



CHAMPLAIN MATERNAL NEWBORN REGIONAL PROGRAM
PROGRAMME RÉGIONAL DES SOINS À LA MÈRE
ET AU NOUVEAU-NÉ DE CHAMPLAIN

Newborn Adaptation to Extrauterine Life and Newborn Assessment

Self-Learning Module

Developed by the
Interprofessional Education and Research Committee of the
Champlain Maternal Newborn Regional Program (CMNRP)

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Disclaimer: This self-learning module is intended for health care providers caring for term, low-risk newborns. Please refer to institutional policies and procedures.



Introduction

“Transition from fetal to newborn life is a critical period involving diverse physiological changes. The newborn must move from an organism completely dependent on another for life-sustaining oxygen and nutrients to an independent being, a task that requires intense adjustment carried out over a period of hours to days... Careful assessment and nursing care is needed during the period of transition to ensure that the neonate who is experiencing problems with transition is recognized and appropriate interventions are initiated” (Fraser, 2014, p. 581).

By possessing the knowledge contained in this module, the health care team will be able to support the healthy mother-baby dyad in their transition to life as a family without unnecessary interruptions and interventions.

Objectives

Upon completion of this self-learning module, the nurse will be able to:

1. Describe the newborn’s physiological adaptation to extrauterine life.
2. Demonstrate a complete physical assessment of the newborn outlining the usual findings, normal variations and abnormalities.
3. Identify skills requiring further enhancement to meet the above objectives and outline a learning plan to meet these needs.

1. Newborn Adaptation to Extrauterine Life

The immediate postpartum period is a time of significant physiological adaptation for both the mother and baby. Successful transition from fetal to neonatal life requires a complex interaction between the following systems:

- Respiratory
- Cardiovascular
- Thermoregulatory
- Immunologic

Establishing respirations is critical to the newborn's transition, as lungs become the organ of gas exchange after separation from maternal uteroplacental circulation. Over 90% of newborns make the transition from intrauterine life to extrauterine life without difficulty, requiring little to no assistance (NRP, 2010). However, for the 10% of newborns who do require assistance, less than 1% of these newborns require extensive resuscitative measures to survive. All personnel who care for newborns immediately after birth should have skills in neonatal resuscitation and maintain current Neonatal Resuscitation Provider (NRP) status.

1.1 Fetal circulation

In utero, oxygenated blood flows to the fetus from the placenta through the umbilical vein. Although a small amount of oxygenated blood is delivered to the liver, most blood diverts the hepatic system through the ductus venosus, which forms a connection between the umbilical vein and the inferior vena cava. Oxygenated blood from the inferior vena cava enters the right atrium and most of it is directed through the foramen ovale to the left atrium, then to the left ventricle, and onto the ascending aorta, where it is primarily directed to the fetal heart and brain (Askin, 2009).

Deoxygenated blood from the head and upper extremities comes back to the right atrium by the superior vena cava, where it blends with oxygenated blood from the placenta. This blood enters the right ventricle and pulmonary artery, where 90% of it is shunted across the ductus arteriosus and into the descending aorta, providing oxygen to the lower half of the fetal body

and eventually draining back to the placenta through the two umbilical arteries. The remaining 10% of the blood coming from the right ventricle perfuses lung tissue to meet metabolic needs (Askin, 2009).

1.2 Neonatal Circulation

With the infant's first breath and exposure to increased oxygen levels, there is an increased blood flow to the lungs causing the closure of the foramen ovale. Constriction of the ductus arteriosus is a gradual process that results from a reduction of pulmonary vascular resistance (PVR), increasing systemic vascular resistance (SVR) and sensitivity to a rise in arterial PaO₂ levels. The removal of the placenta decreases prostaglandin levels (which helped to maintain ductal patency) further influencing closure (Alvaro & Rigatto, 2005; Kenner, 2003).

