

## Gestational age assessment

### Guideline Responsibilities and Authorisation

<b>Department Responsible for Guideline</b>	Newborn Intensive Care Unit (NICU)
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<b>Target Audience</b>	NNPs, CNSs, Registrars, SMOs and Nurses
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### Guideline Review History

Version	Updated by	Date Updated	Summary of Changes
3	Nadia Wright		Review of evidence, references added, appendix of assessment tools added, descriptor of techniques added

## Gestational age assessment

### Contents

1	Overview .....	3
1.1	Purpose.....	3
1.2	Scope.....	3
1.3	Patient / client group .....	3
1.4	Exceptions / contraindications .....	3
1.5	Definitions and acronyms .....	3
2	Clinical management .....	3
2.1	Roles and responsibilities .....	3
2.2	Competency required .....	4
2.3	Guideline.....	4
2.4	Potential complications .....	4
3	Patient information .....	4
4	Evidence base .....	5
4.1	Summary of Evidence, Review and Recommendations .....	5
4.2	Bibliography .....	6
	Appendix A – Assessment tool .....	7
	Appendix B – Assessment descriptions .....	8

## Gestational age assessment

### 1 Overview

#### 1.1 Purpose

To provide accurate and evidence based clinical assessment of gestational age where there is uncertainty or an information deficit from the antenatal period.

#### 1.2 Scope

Waikato hospital staff working in the Newborn Intensive Care unit, postnatal ward, delivery suite or women's assessment unit.

#### 1.3 Patient / client group

Neonates and infants born in, or transferred to, Waikato Hospital.

#### 1.4 Exceptions / contraindications

- Acutely unwell neonates unable to tolerate the handling required for this assessment.
- Infants <26/40 weeks gestation may have this assessment delayed beyond 24 hours of age due to the risk of intraventricular haemorrhage and to facilitate minimal handling in keeping with Extremely Low Birth Weight (ELBW) Bundle of Care for Prevention of Intra Ventricular Haemorrhage (IVH) guideline Ref 6240. This decision will be at SMO discretion.

#### 1.5 Definitions and acronyms

<b>GA</b>	Gestational age
<b>NP</b>	Nurse Practitioner – referring in this context to those who are neonatal specialised.
<b>Medical staff</b>	In NICU this includes Neonatal specialised Nurse Practitioner, Clinical Nurse Specialist, Registrar, Fellow and SMO Paediatricians.
<b>SMO</b>	Senior Medical Officer

### 2 Clinical management

#### 2.1 Roles and responsibilities

**All Staff:**

Identifying infants who require a gestational age assessment.

**Medical staff:**

Completion of the gestational age assessment, appropriate documentation and communication with family.

**SMO:**

Where significant uncertainty in GA exists to confirm the GA assessment.

## Gestational age assessment

### 2.2 Competency required

- Familiarity with this guideline
- Completion of a gestational age assessment under supervision of an experienced medical staff member to ensure competence.

### 2.3 Guideline

The New Ballard gestational age assessment is the recommended GA assessment for use in the instance of uncertain gestation.

This assessment should be performed within the first 12 hours after birth once all life-preserving care has been completed and the infant is stable. The assessment should be timed with the infants routine clinical cares to reduce unnecessary periods of handling.

Follow the scoring sheet in Appendix A in a systematic manner scoring each individual category. *In Appendix B are detailed descriptors of how to perform and score each area of the assessment.* Total the scores in the grid to the right of the page and use the reference chart to translate the total score and calculated GA.

### 2.4 Potential complications

- GA assessments commonly overestimate the gestational age of the infant by 0.5-2 weeks therefore consideration may be required with regards to investigations and follow up care to account for this margin of error.
- Extremely fragile infants may not tolerate handling well enough to facilitate this examination – for these infants assessment should be completed by the most experienced medical staff member on duty to reduce the duration of assessment with as little handling as possible.
- Frank breech delivery may falsely alter the scoring for popliteal angle and heel to ear assessment. Recommendations for these two areas of assessment to be completed at 24-48 hours of age when transient flexor fatigue has resolved.
- In cases where neonatal encephalopathy is present neuromuscular maturity scores may be falsely altered due to poor tone.

## 3 Patient information

Inform parents of the purpose of the assessment and at the conclusion of the assessment findings and what the concluded gestational age means with regards to likely infant care requirements and outcomes.

