
1. Introduction.....	5
2. Scope.....	5
3. Purpose.....	5
4. Duties and responsibilities.....	5
5. Policy.....	6
5.1 Insertion of peripheral arterial line	
5.2 Removal of line	
5.3 Sampling from line	
5.4 Monitoring and observations	
5.5 Management of thromboembolism and occlusion	
6. Approval and ratification.....	10
7. Dissemination and implementation.....	10
8. Review and revision arrangements.....	
9. Document control and archiving.....	10
10. Monitoring compliance with this policy.....	10
11. Supporting references / Evidence base.....	11

Appendices

Appendix 1	Allen's Test	12
Appendix 2	Equality Impact Assessment.....	13
Appendix 3	Checklist for the review and approval of policies.....	14

See also: Any relevant trust policies/guidelines or procedures

1. Aseptic non touch technique (ANTT) guideline

Neonatal Guideline	Current Version is held on the Intranet	First ratified: March 2019	Review date: March 2024	Issue 1	Page 4 of 15
-----------------------	--	-------------------------------	----------------------------	------------	--------------

Introduction

- 1.1 Obtaining arterial access in intensive care patients can be invaluable in terms of invasive blood pressure monitoring and sampling. However they can incur serious complications resulting in distal hypoperfusion and ischaemia. The aim of this policy is to guide safe practice during the insertion and maintenance of peripheral arterial lines in the neonatal population.

2. Scope

- 2.1 This guideline is relevant to all staff caring for babies across neonatal intensive care, transitional care and maternity.

3. Purpose

- 3.1 This guideline aims to facilitate a common approach to the management of babies admitted under neonatal care. At times deviation from the guideline may be necessary, this should be documented and is the responsibility of the attending consultant.

- 3.2 This guideline is subject to regular review to ensure ongoing evidence based practice.

4. Duties and responsibilities

- 4.1 All staff involved in the insertion and maintenance of peripheral arterial lines are duty bound to be competent and up to date with guidance. Where a trainee is learning the procedure they should be supervised adequately, and their understanding of indications and complications ensured.
- 4.2 Any concerns regarding peripheral arterial lines in situ must be acknowledged and escalated.
- 4.3 Where appropriate, reporting of incidents involving peripheral arterial lines via the DATIX system should be carried out.

Neonatal Guideline	Current Version is held on the Intranet	First ratified: March 2019	Review date: March 2024	Issue 1	Page 5 of 15
--------------------	--	-------------------------------	----------------------------	------------	--------------

5. Policy

5.1 Insertion of peripheral arterial line

Equipment

- Cleaned procedure trolley
- Light source: cold light / wee sight / diaphanoscope/ spot light
- Sterile dressing pack, sterile gloves
- Cleaning solution as per unit policy
- 24G intravenous cannula (26G cannula may be considered in extremely preterm infants to prevent cannula occlusion)
- T-connector primed with Sodium Chloride 0.9%, use syringes size 2 ml and more.
- 3-way tap
- Green gauze, small white gauze, adhesive tapes (steristreps) and tegaderm for securing the line and arm-board.
- Syringe pump and heparin saline for infusion
- Transducer set and cable for blood pressure monitoring.

Preparation

- Perform Allen's test to check the for adequacy of collateral circulation
- **The procedure is a sterile one, using ANTT.** First wash hands and dry with a sterile towel and put on an apron and gloves.
- Slight extend the wrist to bring the artery closer to the surface (avoid hyperextension as this may lead to occlusion of the artery)
- Identify the artery by palpation OR trans-illumination with a light source behind the wrist.
- Clean skin with antiseptic cleaning solution (please check skin preparation guideline for specific neonatal procedures)

Procedure

- Insert 24G cannula over the artery at an angle of 30-45 degrees.
- Watch for blood in the hub of the cannula, withdraw the stylet while advancing the cannula slowly.
- There may be spasm from the artery having been touched, hence blood return may be delayed.
- Pulsatile blood flow can be seen in the cannula hub.

