

## Heel Prick for Blood Sampling in Newborn Intensive Care Unit (NICU)

### Procedure Responsibilities and Authorisation

|  |                                |
|--|--------------------------------|
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| <b>Target Audience</b>   | Nurses                         |
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### Procedure Review History

| Version | Updated by                            | Date Updated  | Summary of Changes |
|---------|---------------------------------------|---------------|--------------------|
| 6       | Joyce Mok                             | Jul 2014      | 3 yearly review    |
| 7       | Leanne Baker                          | Aug 2018      | Due for review     |
| 8       | Kimmy Fulgencio & Richard Pagdanganan | November 2021 | 3 yearly review    |

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## Heel Prick for Blood Sampling in Newborn Intensive Care Unit (NICU)

### 1 Overview

#### 1.1 Purpose

To ensure heel prick for baby is performed safely.

#### 1.2 Scope

Registered Nurse, Medical Team and Phlebotomist

#### 1.3 Patient / client group

Neonates and infants in NICU

#### 1.4 Indications

To obtain a capillary blood sample for:

- Blood sugar level
- Newborn screening test (Guthrie test)
- Laboratory tests such as blood counts (CBC), electrolytes (U&E), serum bilirubin (SBR) and drug levels
- Capillary blood gas

#### 1.5 Exceptions / contraindications to heel prick

- Infants with compromised limbs e.g., poor perfusion, local oedema, local infection, skin damage, excessive bruising.
- Infant's condition that precludes putting pressure on the foot.
- Infant with condition that may cause excessive bleeding.
- Infant has intravenous (IV) cannula, central venous line (CVL), or arterial line on the limb.
- Blood sample that is more than 1 ml, e.g., blood for coagulation study.
- Blood sample in which even a minimal amount of haemolysis will compromise results, and therefore a venous sample may be required.

#### 1.6 Special notes on lancets

- It is recommended that the BD Microtainer® Quikheel™ preemie Lancet (lavender) are used for babies <1.5kg or term babies requiring lower blood flow.
- BD Microtainer® Quikheel™ Lancet (green) can be used for babies over 1.5kg where higher blood flow is required.

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## Heel Prick for Blood Sampling in Newborn Intensive Care Unit (NICU)

### 1.7 Definitions

|  |  |
|--|--|
| <b>CBC</b>                                   | Complete Blood Count   |
| <b>Heel prick</b>                            | A small shallow incision is made in the heel to collect capillary blood sample for blood test.   |
| <b>BD Microtainer® Quikheel™ Lancet</b>      | A lancet designed for performing heel pricks on infants and premature babies. It features a sweeping surgical blade that permanently retracts after creating an incision.  |
| <b>Newborn screening test (Guthrie test)</b> | A New Zealand health initiative to ensure early diagnosis of newborn with a range of metabolic diseases. This promotes early treatment and management for rare, but treatable, diseases and prevents and/or minimises morbidities and mortality. |
| <b>Senior clinician</b>                      | They include the Charge Nurse Manager (CNM), Nurse Educator, Associate Charge Nurse Manager (ACNM), Coordinator, Clinical Support Nurse, Nurse Specialist, Nurse Practitioner or Registrar   |
| <b>SBR</b>                                   | Serum Bilirubin  |

## 2 Clinical Management

### 2.1 Competency required

- Registered Nurse who has completed Level II orientation.
- Enrolled Nurse who has completed Level II orientation and is under the direction and delegation of a registered nurse.

### 2.2 Equipment

- Incision device (e.g. BD Microtainer® Quikheel™ Lancet)
- Gauze swab
- Alcohol and chlorhexidine prep pads
- Gloves
- Correct blood tubes
- Infant identification (ID) label
- Correct and signed laboratory request form
- 25% Sucrose for comfort and analgesia
- Warming equipment (optional)

