Guideline

Women and Babies: Neonatal Early Assessment Program (NEAP)

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Functional Sub-Group: Clinical Governance
Corporate Governance

Summary: The Neonatal Early Assessment Program (NEAP) consists of a risk factor assessment and four sets of measurements within the first 6 hours after birth:
1. The first physical examination.
2. The first lower limb oxygen saturation.
3. Anthropometry
4. Body fat (percentage) by air displacement plethysmography

National Standard: National Standard 1

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Approved by: RPA Women and Babies Service Improvement Committee

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Note: Sydney Local Health District (LHD) and South Western Sydney LHD were established on 1 July 2011, with the dissolution of the former Sydney South West Area Health Service (SSWAHS) in January 2011. The former SSWAHS was established on 1 January 2005 with the amalgamation of the former Central Sydney Area Health Service (CSAHS) and the former South Western Sydney Area Health Service (SWSAHS). In the interim period between 1 January 2011 and the release of specific LHN policies (dated after 1 January 2011) and SLHD (dated after July 2011), the former SSWAHS, CSAHS and SWSAHS policies are applicable to the LHDs as follows:
Where there is a relevant SSWAHS policy, that policy will apply
Where there is no relevant SSWAHS policy, relevant CSAHS policies will apply to Sydney LHD; and relevant SWSAHS policies will apply to South Western Sydney LHD.
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1. Introduction

The risks addressed by this policy:

- Clinical risk of neurological damage or death of babies as a result of physical abnormalities, cardiac defects, or neonatal hypoglycaemia going undetected and untreated.

The aims / expected outcome of this policy

- Babies with physical abnormalities, cardiac defects, or increased risk of hypoglycaemia will be identified and appropriately managed.

2. Policy Statement

The goal of this guideline is to familiarise medical staff with the evidence, indications and practical management of a neonate undergoing the NEAP (neonatal early assessment program).

3. Guidelines

3.1 Early Risk Factor Assessment and Physical Examination

The overall goal of the early assessment is to identify risk factors for early neonatal problems that will require regular postnatal observations, as well as identifying congenital and acquired abnormalities which may have an immediate impact on the baby’s care and/or wellbeing.

Early Risk Factor Assessment

All babies should be reviewed for risk factors for the five main problem areas as identified on the ‘Women and Babies Newborn Care Plan and Observations Chart (NCPOC – MR504) and ‘The Standard Newborn Observation Chart (SNOC – SMR 110.014)’. These include:

- Risk of hypoglycaemia
- Respiratory distress
- Risk of subgaleal haemorrhage - trauma from instrumental delivery
- Risk of sepsis
- Risk of jaundice

Assessment of risk of hypoglycaemia will include the anthropometric measurements and percentage body fat as outlined below. Babies identified with risk factors will need observations as outlined in the relevant RPAH guideline and on the NCPOC.

Early physical examination

The goal of this examination is to identify obvious external anomalies, as well as other congenital and acquired problems that may have an immediate impact on the baby’s care or well-being. This would include (but not be confined to) problems such as respiratory distress, consequences of birth trauma (e.g. bruising, sub-galeal haemorrhage, nerve palsy), cleft palate, imperforate anus, abnormal genitalia and other dysmorphology. The examination should
include a complete ‘head to toe to back’ inspection of the baby as detailed below in Figure 2. The findings should be documented in the relevant section of the NCPOC.

3.2 Oxygen saturation screening:
In the first minutes of life, there is a transition from the placenta being the main organ of gas exchange to the newborn lungs. Toth et al demonstrated in 50 healthy newborns that it takes between 12 and 14 minutes to achieve saturations > 95%. Routine oxygenation saturation screening of well newborns has been shown to improve early diagnosis of congenital heart disease (CHD) with a low false positive rate and minimal impact on resources. About half of the babies with a low saturation screen (<95%) will have either congenital heart disease (~1/3rd) or other significant pathologies which include respiratory disease, delayed transition to extra-uterine life (persistent pulmonary hypertension of the newborn), sepsis or metabolic conditions (~2/3rd). Saturation measurement within the first 4 to 6 hours of birth has a lower accuracy for detection of CHD but greater sensitivity for non-cardiac pathology while screening after 24 hours (late screen) has greater sensitivity for detection of CHD, especially left heart ductal dependent lesions. At RPAH, both early and late oxygen saturation screening will be performed in accordance with the existing guideline.