Neonatal Guideline	Current Version is held on the Intranet	First ratified: March 2019	Review date: March 2024	Issue 1	Page 6 of 15
--------------------	--	----------------------------	-------------------------	---------	--------------

- Connect the cannula to T-connector primed with Sodium chloride 0.9%, flush and aspirate gently, there should be no resistance, but blanching may be seen proximal to the insertion site.
- Secure the cannula with steristrips, ensuring fingers are visible for frequent inspection and ensure they do not encircle the limb completely. Put a green gauze over the insertion site to prevent infection, and a further small gauze under the hub of the cannula to prevent skin damage. Cover with tegaderm, and apply limb splint.
- Connect infusion line with 3-way tap primed with Nacl 0.9% to T-connector for blood sampling.
- Check colour and perfusion in the limb, hand and digits.
- Document all attempts of cannulation and procedure in the notes including those that are unsuccessful, use blue cannulation stickers.
- If the cannula flushes but does not aspirate, consider blood pressure wave form monitoring and monitor the fingers (it could be spam from the artery being touched, hence blood return may be delayed).
- **IV Fluids used for infusion:** Patency should be maintained with 0.9% sodium chloride (0.45% Nacl can also be used) with heparin (50 ml 0.9% sodium chloride + 100 units of heparin) at 0.3-0.5 ml/hr
- All infusions of heparin saline should be changed every 24hours as a sterile procedure using ANTT.

5.2 Removal of line

- Aseptic removal of arterial line, apply pressure with a piece of sterile gauze ensuring circulation to the hand is maintained. Keep pressure enough time to stop bleeding (longer if coagulopathy/low platelets) until no bleeds or bruising. Dressing does not prevent bleeding or bruising.
- Document the removal of the arterial line and update the blue sticker with the date and time of removal.

5.3 Sampling from a peripheral arterial line

This is a sterile procedure using a sterile pack and ANTT.

Sampling using ANTT can be performed by doctors, ANNP and nurses who have had additional training and completed competency-based assessment in enhanced practice.

Equipment

- Sterile pack
- 2 ml syringe (A)
- Blood gas syringe +/- syringe for blood collection (B)

Neonatal Guideline	Current Version is held on the Intranet	First ratified: March 2019	Review date: March 2024	Issue 1	Page 7 of 15
--------------------	--	----------------------------	-------------------------	---------	--------------

- 2 ml syringe with saline 0.5- 1 ml (C)
- Clinell wipes
- New Curocap
- Red tray for collection of blood sample.

Preparation

- Record SpO₂ and TcCO₂ if available at time of taking blood to compare with blood gas if performed
- Wash hands, prepare work surface and put on gloves
- Place sterile paper towel beneath 3-way tap collection port using ANTT procedure.
- Ensure 3-way tap closed to port hole

Procedure

- Remove curocap, clean with green alcohol swab and allow to dry for 30 seconds using red sand timer.
- Connect 2 mL syringe (A)
- Turn 3-way tap so it is closed to infusion and open to syringe and arterial catheter
- Withdraw 2 mL blood slowly. It must clear the dead space from baby
- Attach appropriate syringe (B) needed for required blood sample. Do not withdraw more than required amount. Place in clean red tray.
- After taking required samples with syringes, reattach syringe (A), clear the connection of air, slowly return to baby any blood in line not required for samples
- Attach syringe (C) of sodium chloride 0.9%
- Turn 3-way tap so it is open to syringe and arterial line, clear line of air and slowly flush line to clear of blood (use minimum volume necessary to flush)
- Turn 3-way tap so it is closed to syringe, remove syringe (C), clean port hole with alcohol wipe leave to dry for 30 seconds and cover with a new Curocap
- Remove gloves and dispose of dirty consumable appropriately, wash hands according to trust policy.
- Record amount of blood removed and volume of flush on baby's daily fluid record.
- Do not allow air to enter the system to prevent embolism in the distal arteries.
- Never forcibly flush the catheter, if the line appears clotted aspirate the clot or replace with a newly flushed line or T-connector.
- Before leaving baby, ensure arterial wave form present and all alarms set

5.4 Monitoring and nursing care of arterial lines

- Hourly observations of heart rate, respiratory rate, blood pressure, oxygen requirement and oxygen saturation.
- Hourly observations of site for bleeding, inflammation and signs of infection.

