

BLOOD COLLECTION FROM NEONATES IN GCNIC - CHW

PRACTICE GUIDELINE[®]

DOCUMENT SUMMARY/KEY POINTS

- Blood collection from neonates is a painful procedure and expressed breast milk, sucrose or breast feeding must be utilised prior to and throughout the procedure.
- The preferred method of blood collection in newborns is via venepuncture.
- Requested volumes greater than 3mL are referred to the Nurse Practitioner, Fellow or Neonatologist for confirmation.

Key Performance Indicators:

- Expressed breast milk (or breast feeding) or sucrose is administered prior to all invasive blood collection.
- Required volumes greater than 1mL collected by venepuncture or arterial sample (where appropriate).

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

Approved by:	SCHN Policy, Procedure and Guideline Committee	
Date Effective:	1 st November 2023	Review Period: 3 years
Team Leader:	Transitional Nurse Practitioner	Area/Dept: GCNC CHW

CHANGE SUMMARY

- Document due for mandatory review
- This document has been modified with current practice.

READ ACKNOWLEDGEMENT

- Training/Assessment Required – All staff taking blood from a neonate undergo specific instructions, training and supervision until deemed competent.
- All staff working and/or collecting blood in Grace Centre for Newborn Intensive Care should read and acknowledge this document.

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

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General Principles

Blood specimens are collected either by venepuncture, arterial stab and direct sampling from an arterial line or from an approved central venous access device. When these options are not available or if unsuccessful a heel prick maybe an acceptable last choice acknowledging that heel pricks are more painful for the baby¹.

Broviac™ and Hickman™ tunnelled cuffed central venous catheters, Cook™ and Powerline™ tunnelled uncuffed central venous catheters, jugular and umbilical central venous catheters are also available to collect samples following a discussion with the neonatologist on call.

Decisions around the best access sites are usually made collaboratively between the bedside nurse and the proceduralist to ensure an adequate sample quality and volume with minimal pain and risk to the infant.

Support for the infant is paramount during the procedure and the procedure is best performed when the infant is awake.

Specific Instructions

- Neonatal blood collection is a painful procedure.
- A Registered Nurse must be in attendance to provide developmentally supportive care to the infant during the procedure with containment, swaddling, and non-nutritive sucking.
- Non-nutritive sucking with expressed breast milk or sucrose, or a breast feed, is given orally onto the buccal mucosa prior to and throughout the invasive blood collection. Refer to [Sucrose – Management of Short Duration Procedural Pain in Infants](#)
- If an arterial line is present, blood is collected from the line. If the blood sample is required for coagulation studies, careful consideration should be given to the appropriate withdrawal of heparinised solution (as per manufactures specifications) prior to collection.
- The preferred method of blood collection in newborn infants is approved central venous access device, arterial line sample (during acute illness and regular blood collection) and venepuncture.
- Blood volumes greater than 1ml should not be collected via heel prick.
- Difficulties with blood collection are referred to the unit nurse practitioner, fellow, registrar or nursing unit manager.
- During venous blood collection the cubital fossa and long saphenous sites are to be avoided in order to preserve vasculature for central line insertion if required
- If more than 3mL of blood is required the nurse practitioner, registrar or neonatal fellow will make the decision as to whether this blood volume is required, or if particular tests can be scheduled for an alternative day or time.

Methods of Blood Collection

Neonatal Venepuncture

Indications

- Venepuncture is the preferred method of blood collection as there are lower rates of haemolysis and reduced procedural pain¹.
- Venepuncture is undertaken when more than 1ml of blood is required or a non-haemolysed sample is necessary for accurate analysis.
- To obtain a peripheral blood culture to avoid contamination with skin flora.
- To avoid repeated heel pricks in infants requiring frequent blood tests.
- When an arterial line or approved central venous access device is not present for the above indications.

Precautions

- Accredited staff only are to perform the procedure.
- Avoid brachial, cephalic, and long saphenous venous sites for vein preservation if a peripherally inserted central catheter is required.