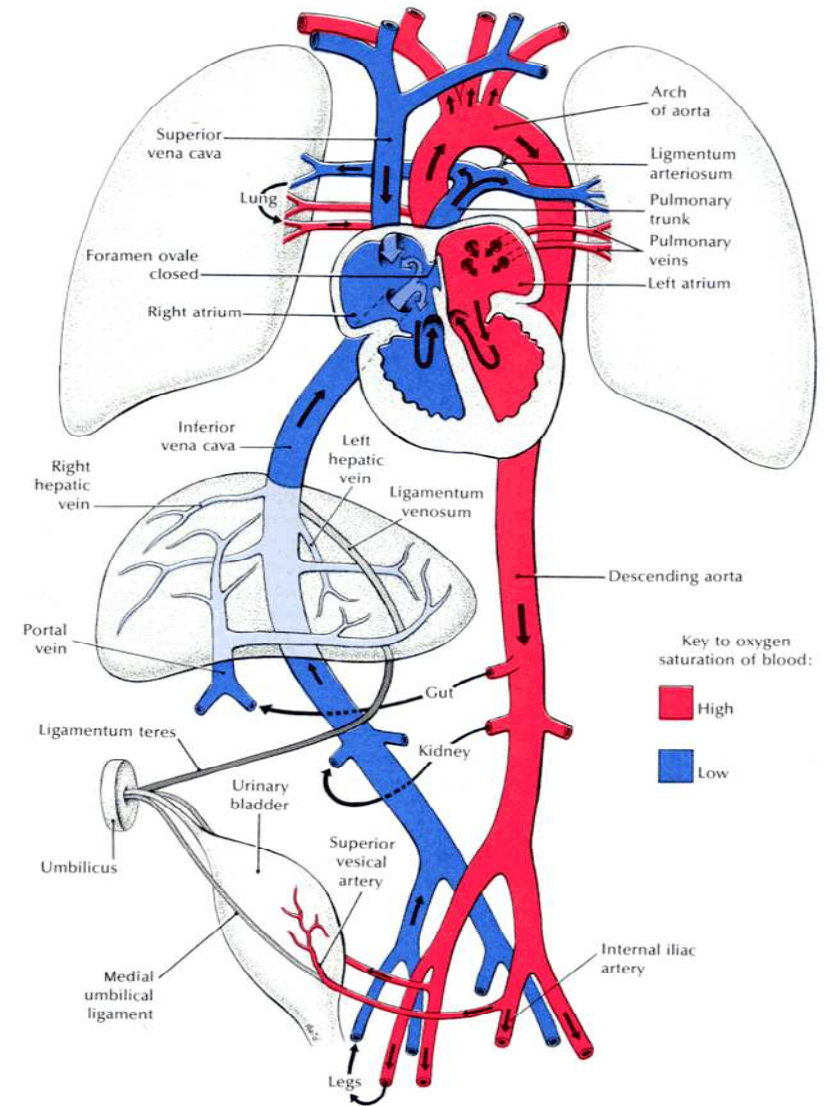
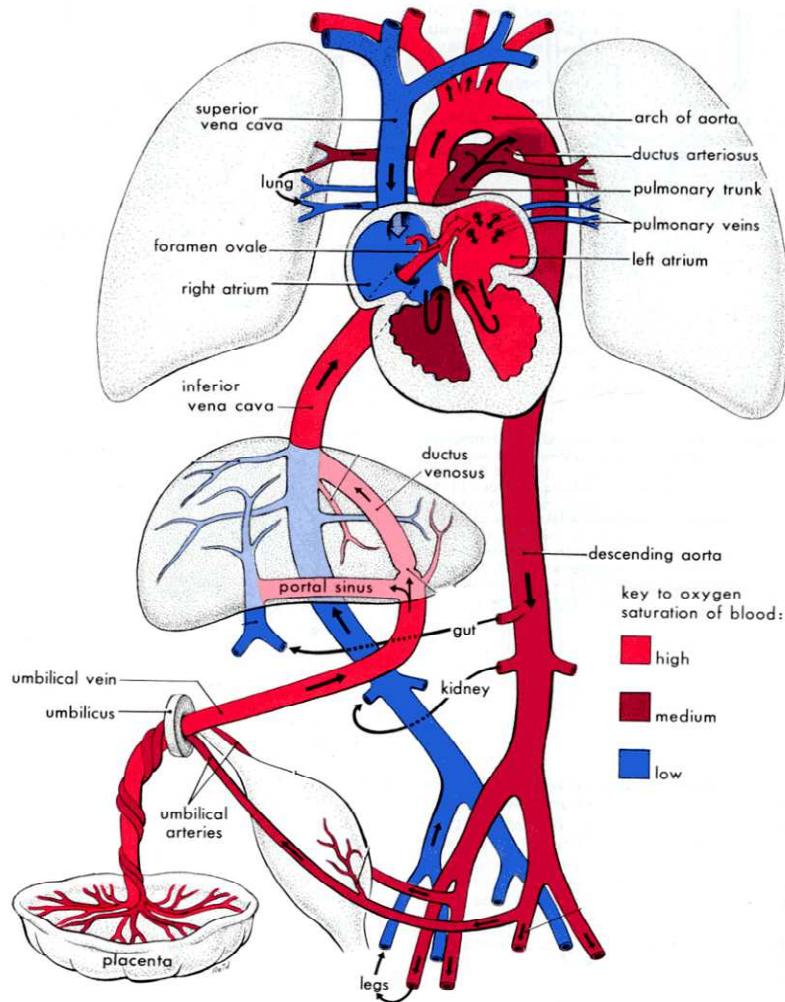
At birth, the clamping of the umbilical cord eliminates the placenta as a reservoir for blood, triggering an increase in systemic vascular resistance (SVR), an increase in blood pressure, and increased pressures in the left side of the heart. The removal of the placenta also eliminates the need for blood flow through the ductus venosus, causing functional elimination of this fetal shunt. Systemic venous blood flow is then directed through the portal system for hepatic circulation. Umbilical vessels constrict, with functional closure occurring immediately. Fibrous infiltration leads to anatomic closure in the first week of life (Alvaro & Rigatto, 2005).

