Newborn Assessment

Self Learning Module

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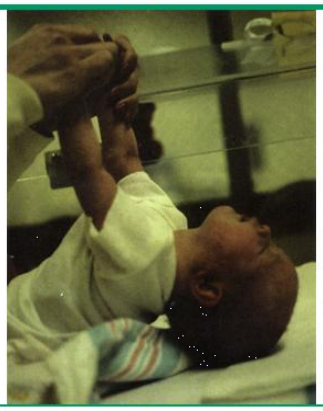
2014

The routine physical examination of the newborn is an important skill for the Maternity nurse to possess. The initial examination should be carried out before 24 hours of age. It can also be done in the room, with the parents in attendance. The rational of your actions and what you find may be explained to the parents as you go along (unless there is a suspected abnormality that must be confirmed by the physician/midwife). Preferably the exam is carried out when the infant is in a quiet awake state. The assessment is carried out in a head to toe manner using appropriate contact precautions (i.e. gloves). Before carrying out the physical exam, the nurse needs to be aware of the newborn history including type of delivery, if it was an operative delivery, any resuscitation performed, mother's history (such as diabetes, hypertension, IUGR, abnormal lab results, general health, any substance abuse, other children with congenital abnormalities etc...). Risk factors for sepsis should be reviewed (such as maternal temperature in labour, ROM > 18 hours, delivery at <37 weeks GA, Chorioamnionitis, inadequately treated GBS)

Physical Exam – In a well lit, warm room (remove newborn's clothes)

1) Observe the newborns general appearance, including the
    a. Body position and movement – Newborn typically lie in the position that they had in-utero. A breech newborn will have legs that extend toward the head. A vertex newborn usually will have flexed hips, knees and ankles. All movement should be symmetrical. Tremors/jitteriness with crying is normal, at rest is abnormal.
    b. Gender – any signs of abnormalities or ambiguous genitalia
    c. Deformations – such as club feet, bowed legs (sometimes with breech presentations) etc...
    d. Signs of respiratory distress – nasal flaring, retractions (in-drawing) of accessory muscles (subcostal/supraclavicular/suprasternal), high respiratory rate, grunting
    e. Colour – Acrocyanosis is normal in the newborn. Central trunk, tongue and mucous membranes should be pink in colour (depends on race). Bruising may be present from the delivery (facial or on the scalp usually). Mottling, especially if the newborn is cold, is normal.
    f. Tone – should be flexed, not flaccid (hypotonic). Grasp the newborn by the hands and gently pull the newborn forward to assess head lag/tone. The newborn should be able to lift his/her head partially.
    g. Fetal nutritional status – Amount of subcutaneous fat on the thighs and gluteal region

Hypotonia-severe head lag



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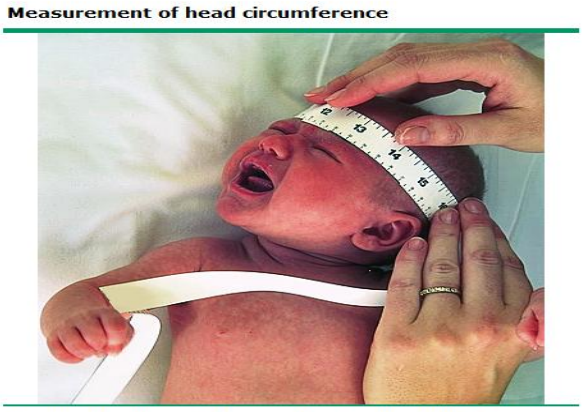
2) Take the newborn's VS prior to disturbing the newborn. Listen for a full minute for each the heart rate and respirations. Listen for any heart murmurs or missed beats. Be aware that these may be normal or abnormal findings in a newborn. (If these are heard, the attending physician/midwife must be notified)
   Normal Newborn Vital Signs
   a. Heart rate 120 – 160 bpm, over 1 minute
   b. Respiration 40 – 60, over 1 minute
   c. Temperature 36.1 – 37 degrees, axilla, in an open crib
   d. Blood pressure – only done if suspected or confirmed cardiovascular/renal abnormalities

3) Measurements (if not done after birth) – Newborns weight, length and head circumference. The head circumference should be measured at its maximum circumference. If the chest appears abnormal, measure it as well. It should be approximately within 2 cms of the head. The length is best measure with two examiners so one can hold the head and the other can extend the legs and take the measurement.