Contraindications

The site of venepuncture should be reviewed if there is evidence or presence of:

- Cellulitis or abscess
- Venous fibrosis on palpation
- Haematoma
- Vascular shunt of graft
- Vascular access device
- Talipes equinovarus
- Contractures

Complications

- Haematoma formation²
- Infection²
- Nerve damage²
- Haemoconcentration²
- Extravasation ²

Heel Prick

Indications

- Where there is no arterial line access or venepuncture has been unsuccessful
- Newborn screen blood collection if unable to obtain with another episode of venous sampling or arterial line
- >12 hourly blood glucose analysis
- Blood samples <1ml

Note

- Results are comparable with those drawn from an arterial source³.
- The heel should be warmed using a warm, wet cotton flannel to facilitate blood flow. The use of a glove filled with warm water poses a risk of burns to the patient and should not be used.
- Hold the foot around the ankle with thumb and forefingers. Do not hold the baby's leg around the calf or shin as this may cause extensive bruising.
- Heel-prick collection should be performed only using a retractable lancet with a limited insertion depth of 1.6mm
- $\geq 2500\text{g}$: Safety-Lancet Super (Purple), 1.6mm depth
- $< 2500\text{g}$: Safety-Lancet Neonatal (Pink), 1.3mm depth
- Scalpel blades are not to be used. Multiple pricks are to be avoided and an alternative collection method considered.
- Heel pricks are performed on the plantar surface of the heel beyond lateral and medial limits of the calcaneus⁴ (see image below). The puncture must not be on the posterior curvature of the heel. The heel prick is not performed through previous puncture sites that may be inflamed or infected.



Figure 1 - Heel Puncture Sites

Precautions

- Avoid the risk of serious complications such as necrotising chondritis with dermal cellulitis and abscess formation after lancet penetration of calcaneus by using a sterile technique and puncturing the heel in the area indicated in the figure illustrated above⁴.
- The blade must not be inserted deeper than 2.4mm to avoid damage to the calcaneus⁴. Ideally, they are not performed on neonates weighing less than 2kg. Refer to lancet size guide above for patients <2.5kg.
- Repeated heel prick leads to tissue injury and inflammation causing increased sensitivity to further heel prick procedures⁶.
- High risk of haemolysis and clotting⁷.

Contraindications

- Presence of local oedema or congestion^{4,8}.
- Presence of cyanosis or impaired perfusion^{4,8}.
- Local infection^{4,7}.
- The necessity to puncture previously traumatised skin^{2,8}.

Complications

- Infection including cellulitis, perichondritis and calcaneal osteomyelitis⁹.
- Bruising if improper technique or repeated samples are taken.
- Scaring¹⁰.

Neonatal Arterial Stab**Indications**

- This is the gold standard for monitoring acid base balance¹¹.
- Assessment of the response to therapeutic interventions including mechanical ventilation¹².
- Blood volumes greater than 4ml (clinical decision to be made in consultation with nurse practitioner, fellow or staff specialist).
- Failure of venous blood sample collection (clinical decision to be made in consultation with nurse practitioner, fellow or staff specialist).

Note

- The radial artery is the preferred site of arterial blood collection due to its superficial anatomical position. However, this is only performed following demonstration of sufficient collateral blood supply to the hand.

Precautions

- Nurse Practitioners, Fellows and Neonatologists may only perform this skill. Registrars with appropriate supervision and/ or previous training may also perform this skill.
- Numerous attempts are discouraged due to the risk of occlusion/ damage to arteries and subsequent reduced distal perfusion using the Allen Test.

Contraindications

- Absolute contraindications to arterial stab blood collection include:
 - An abnormal Allen Test at the selected site¹³.
 - Local infection¹³.
 - Vascular graft at the selected site¹³.
 - Known or suspected severe peripheral vascular disease of the selected limb¹³.
- Relative contraindications include:
 - Severe coagulopathy¹³.
 - Anticoagulation therapy with warfarin, heparin, direct thrombin inhibitors and factor X inhibitors¹³.
 - Use of thrombolytic agents; tissue plasminogen activator¹³.

Complications

- Local haematoma¹¹.
- Artery vasospasm¹¹.
- Arterial occlusion¹¹.
- Air of thrombus embolism¹¹.
- Infection¹¹.
- Haemorrhage¹¹.

Intra-arterial Catheter/ Line**Indications**

Intra-arterial lines are inserted where frequent blood sampling is required to manage the clinical condition and/or blood pressure monitoring is required. When present, an intra-arterial catheter is used for all blood collections where at all possible. [Please refer to the policy: Arterial Catheter Management in Neonates – GCNC.](#)

Precautions

- Peripheral blood cultures are not collected from intra-arterial catheters due to risk of contamination.
- Blood for coagulation profile collected from an intra-arterial catheter/ line may have altered results due to the heparinised saline infusion used to maintain line patency.