Successful transition and closure of fetal shunts creates a neonatal circulation where deoxygenated blood returns to the heart through the inferior and superior vena cava. Blood then enters the right atrium to the right ventricle and travels through the pulmonary artery to the pulmonary vascular bed. Oxygenated blood returns through pulmonary veins to the left atrium, the left ventricle, and through the aorta to systemic circulation. Hypoxia, acidosis and congenital heart defects are conditions that lead to a sustained high PVR and may interfere with the normal sequence of events (Askin, 2008).

The graphics on the next page illustrate fetal and neonatal circulation.



Fetal and Neonatal Circulation



Reference: Moore, K.L. & Persaud, T.V.N. (2008). *The Developing Human: clinically oriented embryology* (8th ed.). Philadelphia: Saunders



1.3 Respiratory Adaptation

The initiation of breathing is a complex process that involves the interaction of biochemical, neural and mechanical factors (Alvaro & Rigatto, 2005). Pulmonary blood flow, surfactant production, and respiratory musculature also influence respiratory adaptation to extrauterine life.

- Umbilical cord clamping decreases oxygen concentration, increases carbon dioxide concentration, and decreases the blood pH. This stimulates the fetal aortic and carotid chemoreceptors, activating the respiratory centre in the medulla to initiate respiration.
- Mechanical compression of the chest during the vaginal birth forces approximately 1/3 of the fluid out of the fetal lungs. As the chest is delivered, it re-expands, generating a negative pressure and drawing air into the lungs. Passive inspiration of air replaces fluid. As the infant cries, a positive intrathoracic pressure is established which keeps the alveoli open, forcing the remaining fetal lung fluid into the lymphatic circulation.
- In order for the respiratory system to function effectively, the infant must have:
 - adequate pulmonary blood flow
 - adequate amount of surfactant
 - respiratory musculature strong enough to support respiration

(Askin, 2008)

1.4 The Newborn Transitional Period

Healthy full-term newborns show a predictable pattern of behavioural changes, behavioural states and cues, sensory abilities, and physiologic adaptations during the first 6- 8 hours following delivery. This transitional period is divided into an initial period of reactivity and inactivity and a second period of reactivity (Askin, 2008). The **first period of reactivity**, occurs in the first 30-60 minutes of life and is described by an alert, exploratory and active newborn. Suck is strongest at this time therefore this is the best time to breastfeed. “Early skin-to-skin contact (SSC) begins ideally at birth and involves placing the naked baby, covered across the back with a warm blanket, prone on the mother's bare chest. This time may represent a psychophysiological 'sensitive period' for programming future behavior, and may benefit breastfeeding outcomes, early mother-infant attachment, infant crying and cardio-respiratory stability” (Cochrane Database, 2007).