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IF THIS DOCUMENT IS PRINTED, IT IS VALID ONLY FOR THE DAY OF PRINTING							Page 4 of 9

## Gestational age assessment

### 4 Evidence base

#### 4.1 Summary of Evidence, Review and Recommendations

**Summary:**

While the Dubowitz assessment has the highest statistical accuracy, the New Ballard assessment has comparable accuracy with improved targeting of extreme prematurity and is more practical for application.

**Dubowitz assessment:**

Developed in 1970 by Dubowitz et al. this assessment has sensitivity of 81.5% and specificity 98.6%. Dubowitz et al. noted that for preterm infants <34 weeks gestation neurological changes are more appreciable while physical changes may be less so. This emphasises the importance of the combined neurological and physical scores for achieving accuracy in GA assessment. Of note Dubowitz was not designed to differentiate between gestations <28 weeks. Systematic review demonstrates the Dubowitz assessment over-estimates gestational age on average by 0.6-2 weeks when compared to LMP GA assessment. Some signs such as head lag and ventral suspension would not be appropriate in unwell or extremely preterm infants. Further the Dubowitz is a time consuming assessment with its number of categories for scoring.

**Ballard assessment:**

Developed in 1979 by Ballard et al., as an adaptation to the Dubowitz assessment in order to reduce the number of parameters to make the assessment more user friendly. This has similar sensitivity and specificity to the Dubowitz assessment. Ballard et al. noted further that there is increasing inaccuracy in GA assessment when performed >48 hours of age.

**New Ballard assessment:**

Introduced in 1991 by Ballard et al. to expand on the previously described Ballard score with extended categories to better assess GA <28/40. Ballard scoring averaged accuracy within 1-2 weeks GA of antenatal ultrasound assessment with a pooled sensitivity of 64% and specificity of 95%. Compared to LMP sensitivity was 84.1% and specificity was 83.5%. It was noted in this extended assessment that there was increased accuracy in babies <26/40 when examined before 12 hours of age though there was no further clarity on ideal time of assessment for those >26/40 beyond the previously described recommendation of <48 hours of age.

**Shortened/Rapid GA assessments:**

While there are a wide range of rapid or shortened GA assessments described in research the reduction in categories for assessment result in significantly reduced accuracy.

Doc ID:	2653	Version:	03	Issue Date:	3 DEC 2021	Review Date:	3 DEC 2021
Facilitator Title:	Nurse Practitioner			Department:	NICU		
IF THIS DOCUMENT IS PRINTED, IT IS VALID ONLY FOR THE DAY OF PRINTING							Page 5 of 9

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## Gestational age assessment

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Doc ID:	2653	Version:	03	Issue Date:	3 DEC 2021	Review Date:	3 DEC 2021
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IF THIS DOCUMENT IS PRINTED, IT IS VALID ONLY FOR THE DAY OF PRINTING							Page 6 of 9


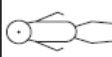















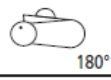
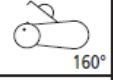
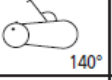
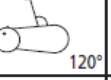
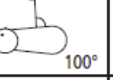
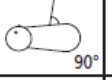
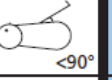
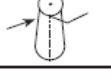
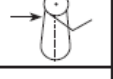
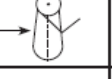
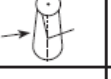
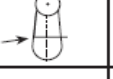
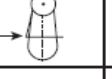



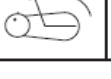
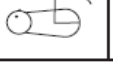
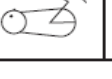
## Gestational age assessment

### Appendix A – Assessment tool

#### MATURATIONAL ASSESSMENT OF GESTATIONAL AGE (New Ballard Score)

NAME \_\_\_\_\_ SEX \_\_\_\_\_  
 HOSPITAL NO. \_\_\_\_\_ BIRTH WEIGHT \_\_\_\_\_  
 RACE \_\_\_\_\_ LENGTH \_\_\_\_\_  
 DATE/TIME OF BIRTH \_\_\_\_\_ HEAD CIRC. \_\_\_\_\_  
 DATE/TIME OF EXAM \_\_\_\_\_ EXAMINER \_\_\_\_\_  
 AGE WHEN EXAMINED \_\_\_\_\_  
 APGAR SCORE: 1 MINUTE \_\_\_\_\_ 5 MINUTES \_\_\_\_\_ 10 MINUTES \_\_\_\_\_