3.2.1 How to perform oxygen saturation screening:
- Early oxygen saturation screening will be performed in accordance with the existing guideline
- Perform screening when the infant is quiet.
- Place the probe around one foot with light source and receiver on each side of foot. Secure with Coban® tape. To ensure good blood flow to the foot, do not secure too tightly and do not hold the probe around the foot.
- Switch on oximeter and allow signal to stabilise. Read when stabilised and there is a good plethysmographic light pulse.

3.3 Anthropometry
Newborn measurement of weight, length, and head circumference reflects fetal nutrition and forms the basis on which future growth measurements.4,5,7,8

3.3.1 How to measure weight:
- The scales on the Pea Pod are used for accurate measurement of weight to the nearest gram.
- The newborn is bare weighed.
- The weight percentile is calculated using the Beeby electronic calculator on the computer in the NEAP room, or if unavailable the weight is plotted on New South Wales population-based birthweight percentile charts (less accurate)9.

3.3.2 How to measure length:
- The length-board measurement, infantometer, has been shown to be the most reliable and accurate measurement of neonatal length and more recent designs have improved ease of use such as the Easy-Glide Bearing Infantometer (Perspective Enterprises, Portage, MI, USA).
- The neonate is placed supine and unclothed on the board and held gently with his or her body aligned and head in a neutral position. One person stands at the top of the length board and holds the baby’s head in contact with the headboard while another
extends the left leg by placing the hand over the left knee, depressing the knee, straightening the leg and moving the footboard to touch the plantar surface of the foot at a right angle to the leg. Recheck that the head has not moved from the headboard before taking the measurement. The actual reading is marked by an arrow as there is an offset for greater ease of reading and accuracy.

- The length percentile is calculated using the Beeby electronic calculator on the computer in the NEAP room or plotted on New South Wales population-based birth length percentile charts\(^9\) (less accurate).

### 3.3.3 How to measure head circumference:
- Head circumference is measured using disposable paper circumference tapes at the maximum fronto-occipital circumference.
- Two reproducible measurements are required.
- The head circumference percentile is calculated using the Beeby electronic calculator on the computer in the NEAP room or plotted on New South Wales population-based birth head circumference percentile charts\(^9\) (less accurate).

### 3.4 Body composition - Fat measurement (fat mass, fat free mass and body fat \%)\)

Accurately determining the nutritional status of newborns is a major public health problem. Furthermore undernourished neonates that survive are at risk of long term health outcomes, including hypertension, stroke, type 2 diabetes, obesity and cardiovascular disease.\(^{12,13}\) Neonatal undernutrition or ‘wasting’ is a clinical diagnosis often characterised by diminished subcutaneous tissues and underlying muscles with loose wrinkled skin of the arms, thighs, elbows and knees. However this clinical sign is, in our experience at RPAH, not well recognised by a range of health providers.

Thus defining who is undernourished is problematic. Conventional approaches include the use of population based percentiles (< 3\(^{rd}\), 5\(^{th}\) or 10\(^{th}\) percentiles) or customised growth charts. Population based charts rely on a large cross section of neonates and use weight for gestational age by sex. Customised charts account for more maternal variables, however there is not strong evidence to support their use at present.\(^{14,15}\) An alternative to birth weight is the use of body composition or body fat \%(BF\%)\).

The wasted, undernourished newborn is characterised by loss of the normal fat accretion in the last 4-6 weeks of pregnancy. As fat is used by the newborn as an alternative substrate to glucose for brain metabolism, BF\% is a potentially very useful measure indicating degree of undernutrition and directly related to neonatal metabolic outcomes. The additional advantage is that it can distinguish the normal fat SGA (weight less than 10\(^{th}\) percentile) from the low fat, undernourished SGA newborn and define the low fat AGA newborn at high risk of hypoglycaemia, currently not possible with any other methods.

Recently a new technology using air displacement plethysmography (ADP) has become available to non-invasively, accurately and quickly measure BF\% in infants from birth to 6 months of age. ADP has been validated against the four-compartment model and biological and physical phantoms\(^{16,17}\) and is considered the criterion method for determining BF\% in neonates.\(^{18-22}\)

Several studies have investigated the BF\% as an indicator of neonatal nutritional status using ADP.\(^{20-25}\) Body fat is a better measure than customised charts for assessing neonatal morbidity and as good as population based charts.\(^{26}\) The advantage of this method is it is
accurate, easy, reliable, non-invasive and acceptable to parents. The cut offs for low and high fat are shown in the flow chart. These were determined by significantly better Receiver Operator Curves (ROCs) for combined morbidity assessed by 3 pre-specified outcomes (temp <36.5C, prolonged hospital stay, poor feeding (2 of 3 objective criteria). The cut off was determined by the highest sensitivity balanced by the best specificity.  