During this initial period, the newborn may be tachypneic (up to 80 bpm) and tachycardic (up to 180 bpm). Mild to moderate chest wall retractions, nasal flaring and expiratory grunting may be observed and crackles may be heard. Periodic breathing (pauses in breathing of less than 15 seconds) may be noted and acrocyanosis (bluish hands and feet) is also normal (Zaichkin & Askin, 2010).



The **period of relative inactivity** takes place 2 -3 hours after birth. The newborn becomes less interested in external stimuli and falls asleep for a few minutes to several hours. During deep sleeps, the baby is difficult to arouse. Feeding may be difficult. Heart rate should stabilize at 100 - 140 bpm and the respiratory rate decrease to 40 to 60 breaths per minute. The newborn should be centrally pink with clear breath sounds and show no signs of respiratory distress.

The **second period of reactivity** occurs between 4 - 6 hours after birth. This will last from 10 minutes to several hours. Heart and respiratory rates may increase but should remain within normal limits (Zainchkin & Askin, 2009).

1.5 Cardiovascular Changes

PRENATAL STATUS	POSTBIRTH STATUS	ASSOCIATED FACTORS
Primary Changes Pulmonary Circulation <ul style="list-style-type: none"> High pulmonary vascular resistance Increased pressure in right ventricle and pulmonary arteries Systemic Circulation <ul style="list-style-type: none"> Low pressures in the left atrium, ventricle and aorta 	<ul style="list-style-type: none"> Low pulmonary vascular resistance Decreased pressure in the right atrium, ventricle and pulmonary arteries High systemic vascular resistance Increased pressure in left atrium, ventricle and aorta 	<ul style="list-style-type: none"> Expansion of collapsed fetal lung with air Loss of placental blood flow
Secondary Changes Umbilical Arteries <ul style="list-style-type: none"> Patent Carries deoxygenated blood from hypogastric arteries to 	<ul style="list-style-type: none"> Functionally closed at birth permanently gone at 2-3 months 	<ul style="list-style-type: none"> Close prior to the umbilical vein Likely due to smooth muscle contraction in response to



PRENATAL STATUS	POSTBIRTH STATUS	ASSOCIATED FACTORS
<p>placenta</p> <p>Umbilical Vein</p> <ul style="list-style-type: none"> • Patent • Carries blood from placenta via ductus venosus through liver to the inferior vena cava <p>Ductus Venosus</p> <ul style="list-style-type: none"> • Patent • Connects umbilical vein to inferior vena cava <p>Ductus Arteriosus</p> <ul style="list-style-type: none"> • Patent • Shunts blood from pulmonary artery to descending aorta (right to left shunt) <p>Foramen Ovale</p> <ul style="list-style-type: none"> • Formation of a valve opening that allows blood to flow directly from the right atrium to the left atrium (shunt) 	<ul style="list-style-type: none"> • Closed, and forms a ligament when fully obliterated • Closed, and forms a ligament when fully obliterated • Functionally closed almost immediately after birth • Anatomic obliteration within 1-3 months • Functionally closed at birth • Permanent closure within a few months or years in the majority of people 	<p>thermal and mechanical stimuli and alteration in oxygen tension</p> <ul style="list-style-type: none"> • Closes shortly after umbilical arteries • Blood from placenta may still enter neonate until cord is clamped • Loss of flow from umbilical vein (clamping of the cord) • High systemic resistance increasing aortic pressure • Low pulmonary resistance reducing pulmonary arterial pressure • Increased oxygen content of blood in ductus arteriosus creating vasospasm of its muscular wall • Increased pressure in the left atrium and decreased pressure in the right atrium causing closure of valve over foramen



2. Initial Assessment of the Newborn

The physical examination of the newborn begins at birth and continues throughout the hospital stay. Newborn assessment includes observation, auscultation, and palpation, proceeding in a systematic head-to-toe fashion, although it can be adapted to the particular infant and situation. In order to obtain quality data, the assessment is organized to minimize stress for the infant. It is best to begin by observing the symmetry, respirations, movement, and behaviour of the baby. The infant's respiratory rate, heart rate, colour and axillary temperature should be measured and recorded.

At birth, a healthy newborn should be immediately put skin-to-skin on his/her mother, dried and covered by dry warm blankets. The newborn's Apgar scoring and initial assessments should be done while remaining skin-to-skin (unless resuscitation is required). Administration of medications, measurements and weight should be delayed until a period of *uninterrupted* skin-to-skin contact on mother for at least one hour, or until after the newborn's first attempt to breastfeed.