They may be collected following standard withdrawal of blood and if normal can be relied on, however if abnormal will require correlation with a peripheral sample prior to treatment.

Central venous Access Device

[Central Venous Access Device \(CVAD\) Management in Neonates in the ICU Environment](#)

Indications

- When present, a tunnelled central catheter is used where possible for routine blood collection.
- The use of non-tunnelled central venous (umbilical venous and internal jugular) catheters may be used in certain circumstances, prior to line removal, or the inability of blood collection from other routes. This is discussed with the staff specialist, neonatal fellow, nurse practitioner or nursing unit manager.

Precautions

- The risk of infection and CVAD occlusion increases each time a CVL is accessed.
- Blood sampling from a central venous catheter is always discussed with the staff specialist, neonatal fellow, nurse practitioner or nursing unit manager.
- This procedure is supported by senior nursing staff.
- Care is to be taken to combine routine lines changes and blood collection to avoid unnecessary accessing of the line.
- An aseptic technique must be used to minimise infection risk.
- Only 10ml syringes are to be used when accessing a central venous catheter.
- Blood is not collected from a catheter infusing inotropes.

Contraindications

- Small lumen catheters; 1Fr and 2Fr peripherally inserted central catheters due to the potential blockage and/ or damage to the catheter¹⁴.
- Infants with difficult vascular access with risk of compromise to line integrity/ patency.

Complications

- Infection
- Air or thrombus embolism
- Alteration to line patency

Collection Procedure

Equipment Required

Venepuncture	Heel prick	Arterial Stab
Neo-safe 22G/23G or 24G IV cannula	Appropriate heel lance	24G IV cannula
Non-sterile gloves	Non-sterile gloves	Non-sterile gloves
Specimen tubes	Specimen tubes	Specimen tubes
Expressed breast milk or sucrose	Expressed breast milk or sucrose	Expressed breast milk or sucrose
Dressing pack	Gauze ball	Dressing pack
Aqueous chlorhexidine 0.1% solution		Aqueous chlorhexidine 0.1% solution

Note:

- For specifics of blood collection via an arterial line please refer to the local guideline - [Arterial Catheter Management In Neonates - GCNC – CHW](#) and [Central Venous Access Device \(CVAD\) Management in Neonates in the ICU Environment](#)
- For specifics of blood collection via a CVAD please refer to the local guideline – CVAD Management for Neonates – [Blood Sampling Information Sheet](#)

Method^{15, 16}

Step	Action
1.	Confirm identity of patient and the need for blood collection.
2.	If parents present, inform them of the need for the collection and the rationale.
3.	Allow enough time for the procedure.
4.	Wash hands.
5.	Assess the neonate's peripheral circulation.
6.	Select the most appropriate site for phlebotomy using the above recommendations.
7.	Gather relevant equipment as listed above.
8.	Administered sucrose prior to the procedure.

9.	Prepare neonate using developmental care principals outlined above with an assisting nurse.		
10.	Wash hands and don gloves. Facial protection must be worn in there is a risk of splashing.		
11.	Position the chosen limb to enable a secure a hold in order to prevent withdrawal of the limb risking failure of the procedure.		
	<p>11a. <u>Venepuncture and arterial stab</u></p> <ul style="list-style-type: none"> ○ Clean the skin with aqueous chlorhexidine and allow to dry ○ Insert IV catheter into the vein or artery 3-5mm past the bevel at the shallow angle until flash back is observed 	<p>11b. <u>Heel Prick</u></p> <ul style="list-style-type: none"> ○ Warm the infant's heel with your hand ○ Line up the blade of a disposable lancet to the heel so that the blade, once released, will cut across the grain of the heel and activate the lancet trigger using firm pressure and then withdraw ○ The first drop of blood is wiped off with a gauze ball as it may be contaminated with skin cells 	<p>11c. <u>Central Venous Catheter</u></p> <ul style="list-style-type: none"> ○ As per link above.
12.	Collect blood samples in appropriately labelled specimen bottles.		
13.	Place a gauze swab over the puncture site and carefully remove the needle/ heel lance and discard immediately in a sharp's disposal unit. Continue to apply pressure until the bleeding has stopped. Do not apply a band aid.		
14.	Re-position the neonate comfortably and safely.		
15.	Wash and dry hands.		
16.	Place blood samples in the nominated location for collection or transportation.		
17.	Document blood collection in the medical record.		

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