3.4.1 How to measure body composition:
- This is performed in the NEAP room just after the measurement of length and weight using the PeaPod (CosMed, USA).
Figure 1 - Overview on performing the NEAP

1. Neonatal Early Assessment Program
2. Login to Pea Pod to initiate air stabilisation
3. Place baby under warmer and undress fully for physical examination
4. Attach Pulse Oximeter Sensor, turn on unit, read oxygen saturation
5. Perform head to toe, front to back physical examination
6. Measure baby's head circumference
7. Measure baby's length with parent
8. Calibrate Pea Pod volume chamber
9. Include ID bands and cord clamp
10. Enter baby's data
11. Tare Pea Pod scales
12. Include ID bands and clamp on scale before AND AFTER weighing
13. Measure the baby
14. Print results, attach baby sticker and add to notes
15. Return the baby to the warmer and re-dress
Figure 2 - Early Physical Examination of the Newborn Baby
The routine newborn assessment should include all aspects of the checklist on page 1 of the NCPOC. The schema below moves from head to toe, front to back (adapted from Queensland Maternity and Newborn Clinical Guidelines Program 61)\(^2\). This examination does not replace the discharge check which will include the red reflex, the heart and the hips.
Figure 3 - Physical examination referral pathway

Review History

First Physical Examination
(undressed fully, under warmer)

Check especially:
- Heart
- Palate
- Genitalia
- Ano rectum for malformations

Normal

Remind parent/s that their baby will need a second examination that will include:
- eyes (red reflex test)
- heart
- hips

Abnormal

Refer immediately to RMO or NNP
Figure 4 - Pea Pod Quick Reference User Guide

Pea Pod Quick Reference User Guide

Login to Pea Pod: Username - NEAP
Password - ppsydney

Place an umbilical cord clamp and baby ID bands to match those worn by the baby in the volume chamber and tare/zero

"Stabilisation of air circulation system" takes 5 minutes

Taring volume chamber takes 2 minutes

Enter baby’s data

Place a clean underlay on the scales and an umbilical cord clamp and baby ID bands to match those worn by the baby and tare/zero scales

Remove clamp and ID bands from scale and weigh the baby

Replace clamp and ID bands and re- tare/ re-zero scales

Remove clamp and ID bands from volume chamber and measure the baby

Print results, attach baby sticker and add to notes

Clean the Pea Pod with detergent wipes (do not exit software or turn off the Pea Pod)
Figure 5 - Anthropometry referral pathway
Figure 6 - Oxygen Saturation referral pathway

Oxygen Saturation Screening

- SpO₂ ≥ 95%
  - Routine clinical examination

- SpO₂ 90% - 94%
  - Midwife examines infant
  - No clinical signs
    - Re-test 2 - 3 hours
      - SpO₂ < 95%
        - Call Neonatal Team
      - SpO₂ ≥ 95%
        - Routine clinical examination

- SpO₂ < 90%
  - Call Neonatal Team
Figure 7 – Body fat percentage referral pathway

Body fat %
Measured by air displacement plethysmography in the Pea Pod

Low body fat
Female
< 5.8%
Male
< 4.2%

Hypoglycaemia Protocol;
Thermoregulation Protocol;
Feeding policy

Placenta to Histopathology

Normal body fat

Female
5.8% - 14.3%
Male
4.2% - 12.7%

No macrosomia:
Reassure parents

Check for Macrosomia

High body fat

Female
> 14.3%
Male
> 12.7%

Macrosomia:
Refer immediately to RMO or NNP

Placenta to Histopathology

Document in notes

Compliance with this Guideline is recommended
4. **Key Points**

<table>
<thead>
<tr>
<th>Key point</th>
<th>Level of Evidence &amp; Recommendation (NHMRC)²⁵</th>
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<tbody>
<tr>
<td>Air displacement plethysmography (ADP) non-invasively, accurately and quickly measures BF% in infants from birth to 6 months of age.</td>
<td>Level of evidence: 3</td>
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<td></td>
<td>Strength of recommendation: A</td>
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<tr>
<td>Body fat is a better measure than customised charts for assessing neonatal morbidity</td>
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<td></td>
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5. **References**