#### NEUROMUSCULAR MATURITY

NEUROMUSCULAR MATURITY SIGN	SCORE							RECORD SCORE HERE
	-1	0	1	2	3	4	5	
POSTURE								
SQUARE WINDOW (Wrist)								
ARM RECOIL								
POPLITEAL ANGLE								
SCARF SIGN								
HEEL TO EAR								
TOTAL NEUROMUSCULAR MATURITY SCORE								

SCORE  
 Neuromuscular \_\_\_\_\_  
 Physical \_\_\_\_\_  
 Total \_\_\_\_\_

#### MATURITY RATING

SCORE	WEEKS
-10	20
-5	22
0	24
5	26
10	28
15	30
20	32
25	34
30	36
35	38
40	40
45	42
50	44

#### PHYSICAL MATURITY

PHYSICAL MATURITY SIGN	SCORE							RECORD SCORE HERE
	-1	0	1	2	3	4	5	
SKIN	sticky friable transparent	gelatinous red translucent	smooth pink visible veins	superficial peeling & / or rash, few veins	cracking pale areas rare veins	parchment deep cracking no vessels	leathery cracked wrinkled	
LANUGO	none	sparse	abundant	thinning	bald areas	mostly bald		
PLANTAR SURFACE	heel-toe 40-50 mm: -1 < 40 mm: -2	>50 mm no crease	faint red marks	anterior transverse crease only	creases ant. 2/3	creases over entire sole		
BREAST	imperceptible	barely perceptible	flat areola no bud	stippled areola 1-2 mm bud	raised areola 3-4 mm bud	full areola 5-10 mm bud		
EYE / EAR	lids fused loosely: -1 tightly: -2	lids open pinna flat stays folded	sl. curved pinna; soft; slow recoil	well-curved pinna; soft but ready recoil	formed & firm instant recoil	thick cartilage ear stiff		
GENITALS (Male)	scrotum flat, smooth	scrotum empty faint rugae	testes in upper canal rare rugae	testes descending few rugae	testes down good rugae	testes pendulous deep rugae		
GENITALS (Female)	clitoris prominent & labia flat	prominent clitoris & small labia minora	prominent clitoris & enlarging minora	majora & minora equally prominent	majora large minora small	majora cover clitoris & minora		
TOTAL PHYSICAL MATURITY SCORE								

GESTATIONAL AGE (weeks)  
 By dates \_\_\_\_\_  
 By ultrasound \_\_\_\_\_  
 By exam \_\_\_\_\_

Reference  
 Ballard JL, Khoury JC, Wedig K, et al: New Ballard Score, expanded to include extremely premature infants. J Pediatr 1991; 119:417-423. Reprinted by permission of Dr Ballard and Mosby—Year Book, Inc.

## Gestational age assessment

### Appendix B – Assessment descriptions

**Video explanation link:** <https://www.youtube.com/watch?v=pRy15YO6hU4>

**Images from:** Ballardscore.com

**Descriptions from:** bettercare.co.za

#### Neuromuscular assessments:

**Posture:** Handle the infant and observe the position of the arms and legs. More mature infants have better flexion of their limbs.

- Score 0 if both arms and legs are fully extended.
- Score 1 if there is slight flexion of the legs only.
- Score 2 if there is moderate flexion of the legs.
- Score 3 if the legs are flexed to 90° and the arms are partially flexed.
- Score 4 if all limbs are fully flexed against the body.

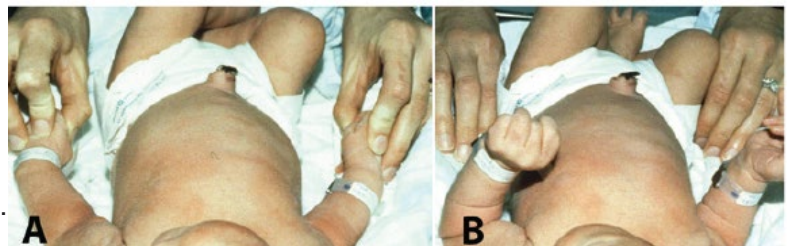
**Square window:** Gently press on the back of the infant's hand to push the palm towards the forearm. Observe the degree of wrist flexion. More mature infants have greater wrist flexion.