2.1 Apgar Score

The purpose of the Apgar score is to provide an estimate of how well the newborn is adapting to life (see table on next page). The score is done at 1 and 5 minutes after birth, and may be repeated at 10 minutes if the score is and remains low.

- Score ≤ 3 - critically low
- Score 4 to 6 - fairly low
- Score 7 to 10 - generally normal.

A low score on the one-minute test may show that the newborn requires medical attention but is not necessarily an indication that there will be long-term problems, particularly if there is an improvement by the five-minute test/assessment.



APGAR SCORE			
SIGN	0	1	2
Colour	Blue or pale	Acrocyanotic [Pink body, blue extremities]	Completely pink
Heart Rate	Absent	Less than 100 beats per minute	Greater than 100 beats per minute
Reflex Irritability	No response	Grimace	Cry or active withdrawal
Muscle Tone	Limp	Some flexion	Active motion
Respiration	Absent	Weak cry; Hypoventilation	Good, crying

(Kattwinkel, 2011)

2.2 Vital Signs

a) RESPIRATIONS

- Assess respirations while the infant is at rest.
- Count respirations for one full minute while observing abdominal and thoracic movement.
The normal rate for respirations is 40-60 breaths/minute.
- Auscultate the chest bilaterally and over all the lung fields to determine the quality of air entry and breath sounds.

Be AWARE of the signs of RESPIRATORY DISTRESS:

SIGNS OF RESPIRATORY DISTRESS	CAUSE
Tachypnea <ul style="list-style-type: none"> • Respirations (> 60 breaths/minute) 	<ul style="list-style-type: none"> • Develops when the newborn attempts to improve ventilation
Grunting <ul style="list-style-type: none"> • Audible sounds resulting of expired air passing through a partially closed glottis 	<ul style="list-style-type: none"> • The glottis closes in an effort to increase intrapulmonary pressure and to keep alveoli open • Keeping alveoli open during expiration is a compensatory response to decreased partial pressure of oxygen (pO₂)
Retractions <ul style="list-style-type: none"> • Depressions observed between the ribs, above the sternum, or below the xiphoid process during inhalation 	<ul style="list-style-type: none"> • Result from a very compliant chest wall and noncompliant lung



SIGNS OF RESPIRATORY DISTRESS	CAUSE
Nasal Flaring <ul style="list-style-type: none">Outward flaring movements of the nostrils on inspiration in an attempt to move more air into the lungs	<ul style="list-style-type: none">Occurs as an attempt to decrease airway resistance and increase the inflow of air
Central Cyanosis <ul style="list-style-type: none">Bluish discoloration (duskiness) of the body, lips, and mucous membranes	<ul style="list-style-type: none">Results from inadequate oxygenation caused by atelectasis, poor lung compliance, and right-to-left shunting.
Asymmetry of chest movements	<ul style="list-style-type: none">May result from conditions such as:<ul style="list-style-type: none">-Diaphragmatic hernia,-Cardiac lesions causing congestive heart failure,-Pneumothorax-Phrenic nerve damage

(ACoRN, 2010)

b) HEART RATE

- Place the warm stethoscope on the left side of the infant's chest, near the edge of the sternum and slightly lower than the nipple line. The heart sounds can be clearly heard at the point of maximal intensity (PMI) which is located at the third to fourth intercostal space just lateral to the mid-clavicular line.
- Assess the heart rate and the rhythm for one full minute, noting heart sounds (i.e.: quality, pitch, location, murmurs or unusual sounds).
- The normal heart rate ranges from 100-160 beats/minute, but some term babies may have a resting heart rate as low as 80 bpm (ACoRN, 2010).

c) TEMPERATURE

- Assess the temperature via the axillary route. This is the safest and most convenient mode to measure temperature in the neonate. The risk of trauma is increased with a temperature taken rectally. The use of tympanic thermometers is not recommended as readings may not be accurate in children under 2 years of age (ACoRN, 2010).
- The normal axilla temperature ranges from 36.3 – 37.2°C (ACoRN, 2010).

NOTE: A cold stressed infant may exhibit normal to elevated axilla temperatures in response to metabolism of brown fat.