4) Examine the skin – **Pallor** may indicate anemia, **ruddiness/plethoria** may indicate polycythemia, **yellowness** indicates hyperbilirubinemia (jaundice). Mild jaundice after 24 hours is normal; jaundice prior to 24 hours or significant jaundice is not. **Central cyanosis (duskiness)** not normal after 5 minutes of age (is a sign of decreased arterial oxygen saturation). **Circumoral cyanosis** may be normal in the first few hours after birth when the newborn is feeding. It is not normal outside of feedings. If a newborn is dark skinned, examine the mucous membranes/tongue & nail beds to assess cyanosis.
   a. Milia – benign, white papules, usually on the nose/cheeks. Resolves within a few weeks of life.
   b. Pustular melanosis – benign, superficial pustules over hyperpigmented macules. Normally seen in African-American infants. Pustules can be wiped off, leaving the macule behind.
   c. Erythema toxicum– benign, white papules 1 – 2 mm in size on an erythematous (reddened) base. Usually develop at day2 – 3 and are more on the body than the face, never on the soles of the hands/feet.

d. Mongolian Spots – benign, a discoloration of the skin, usually darker brown or bluish-grey or greenish – blue. They vary in size and are usually located at the base of the spine, buttocks but can be located anywhere. They are more prevalent in darker skinned infants.
e. Nevus simplex (stork bite) – benign, red-pink capillary malformation, usually on the face/forehead/eyelids or the nape of the neck.
f. Nevus flammeus (port wine stain) – low flow capillary malformation, forms anywhere on the body. May be or may not be benign.
g. Harlequin sign – benign, a difference in color between one side of the body and the other (one side pink/one side pale). May be a sign of an immature vasomotor reflex (vessels on one side vasoconstrict and on the other vasodilate). Usually is transitory and associated with crying.
h. Petechiae – abnormal
i. Hemangiomas – abnormal buildup of the blood vessels in the skin or other organs. May indicate a syndrome. Often presents as a raised reddened lesion/tumor on the skin.

5) Inspect the head – size, shape, any abnormalities
   a. Feel the anterior and posterior fontanelles while the infant is in the sitting position. They should be soft and flat. Bulging/tense fontanelles may be indicative of an intracranial bleeds (increased intracranial pressure). If the fontanelles are bulging while the newborn is crying, settle the newborn and recheck the fontanelles. If still bulging, further investigation needs to be done. Sunken fontanelles are a sign of dehydration (not usually found directly after birth).
   b. Feel the suture lines. Should be palpable and slightly open. *Molding* is the overlapping of sutures that is common in the initial neonate period. Note the extent of the overlapping. This should decrease as the newborn's head returns to its normal size/shape. If the overlapping does not decrease within 2 – 3 days, it may suggest craniosyntosis. If there are wide gaps between the sutures, this may be indicative of increased intracranial pressure, especially if accompanied by bulging/tense fontanelles. Closed suture lines are not a normal finding and need to be investigated.
   c. Check for any *caput* – the edema caused by the descent through the birth canal. This is usually present over the presenting part of the scalp. This swelling crosses over suture lines and self resolves in a few days post birth.
   d. Note any other types of abnormalities, such as cephalohematomas or subgaleal hemorrhage. *Cephalohematomas* are a fluctuant mass that does not cross suture lines. It may increase in size after birth and is the result of a subperiosteal collection of blood. It is usually self limiting and resolves slowly over weeks. A *subgaleal* hemorrhage can be a life threatening condition. It extends over the suture lines and feels fluctuant and firm. This blood loss can be extensive. Also look for any depressions/fractures (especially if a forceps delivery).

6) Inspect the facial symmetry. The face should be symmetrical whether the newborn is at rest or crying. Look for any facial paralysis (presents as asymmetrical facial expressions). Usually seen when the infant is crying. Facial palsies are usually caused by forceps delivery or prolonged second stages. They will usually resolve within a few weeks. Asymmetrical crying face (ACF) occurs due to a congenital absence or hypoplasia of the depressor anguli oris muscle. It presents as an asymmetry when the infant is crying. This condition usually gets less noticeable as the child ages. It is usually benign but may be associated with cardiovascular issues.