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### 2.3 Procedure

#### 1. Choosing the site for heel prick

- The safest incision site is on the lateral and medial margins of the heel, i.e., the sides of the heel on the plantar aspect of the foot (refer to diagram below – shaded area).
- Never puncture the central area, the posture curvature or the bony surface of the heel (calcaneus) to reduce risk of injury.
- Never puncture a previously punctured or swollen site to reduce risk of injury.
- Check site for any contraindications such as signs of infection, bruising, cyanotic, swelling, lesions, hematoma, oedema and scarring.
- Do not use limb with IV, CVL, or arterial line. Occasionally, capillary sample may have to be taken from limb with IV line because that is the only option, caution must be taken during procedure to prevent dislodgement/interference of the IV line and to reduce risks of bruising and infection.
- Rotate sites if infant requires frequent blood tests to prevent complications such as bruising, haematoma, infection, scarring, inflammation or infection of the bone surface and dermal cellulites.
- If laboratory technician is performing the blood sampling, they may ask the nurse to document and sign on the laboratory request form of any pre-existing bruising or broken skin to ensure nursing and laboratory staff are aware of the extent of bruising or skin breakdown.



#### 2. Reducing stress and pain

If possible, do not interrupt sleep: the optimal baseline state of quiet wakefulness should be obtained before starting the procedure.

- Infant may be kept calm and comfortable with swaddling, cuddling or skin to skin by parents, or breastfeeding by mum. Offering breastmilk and non-nutritive sucking can alleviate procedural pain in newborn.
- Give 25% Sucrose as per NICU protocol for [Sucrose Oral Liquid for Analgesia in Neonates and Infants \(2905\)](#)
- Document the administration of sucrose in the *NICU stat prescriptions form (T1695HWF)*.
- **Do not bang** blood tubes on top of incubator. The incubator acts as an echo chamber and exposes infant to unnecessary noise.

#### Note:

- If blood collection is difficult, i.e., TWO lancet attempts have been made, then further collects need to be discussed and an assessment made in consultation with the senior clinician before further attempts are made.

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- Multiple attempts can cause permanent damage to the heels.
- The procedure should be performed at least 20 to 30 minutes after any changes on calm and steady state to obtain the best result.

### 3. Preparation

- Verify orders and identification of infant to ensure correct sample is obtained.
- Explain procedure to parents to allay anxiety.
- Perform hand hygiene
- Prepare equipment
- Gel hands and put on gloves
- Ensure infant's foot is warm to promote vasodilation, which assists in obtaining an adequate sample. Warm the foot using a warming device for 5-10 minutes e.g., a warm face cloth or a glove filled with warm water.
- Temperature of water in glove must not be too hot and use only **the water from the mixing taps in the nurseries** (temperature of the mixed water that does not exceed 42°C).
- Monitor the temperature of warming device and remove the warming device immediately from infant's limb and out of the cot/incubator prior to heel prick to avoid baby being burned/scalded.

### 4. Performing heel prick

- Clean the site with the alcohol and chlorhexidine prep pad and **allow to air dry.** Allowing air drying ensures effective disinfection and prevents possible haemolysis by residual alcohol. Do not put anything on the heel as it may contaminate the sample and alter the result e.g., paraffin.
- Hold foot securely with heel lowermost and firmly while gently flexing the ankle to prevent movement during heel prick.
- Before activation place the incision device against the heel in accordance with the manufacturer's instruction to ensure correct depth of incision is achieved: not too deep to cause harm and not too shallow to prevent adequate blood flow.
- Prick heel firmly with the incision device without exerting pressure: depress the trigger and remove the device from foot.
- Wipe away the first drop of blood with gauze to remove excess tissue fluid and ensure circulating blood is measured.



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- Ensure blood flow by placing the fingers along the calf with the thumb on the ball of the foot to provide counter pressure. The fingers then apply gentle pressure to the calf to encourage blood flow toward the heel.
- Apply gentle intermittent squeeze and relax action to allow capillaries to refill to create large teardrop size of blood.
- Avoid excessive heel squeezing to prevent sample compromise and unnecessary pain to the infant.  
Note: Sample compromise can occur from interstitial fluid, haemolysis, and bruising. Excessive squeezing can also cause high serum potassium and lactate readings, repeat sample if necessary.
- Encourage blood flow downwards, i.e., ensure infant's heel is lower than the body, to facilitate blood flow.
- When the blood flow ceases and need to obtain large volume of blood, the second puncture can be performed on different part of the same foot or on the other foot to reduce pain and prevent the sample from containing tissue fluid on previous site.
- When the heel prick is complete, put gauze over the puncture site and apply pressure until bleeding stops.
- **The laboratory staff may put** gauze over foot, the nurse must ensure bleeding has stopped and remove the gauze within 15 minutes.