Neonatal Guideline	Current Version is held on the Intranet	First ratified: March 2019	Review date: March 2024	Issue 1	Page 8 of 15
--------------------	--	----------------------------	-------------------------	---------	--------------

- Fluid infusing documenting and signed for on nursing observation chart.
- Hourly observations of infusion rate, hourly volume infused, total volume infused, line pressure and review of line site using NESS score documented on nursing observation chart.
- Shift by shift review of dressing documented in notes.
- Observe the colour and perfusion of the hand or foot and digits distal to arterial line hourly and for 6 hours post removal of line.
- Nurse so limb and site of PAL is easily seen.
- Record on nursing observation chart warm and pink if satisfactory.
- Never inject fluid boluses or medications into arterial line unless exceptional circumstances directed by the consultant.

5.5 Management of arterial occlusion and thrombosis

- Remove the arterial line.
- Liaise with Evelina NICU/ Haematologist as early as possible.
- If the limb is warm, normal colour and pulses are easily felt, observe puncture site and peripheral pulses at least hourly.
- Ensure no BP cuff on the same limb
- If the limb is warm, normal colour but pulses are weak, place GTN patch- half a 5 mg patch over proximal part of affected limb. Commence heparin after discussing with Paediatric haematologist from Evelina.
- If the limb is cool, or colour pale or pulses absent, consider giving heparin bolus and infusion, starting IV tissue plasminogen Activator (t-PA). Discuss first with Evelina.

Neonatal Guideline	Current Version is held on the Intranet	First ratified: March 2019	Review date: March 2024	Issue 1	Page 9 of 15
--------------------	--	-------------------------------	----------------------------	------------	--------------

6 Approval and Ratification

6.1 This guideline will be approved and ratified by the Neonatal Guidelines Group.

7 Dissemination and Implementation

7.1 This guideline will be uploaded to the trust intranet 'Neonatal Guidelines' page and thus available for common use.

7.2 This guideline will be shared as part of ongoing education within the Neonatal Unit for both medical and nursing staff.

7.3 All members of staff are invited to attend and give comments on the guideline as part of the ratification process.

8 Review and Revision Arrangements

8.1 This policy will be reviewed on a 5 yearly basis.

8.2 If new information comes to light prior to the review date, an earlier review will be prompted.

9 Document Control and Archiving

9.1 Amendments to the document shall be clearly marked on the document control sheet and the updated version uploaded to the intranet. Minor amendments will be ratified through the Neonatal Guidelines Group. A minor amendment would consist of no major change in process, and includes but is not limited to, amendments to documents within the appendices.

10 Monitoring compliance with this Policy

Measurable Policy Objective	Monitoring/ Audit method	Frequency of monitoring	Responsibility for performing the monitoring	Monitoring reported to which groups/ committees, inc responsibility for reviewing action plans
e.g. All policies will be reviewed by their authors at least annually to ensure that they remain valid and in date	Compliance audit of sample of policies (including Review History)	Annual	Associate Director of Quality	Management Executive

11 Supporting References / Evidence Base

- Neonatal guidelines 2017/19: Published by the Bedside Clinical Guidelines Partnership, Staffordshire, Shropshire and Black Country Neonatal Operational Delivery Network and Southern West Midlands Neonatal Operational Delivery Network
- Nottingham neonatal service guidelines 2016/2021
- Neonatal Guidelines - St George's Hospital
- Atlas of Procedures in Neonatology by Mhairi G. MacDonald, Jayashree Ramasethu. Pub: Wotters Klumer, Lippincott Williams & Wilkins
- Care of the neonatal with an arterial line (2009) Trevor Mann Baby Unit Brighton & Sussex University Hospital.