7) Examine the eyes – look for

a. Spacing – close or wide spacing between the eyes is often indicative of a syndrome (i.e. Trisomy 13)
b. Symmetry - Asymmetry of the eyes may result in epicanthal folds, which normally indicates some type of syndrome (i.e. Trisomy 21 - Down's syndrome).
c. Eye movement - The newborns eyes should open when held vertically and in low lighting.
d. Width of palpebral fissures - The palpebral fissures, if are slanted upward from the inner canthus, may indicate Down's syndrome.
e. The appearance of the sclera, conjunctiva and pupils. The sclera should be white (or bluish-white) and clear, a yellow colour indicates hyperbilirubinemia. The conjunctiva should be clear of any signs of infections, including purulent discharge & inflammation. The pupils should react to light equally. 'Cross eye' can be normal until 6 months of age.

Down syndrome facies

Characteristic facial features of Down syndrome depicted in a term (A) and preterm (B) infant include: epicanthal folds, slanted palpebral fissures, flat nasal bridge, and protruding tongue.
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http://newborns.stanford.edu/PhotoGallery/Downs1.html

8) Inspect the ears – Look for position, size, symmetry and appearance. The outer canthus of the eye should be in line with the pinna of the ear. Low set ears may indicate a syndrome. Look for any malformations, skin tags or sinuses. Term newborns should have ears with firm cartilage – the ear will spring back into shape if bent over. Preterm newborns have less cartilage in their ears – the ears may stay bent over or take longer to return to normal position.

9) Inspect the nose – look for shape and patency. The shape may be distorted due to birth and should return to its regular shape within a few days of birth. Rarely, the septum may be dislocated and required replacement within days of birth or it becomes a permanent deformity. Thin, broad or flattened noses may indicate a syndrome. (i.e. a flatten bridge of the nose may indicate Down's syndrome). Establish patency by testing for air flow from each nostril (hold a thread in front of each nostril to see if it moves). Excessive suctioning may cause the nasal tissue to swell and obstruct the newborns breathing. Other causes of obstructed breathing may include choanal atresia or laryngeal webs. Passing an orogastic tube through the nares can rule out choanal atresia (done on orders from a physician/midwife, in hospital).

http://newborn.stanford.edu/PhotGallery/

Dislocated Septum: Notice that the septum is pushed to the side and is not straight. The bottom of the nose looks shifted to the newborn's left. To decide if the distortion is positional or a dislocated septum; gently compress the tip of the nose. If the deformity appears to worsen, it is not likely a positional deformity. If the septum stays straight, it is likely positional. The nares may appear uneven in both.

10) Inspect the mouth – Look at the size and shape as well as how the jaws fit together (Robin's syndrome presents with a very small lower mandible). The inside of the lips and the tongue should be pink. Common findings in the mouth include:
    a. Epstein's pearls – small, white inclusion cysts, are benign, usually between the hard and soft palate.
    b. Mucus retention cysts on the gums.
    c. Ankylogossia – 'tongue tie' – unusually short frenulum linguae. This may need to be cut if it interferes with the newborn's ability to breastfed. It can cause the newborns tongue to indent at the tip when the neonate tries to stick his tongue out of his mouth.

d. Natal teeth – primary incisors. May be part of a syndrome. The teeth may need to be removed if loose and pose a choking risk. Smoothing of the edges if breastfeeding is uncomfortable may also be considered.
e. Cleft palate – may include the hard, soft or both of the palates. The extent of the cleft need to be considered when feeding the neonate.

Epstein pearls from
http://newborns.stanford.edu/PhotoGallery/EpsteinsPearl2.html

Natal Teeth from
http://newborns.stanford.edu/PhotoGallery/Teeth2.html

Tongue Tie
http://newborns.stanford.edu/PhotGallery/Ankyloglossial.html

11) Inspect the neck – Look for any abnormalities, masses, decreased mobility or excessive skin.
a. Extensive hematomas may extend from the head down to the neck and may be life threatening.
b. Torticollis (wry neck) may result from damage to the sternocleidomastoid muscle (birth injury) or abnormalities of the cervical spine. The head is tilted to one side and the chin pointed toward the other.
c. Excessive skin/webbing may be indicative of a syndrome (i.e. Down's or Turner syndrome).