### 5. Obtaining capillary blood sample

- Hold the capillary tube horizontally so that blood is drawn by capillary action and avoid air bubbles.
- Wait for a large drop to form and place the capillary tube in the centre of the drop and allow it to fill.
- Cap one end of the tube, insert a metal rod (flea) into the tube and cap the other end.
- Mix by **slowly** wiping a magnet along the entire length of the tube 10 times; ensure the magnet is drawn past the caps to take the flea to the very end of the tube. Rotate the capillary tube as you wipe the magnet to ensure all the heparin is mixed in.
- Label the specimen with baby's ID label.
- If doing a blood gas or blood sugar, check you have the correct amount of blood required for your sample and put sample through blood gas analyser ASAP to avoid sample clotting and delay in obtaining results.

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### 6. Collecting laboratory blood sample

- Order of sample collection to ensure accurate results:
  - Blood gas or blood sugar
  - CBC
  - U&E and SBR
- Collect the free-flowing blood drops into the specimen tube so that the blood drips into the tube, thus prevent micro clots that can be formed on the skin and result in platelet aggregation and interfere with results.
- Avoid scooping the blood drops from the surface of the foot to prevent haemolysis.
- For CBC, rotate the specimen tube to allow the blood to mix with heparinised sides of tube.
- Fill blood to the 250 mark in the purple EDTA tube for CBC. Do not overfill. Over filling the tube will cause the sample to clot because of inadequate blood: heparin ratio.
- Fill blood to the 400 or 600 mark in the green Microtainer™ blood tube according to the number of blood tests required for biochemistry or drug assay.

- **Note:**

Specimen that takes more than 2 minutes to collect will frequently result in poor quality specimen and higher incidence of micro clots in EDTA and heparin tubes.

### 7. Labelling specimens

- Label all specimens at the infant's bedside to ensure correct labelling of all blood samples.
- For 'group and cross-match' and Coombs Test, collector must hand write on label specimens and initial on the label.
- Collector must sign and write the date and time on the laboratory form.

### 8. After care

- Dispose of used equipment appropriately.
- Perform hand hygiene.
- Report results then document procedures and results.

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### 3 Audit

#### 3.1 Indicators

- Point of Care Test (POCT) blood gas audit monthly by Waikato Hospital Laboratory on the errors, e.g., wrongly scanned ID patient NHI numbers.
- NICU haemolysed and clotted samples monthly by Waikato Hospital Laboratory

### 4 Evidence base

#### 4.1 References

- Great Ormond Street Hospital (July 2012). Blood glucose monitoring. Clinical guidelines retrieved March 2014 from [http://www.gosh.nhs.uk/health-professionals/clinical\\_guidelines/blood-glucose-monitoring](http://www.gosh.nhs.uk/health-professionals/clinical_guidelines/blood-glucose-monitoring)
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- Victorian Clinical Genetics Service, August 2021, Newborn Blood Spot Screening Comprehensive Collection Guide, [https://www.vcgs.org.au/sites/default/files/downloads/NBS\\_collection\\_guidelines.pdf](https://www.vcgs.org.au/sites/default/files/downloads/NBS_collection_guidelines.pdf)
- Public Health England- NHS, March 2016, Guidelines for Newborn Blood Spot Sampling, [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/899485/Guidelines\\_for\\_Newborn\\_Blood\\_Spot\\_Sampling\\_March\\_2016.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/899485/Guidelines_for_Newborn_Blood_Spot_Sampling_March_2016.pdf)

#### 4.2 Associated Waikato DHB Documents

- Waikato DHB Laboratory Procedure: NICU ABL 800 blood gas analyser operating instructions
- Waikato DHB NICU Drug Manual: [Sucrose Oral Liquid for Analgesia in Neonates and Infants](#) (2905)
- Waikato DHB NICU nursing procedure: [Neonatal pain and sedation: Assessment and nursing management](#) (1684)

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