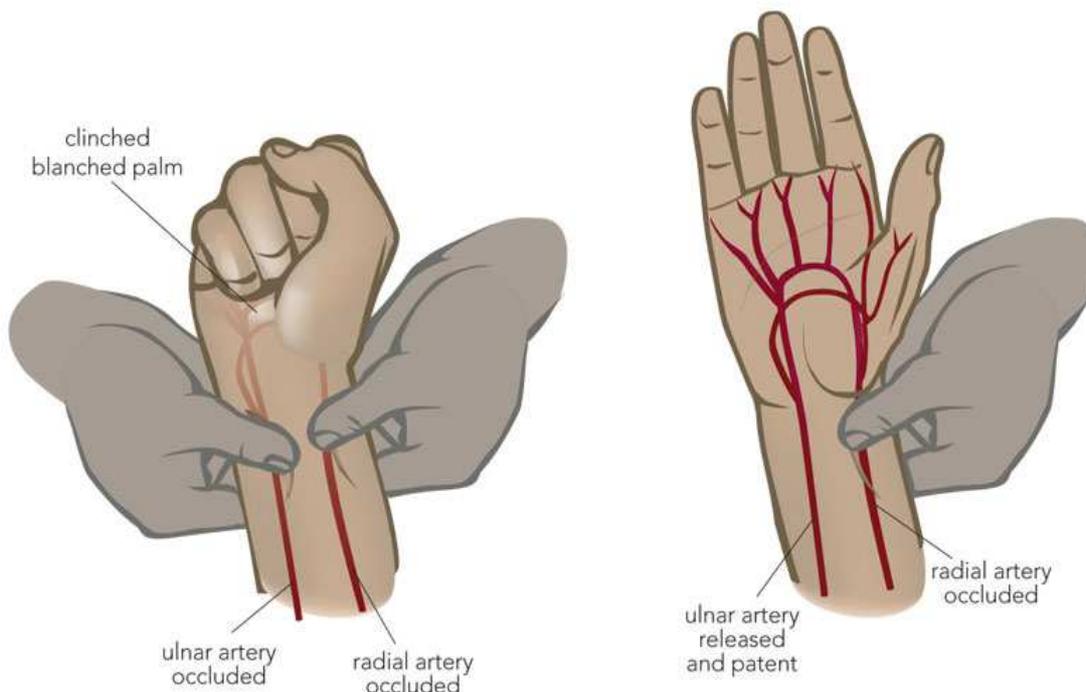
Neonatal Guideline	Current Version is held on the Intranet	First ratified: March 2019	Review date: March 2024	Issue 1	Page 11 of 15
--------------------	--	-------------------------------	----------------------------	------------	---------------

APPENDIX 1: Procedure for performing Allen's Test

Allen's test

Used for checking collateral circulation if using upper limb.

1. Elevate the arm and simultaneously occluding the radial and ulnar arteries at the wrist, then rubbing the palm to cause blanching.
2. Release the pressure on the ulnar artery. If normal colour returns to the palm in <10 seconds, adequate ulnar circulation is present.
3. Document the results of Allen's test in the medical records. If the test is normal, then a radial arterial line can be inserted. If it is abnormal, or equivocal, then do not insert the arterial line.



Neonatal Guideline	Current Version is held on the Intranet	First ratified: March 2019	Review date: March 2024	Issue 1	Page 12 of 15
--------------------	--	----------------------------	-------------------------	---------	---------------

APPENDIX 2: EQUALITY IMPACT ASSESSMENT

Equality Impact Assessment Summary

Name and title:

Policy:

<p>Background</p> <ul style="list-style-type: none"> Who was involved in the Equality Impact Assessment
Neonatal guidelines group
<p>Methodology</p> <ul style="list-style-type: none"> A brief account of how the likely effects of the policy was assessed (to include race and ethnic origin, disability, gender, culture, religion or belief, sexual orientation, age) The data sources and any other information used The consultation that was carried out (who, why and how?)
The group considered the effect of the policy on the various groups within our neonatal population; and staff employed, including race and ethnic origin, disability, gender, culture, religion or belief, sexual orientation and age.
<p>Key Findings</p> <ul style="list-style-type: none"> Describe the results of the assessment Identify if there is adverse or a potentially adverse impacts for any equalities groups
The policy is inclusive
<p>Conclusion</p> <ul style="list-style-type: none"> Provide a summary of the overall conclusions
No adverse features of the policy identified
<p>Recommendations</p> <ul style="list-style-type: none"> State recommended changes to the proposed policy as a result of the impact assessment Where it has not been possible to amend the policy, provide the detail of any actions that have been identified Describe the plans for reviewing the assessment
The policy is suitable for implementation.

Neonatal Guideline	Current Version is held on the Intranet	First ratified: March 2019	Review date: March 2024	Issue 1	Page 13 of 15
--------------------	--	----------------------------	-------------------------	---------	---------------

APPENDIX 3: CHECKLIST FOR THE REVIEW AND APPROVAL OF DOCUMENTS

To be completed (electronically) and attached to any document which guides practice when submitted to the appropriate committee for approval or ratification.

Title of the document:

Policy (document) Author:

Executive Director:

		Yes/No/ Unsure/ NA	<u>Comments</u>
1.	Title		
	Is the title clear and unambiguous?	Y	
	Is it clear whether the document is a guideline, policy, protocol or standard?	Y	
2.	Scope/Purpose		
	Is the target population clear and unambiguous?	Y	
	Is the purpose of the document clear?	Y	
	Are the intended outcomes described?	Y	
	Are the statements clear and unambiguous?	Y	
3.	Development Process		
	Is there evidence of engagement with stakeholders and users?	Y	
	Who was engaged in a review of the document (list committees/ individuals)?		Neonatal guidelines group reviewed. Nursing and medical contribution to guideline creation.
	Has the policy template been followed (i.e. is the format correct)?	Y	
4.	Evidence Base		
	Is the type of evidence to support the document identified explicitly?	Y	
	Are local/organisational supporting documents referenced?	NA	
5.	Approval		
	Does the document identify which committee/group will approve/ratify it?	Y	
	If appropriate, have the joint human resources/staff side committee (or equivalent) approved the document?	NA	
6.	Dissemination and Implementation		
	Is there an outline/plan to identify how this will be done?	Y	
	Does the plan include the necessary training/support to ensure compliance?	Y	
7.	Process for Monitoring Compliance		

Neonatal Guideline	Current Version is held on the Intranet	First ratified: March 2019	Review date: March 2024	Issue 1	Page 14 of 15
-----------------------	--	-------------------------------	----------------------------	------------	---------------

		Yes/No/ Unsure/ NA	<u>Comments</u>
	Are there measurable standards or KPIs to support monitoring compliance of the document?	No	Monitoring of DATIX reports
8.	Review Date		
	Is the review date identified and is this acceptable?	Y	
9.	Overall Responsibility for the Document		
	Is it clear who will be responsible for coordinating the dissemination, implementation and review of the documentation?	Y	
10.	Equality Impact Assessment (EIA)		
	Has a suitable EIA been completed?	Y	

Committee Approval (Neonatal Guidelines Committee)

If the committee is happy to approve this document, please complete the section below, date it and return it to the Policy (document) Owner

Name of Chair	Dr Samantha Edwards 	Date	25 March 2019
----------------------	---	-------------	---------------

Ratification by Management Executive (if appropriate)

If the Management Executive is happy to ratify this document, please complete the date of ratification below and advise the Policy (document) Owner

Date: n/a

Neonatal Guideline	Current Version is held on the Intranet	First ratified: March 2019	Review date: March 2024	Issue 1	Page 15 of 15
--------------------	--	----------------------------	-------------------------	---------	---------------