12) Inspect the clavicles - Feel for any breaks (irritability when palpated and possible decreased arm movement on the affected side).

13) Examine the symmetry/structure of the chest.
    a. Look for equal rise of the chest with respirations. Look for any signs of respiratory distress such as retractions (intercostals/subcostal/substernal).
    b. Auscultate all lobes of the lungs to assess air entry. Air entry should be clear or have a few rales (crackles) in the first few hours of life. Crackles may indicate underlying infection while stridor/rhonchi may indicate airway obstruction (such as choanal atresia or a laryngeal web). Observe for grunting, tachypnea, nasal flaring (signs of respiratory distress) or decreased/absent breath sounds.
    c. Respirations should be 40 – 60/minute. Auscultate for a full minute. Observe the rate and rhythm of the breathing.
    d. Examine the nipples. Both male and females may have swollen breast buds and be leaking a small amount of milky fluid (witch's milk) from the nipples. This is caused by hormones from the mother. Widely spaced nipples may indicate a genetic syndrome such as Turner's syndrome (nipples should be <25% of the chest circumference apart). Note any extra nipples (supernumerary nipples).

http://newborns.stanford.edu/PhotoGallery/Retractions1.html http://newborns.stanford.edu/PhotoGallery/Retractions2.html

14) Assess the cardiovascular system –
    a. Listen for a full minute to the heart sounds (rate/rhythm). Normal rate is 120 – 160/minute (may be as low as 85 if the infant is sleeping). If HR is low, check O2 Saturation. Assess for a heart murmur, skipped beats and/or an irregular heart rate. Murmurs are common in the neonatal period. If benign, they are often found over the base or left sterna border, however, ALL irregular findings need to be communicated to the primary care provider, including any murmurs.
    b. Check the femoral pulses. The pulses should be palpable, strong, regular and equal bilaterally. Any weak/absent/bounding or irregular pulses must be reported to the primary care provider.

15) Examine the abdomen for shape (rounded, scaphoid, flat). An infants' abdomen normally protrudes a small amount. Any distention is abnormal. Note: a scaphoid shape needs to be investigated as it may be an indication of a diaphragmatic hernia or it may be normal.
    a. Auscultate bowl sounds. Usually will be present a few hours after birth.
    b. Palpate gently for any masses (organomegaly). The liver can be palpated under the right costal margin and the kidneys in both lower quadrants. No other masses should be palpable.
    c. Note any umbilical hernia.
    d. Note any separation of the rectus abdominis muscle (diastasis recti). This may be benign.

16) Inspect the umbilical cord. It should be white have three vessels – one artery and two veins. Cords with only two vessels are associated with a higher risk of syndromes. Note any foul smell from the cord. Note thickness/gelatinous (i.e. Wharton's jelly) of the cord.

17) Examine the genitalia.

    a. Male –
        i. The scrotum should be rugated and pigmented.
        ii. The testes should be palpable in the scrotum.
        iii. Stretch the penis to assess length (normal is 2.5 – 3.5 cm).
        iv. The foreskin is usually not retractable at birth (may take several years to retract – instruct the parents not to force retraction).
        v. Locate the urethral meatus – it should be at the tip of the penis. Hypospadias is when the urethral meatus is located ventrally on the penis. Epispadias is location of the urethral meatus dorsally on the penis (is uncommon).
    b. Female –
        i. Assess the labia, clitoris, meatus and vaginal opening. The labia majora become larger the closer to term the infant is.
        ii. Vaginal opening should be present and may excrete a white discharge that may be blood tinged (caused by the maternal hormones).

Note: For older newborns, an easy way to determine contact diaper dermatitis (diaper rash) vs candiditis infection is that diaper rash will not be anywhere that the diaper does not touch (i.e. creases, thighs, abdomen). A candiditis rash is usually fiery red satellite lesions that eventually will extend out of the diaper area (thighs/abdomen/creases). *Fecal /urine matter cannot be removed by water alone* and will eventually cause a diaper rash. Water with baby soap on a cloth or diaper wipes may be used to clean at diaper changes and will remove the fecal/urine matter.