- Score –1 if the wrist cannot be flexed to 90°.
- Score 0 if the wrist can only be flexed to 90° only, giving the appearance of a 'square window'.
- Score 1 if the wrist can be flexed to 60°.
- Score 2 if the wrist can be flexed halfway to the forearm.
- Score 3 if the wrist can be flexed to 30°.
- Score 4 if the palm of the hand can be pressed against the arm.



**Arm recoil:** Fully bend the arm at the elbow so that the infant's hand reaches the shoulder, and keep it flexed for 5 seconds. Then fully extend the arm by pulling on the fingers. Release the hand as soon as the arm is fully extended and observe the degree of flexion at the elbow (recoil). Arm recoil is better in more mature infants.

- Score 0 if there is no arm recoil at all.
- Score 1 minimal recoil
- Score 2 if there is some arm recoil.
- Score 3 if the arm recoil is good and the arm is flexed halfway back to the shoulder.
- Score 4 if there is a brisk arm recoil and the infant pulls the arm back almost to the shoulder.



**Popliteal angle:** With one hand hold the infant's knee against the abdomen. With the index finger of the other hand gently push behind the infant's ankle to bring the foot towards the face. Observe the angle formed behind the knee by the upper and lower legs - the popliteal angle. More mature infants have a reduced popliteal angle.

- Score –1 if the leg can be fully extended to form an angle of 180°.
- Score 0 if the knee can only be extended to 160°.
- Score 1 if the knee can only be extended to 140°.
- Score 2 if the knee can only be extended to 120°.
- Score 3 if the knee can only be extended to 100°.
- Score 4 if the knee can only be extended to 90°.
- Score 5 if the knee cannot be extended to 90°.





## Gestational age assessment

**Scarf sign:** Take the infant's hand and gently pull the arm across the front of the chest and around the neck like a scarf. With your other hand gently press on the infant's elbow to help the arm around the neck. In more mature infants the arm cannot be easily pulled across the chest.

- Score -1 if the arm can be wrapped tightly around the neck (like a scarf).
- Score 0 if the elbow can only be pulled beyond the chest but not fully wrapped around the neck.
- Score 1 if the elbow reaches the other side of the chest but cannot be pulled beyond the chest.
- Score 2 if the elbow can reach the midline of the chest.
- Score 3 if the elbow cannot reach the midline of the chest.
- Score 4 if the elbow cannot be pulled as far as the side of the chest.



**Heel to ear:** Hold the infant's toes and gently pull the foot towards the ear. Allow the knee to slide down at the side of the abdomen. The infant's pelvis may be allowed to lift off the bed. Observe how close the heel can be pulled towards the ear. More mature infants have less flexion of the hips and, therefore, you cannot bring the heel towards the ear.

- Score -1 if the heel can easily be pulled to the ear.
- Score 0 if the heel can almost reach the ear.
- Score 1 if the heel gets close to the ear.
- Score 2 if the heel can be pulled just beyond halfway to the ear.
- Score 3 if the heel can be pulled halfway to the ear.
- Score 4 if the heel cannot be pulled halfway to the ear.



### **Physical maturity signs:**

**Skin:** Examine the skin over the front of the chest and abdomen, and also look at the limbs. More mature infants have thicker skins.

**Lanugo:** This is the fine, fluffy hair that is seen over the back of small infants. Except for very immature infants that have no lanugo, preterm infants have a lot of lanugo and this decreases with maturity. The infant has to be turned over to examine the amount of lanugo on the back. If the infant is too sick to be turned over, then the amount of lanugo is not scored.

**Plantar creases:** Use your thumbs to stretch the skin on the bottom of the infant's foot. Only note definite creases and not very fine wrinkles that disappear when the skin is stretched. More mature infants have more creases. To measure the length of the foot in very small infants place a measuring tape on the sole and measure the distance in mm from the back of the heel to the tip of the big toe.

**Breast:** Both the appearance of the breast and the size of the breast bud are considered. Palpate for the breast bud by gently feeling under the nipple with your index finger and thumb. More mature infants have a bigger areola and breast bud.

**Ears and eyes:** Both the shape and thickness of the external ear are considered. With increasing maturity the edge of the ear curls in. In addition, the cartilage in the ear thickens with maturity so that the ear springs back into the normal position after it is folded against the infant's head. The eyelids separate with increasing maturity.

**Genitalia:** Male and female genitalia are scored differently. With maturity the testes descend in the male and the scrotum becomes wrinkled. In females the labia majora increase in size with maturity.

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