18) Examine the anus. Look for patency and location. An imperforate anus is not always visible upon inspection. DO NOT take the newborn's temperature rectally – may perforate the imperforate anus. Signs of an imperforate anus include – No meconium passage, distended abdomen, foul breath, vomiting of fecal matter. Surgery is required.

19) Examine the trunk & spine.
    a. Turn the newborn onto his/her abdomen and inspect the spine. Palpate the vertebrae to detect any abnormalities.
    b. Look for a sacral dimple by separating the gluteal folds – often they can be benign (will have an intact base). If the dimple is deep, large, located above or near the top of the gluteal crease or are associated with markers for neural tube defects, such as hemangioma (raised lesion made of a buildup of blood vessels near the surface)/hypertrichosis (tuft of hair)/discoloration, the newborn may need to be sent for an ultrasound/MRI to confirm/rule out neural tube defects such as spinal bifida.

20) Examine the extremities
    a. Hands/Feet – Creases are a normal finding and are a sign of maturity. A premature newborn may not have any creases on his/her hands/feet. Look for a simian crease (a singular palmar crease), syndactyly (fusion of the digits), polydactyly (extra digits). All of these may be normal in a newborn who presents normally in all other exams. However, a simian crease is more often found in Trisomy 21 (Down's syndrome). Often, the newborn will have clenched fists, with the thumb on the inside. The newborn should, however, periodically relax his/her fists. If not doing so, this is an abnormal finding. Also note any club feet, postural abnormalities or congenital vertical talus (rocker feet - may be indicative of a syndrome).
    b. Movement – all extremities should move equally and spontaneously. If a brachial plexus injury has occurred there may be decrease movement in that arm. This occurs when the brachial nerves are stretched during delivery. This occurs most often with shoulder dystocias but can happen spontaneously. Damage can be permanent or temporary. Some types of damage include:
        i. Erb's Palsy – upper arm is adducted and internally rotated and the forearm is extended. The newborn is able to move the hand & wrist of the affected arm
        ii. Erb's Palsy Plus – the arm is adducted and internally rotated, the forearm is extended and pronated and there is flexion of the wrist/hand of the affected arm ("waiter's tip pose").
        iii. Klumpke's Palsy – hand paralysis and Horner's syndrome (Is uncommon)

Transverse palmar crease

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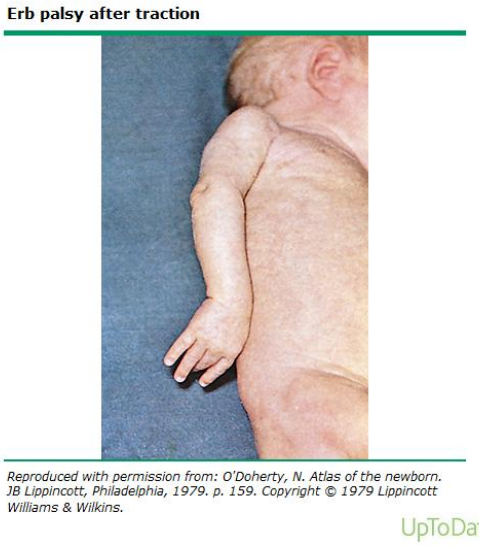
Sandal gap sign associated with Down's syndrome from http://newborns.stanford.edu/PhotoGallery/Downs4.html



Erb's palsy from
http://newborns.stanford.edu/PhotoGallery/ErbsPalsy1.html

21) Examine the hips – place your hands around the newborns hips. Gently rotate the hips outward and with posterior pressure and feel for a 'jerk' or dislocation (Ortolani's maneuver). Gently rotate the hips inward with anterior pressure to feel for a hip reduction (Barlow's test). Breech presentation newborns are at risk for developmental dysplasia of the hip (DDH). Turn the infant to the prone position and gently straighten the legs. Creases/leg folds on either leg should be symmetrical. If they are asymmetrical, it may indicate a dislocation/reduction of a hip. This step can be done at the same time as the spine/anus is checked.

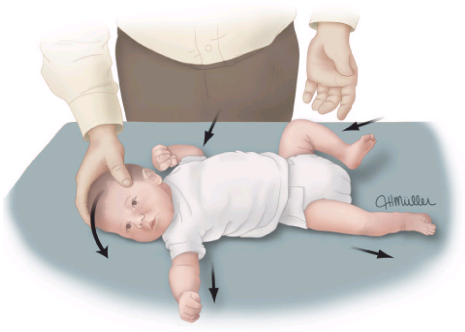
Symmetrical leg creases from http://newborns.stanford.edu/PhotoGallery/LegCreases1.html

22) Neurological exam – newborns are born with many primitive reflexes. These include:
    a. Rooting reflex – stroke the newborn's cheek – he/she should turn his/her head towards your finger to 'root'
    b. Sucking reflex – place a clean gloved finger in the newborn's mouth. The newborn should start to suck on your finger (Check for a cleft palate/teeth at the same time)
    c. Babinski sign – run a finger up the lateral side of the foot and across the ball of the foot. The toes should separate. This is a normal finding at birth and an abnormal finding after 1-2 years of age.

d. Moro (Startle) reflex – this response may be elicited by a loud noise or by gently holding the newborn at a 45 degree angle and lowering him/her suddenly, while protecting the head/neck. The newborn's arms and legs should abduct away from the body.
e. Stepping reflex – while holding the newborn vertical, gently touch his/her feet to a firm surface. The infant should lift one foot at a time away from the surface.
f. Grasping reflex – the newborn should grasp any object placed in his/her hand (palmer) or should curl his/her toes down when the examiner places fingers under the toes and strokes down towards the heel (plantar).
g. Tonic neck reflex – Turn the newborns head to one side. The side to which the newborn is facing should have an extended arm/leg while the opposite side should have an arm/leg flex.

Also assess the newborn's alertness, tone, activity, strength and cry as part of the neurological exam.

Infant asymmetrical tonic neck reflex



Asymmetrical tonic neck reflex is characterized by extension of the upper and lower extremities on the side to which the head and neck is turned with flexion of the contralateral upper extremity (fencing posture). It appears beginning at 35 weeks gestation, is well-established by one month of age, and disappears by three to four months of age in a term infant.

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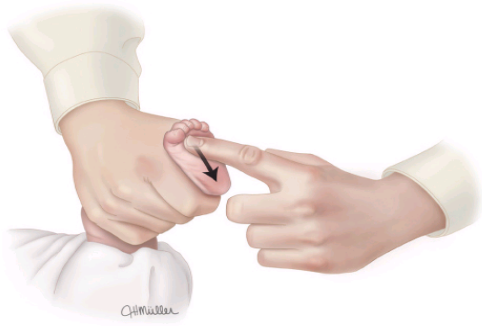
Infant plantar grasp



The plantar reflex is well established by 32 weeks conceptional age and disappears by three months of age. During the normal plantar grasp, the toes plantar flex around the examiner's finger when it is brought across the ball of the foot.

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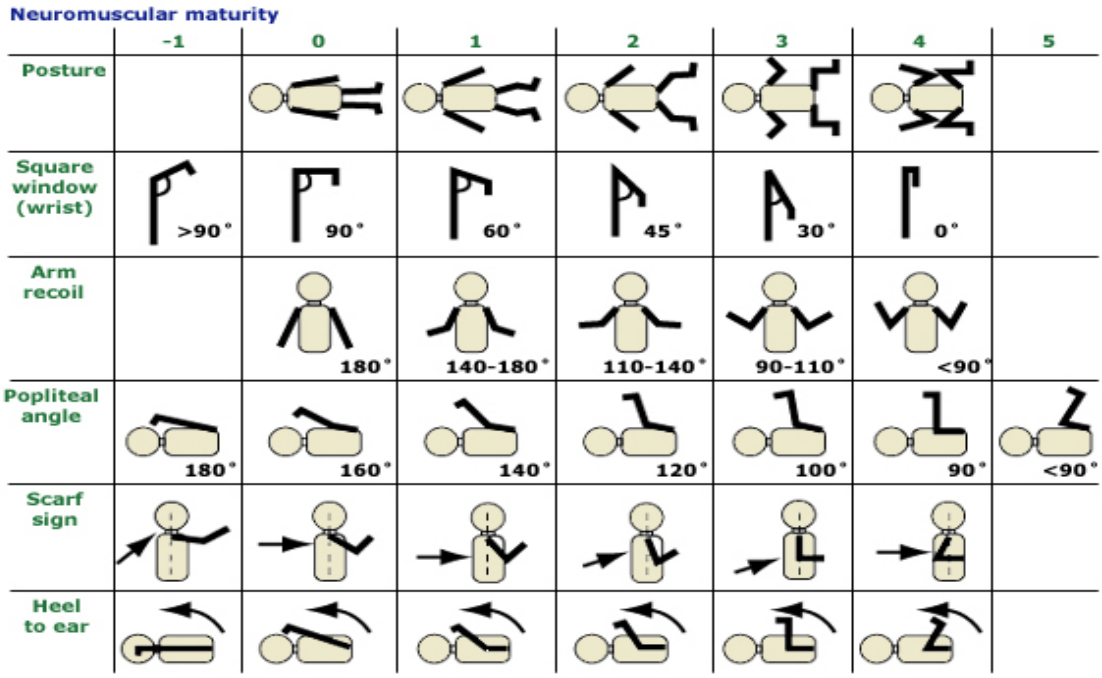
Syndromes

- Trisomy 21 – Down's syndrome (most common Trisomy among live births)– May present with low set ears, epicanthal fold, flattened bridge of the nose
- Trisomy 18 – Edward's syndrome (2nd most common Trisomy among live births) – The majority of fetuses with this syndrome die in utero. Of those born, 50% will die within 2 weeks of life and only 5 – 10% will survive to one year. If they survive, severe intellectual disability is present. In the antepartum period, may present with IUGR & polyhydramnios. After birth, the newborn may present with – prominent occiput, small mouth, pointed ears, micrognathia (small lower jaw), short sternum, horseshoe kidney, flexed/overlapping fingers, hypertonia. Any organ system, especially gastrointestinal and cardiovascular, may be affected.
- Trisomy 13 – Patau syndrome - The majority of fetuses with this syndrome die in utero. Of those born, 80% will die within 4 weeks of life and only 5% will survive to 6 months. If they survive, severe intellectual disability is present, as well as seizures and failure to thrive. The newborn may present with a sloping forehead, severe eye defects, cleft lip/palate, polydactyly, congenital vertical talus, narrow convex fingers, umbilical hernia, omphalocele (abdominal wall defect that results in organs protruding out of the umbilicus), deafness, absence of

olfactory bulb or nerve, holoprosencephly (failure of the forebrain to develop), gastrourinary defects, hemangiomas, scalp defects and congenital heart defects

The following charts are used to assess physical maturity (gestational age at birth). This is put in for interest sake but this self learning package will not go into detail on this subject.

New Ballard score



The New Ballard Score is used to estimate gestational age from neuromuscular and physical features. The scores of each feature are added to calculate a maturity rating that correlates with gestational age.

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New Ballard score

Physical maturity							
	−1	**0**	**1**	**2**	**3**	**4**	**5**
Skin	Sticky; friable; transparent	Gelatinous; red; translucent	Smooth; pink; visible veins	Superficial peeling and/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 creases	Heel-toe 40 to 50 mm: −1 <40 mm: −2	>50 mm; no crease	Faint red marks	Anterior transverse crease only	Crease anterior 2/3	Creases over entire sole	
Breast	Imperceptible	Barely perceptible	Flat areola; no bud	Stippled areola; 1 to 2 mm bud	Raised areola; 3 to 4 mm bud	Full areola; 5 to 10 mm bud	
Eye/ear	Lids fused Loosely: −1 Lightly: −2	Lids open; pinna flat, stays folded	Slightly curved pinna; soft with slow recoil	Well-curved pinna; soft but ready recoil	Formed and firm with 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 and minora equally prominent	Majora large; minora small	Majora cover clitoris and minora	

Maturity rating													
Score	−10	−5	0	5	10	15	20	25	30	35	40	45	50
Gestational age (weeks)	20	22	24	26	28	30	32	34	36	38	40	42	44

The New Ballard Score is used to estimate gestational age from neuromuscular and physical features. The scores of each feature are added to calculate a maturity rating that correlates with gestational age (see figure 1a).

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