- Place the probe gently against the axilla (in alignment with the length of the baby's body) and hold the infant's arm pressed firmly against the side and hold the thermometer in place until a reading is obtained.

2.3 Medication Administration

Newborns in Canada routinely receive two medications at birth: an intramuscular injection of Vitamin K and an antibiotic agent for eye prophylaxis. Parents may refuse Vitamin K; however, it is important to document the reason for refusal as well as information given to parents about the risks of disregarding the recommended treatments. Some institutions have specific forms for parents to sign should they refuse standard procedures recommended/required for newborn care.

a) VITAMIN K

Intramuscular administration of Vitamin K is the most effective method of preventing hemorrhagic disease of the newborn. It is administered to the newborn in order to facilitate normal clotting until the newborn's intestinal tract produces the bacteria necessary to synthesize Vitamin K. Vitamin K should be given as a single intramuscular dose to all newborns **within 6 hours of birth** (Canadian Paediatric Society and College of Family Physicians of Canada, 2014; Provincial Council for Maternal & Child Health, 2012). For infants weighing less than or equal to 1500 grams, the dose is 0.5 mg IM; for infants weighing more than 1500 grams, the dose is 1.0 mg IM.

NOTE: If parents refuse Vitamin K IM, an oral dose of 2.0 mg can be given at the first feeding, with follow-up doses given at 2 to 4 weeks of age and 6 to 8 weeks of age. Parents should be advised of the importance of the baby receiving the follow-up doses and be cautioned that their infants remain at increased risk of late hemorrhagic disease (CPS & CFPC, 2014).

b) EYE PROPHYLAXIS

It has been standard practice in Ontario that all newborns should receive a prophylactic agent against ophthalmia neonatorum, due to maternal gonorrhoea or chlamydia infections, except for very premature newborns whose lids are fused at the time of birth. The administration of the prophylactic agent may be delayed for **up to one hour after birth** to enable parent–infant contact and/or initial stabilization of the baby (Provincial Council for Maternal and Child Health, 2012).

According to the *Health Protection and Promotion Act*, R.S.O. 1990, Regulation 557, section 33, the administration of ophthalmic eye prophylaxis to newborns is a fundamental part of healthcare in Ontario and healthcare providers are required to administer an effective ophthalmic agent into the eyes of newborns. The *Health Protection and Promotion Act* (HPPA) supersedes the *Health Care Consent Act*, 1996 and does not allow for exemptions based on informed choice in the application of eye prophylaxis for newborns. It was previously recommended that each eye be treated with a 1-cm ribbon of 0.5% erythromycin ointment.

To date there has been a great deal of controversy regarding this mandatory prophylaxis. In November 2012, the Association of Ontario Midwives released a position statement advocating that “parents should have the right to decline neonatal eye prophylaxis for their newborns” (p. 1). In March 2015, the Infectious Diseases and Immunization Committee of the Canadian Paediatric Society, released a position statement which provided updated recommendations for preventing ophthalmia neonatorum based on the current state of evidence (Moore, MacDonald & Canadian Paediatric Society, 2015). While not prescriptive, this position statement did highlight evidence to suggest that there are medications other than erythromycin that can effectively prevent neonatal infection in newborns that are born to mothers with known gonorrhoea or chlamydia infections. Please consult that CPS position statement for more information.

Provinces that are legislated to provide neonatal eye prophylaxis are reviewing the CPS guidelines to determine whether the current regulation for mandatory eye prophylaxis needs to be changed or be eliminated. In Ontario, this will be done through the Provincial Council for Maternal and Child Health (PCMCH). In the meantime, health care practitioners are advised to consult with the public health authority in their area to receive directions on how this issue should be managed/ addressed. Health care providers should refer to organizational policies in the event that a family has made an informed choice to decline the eye prophylaxis. Additionally, health care providers should educate parents about the signs of infection/ conjunctivitis and the appropriate follow-up.



2.4 Newborn Measurements

a) WEIGHT

- Place a paper or warm blanket on the scale basket and zero scale.
- Remove the infant's clothing/blanket (no diaper).
- Place the infant on the scale, keeping one hand over the infant without touching.
- If this is the first weight following birth, encourage support person to take a picture of the baby on the scale so the weight can be seen (useful if transcription error occurs).
- Read and note weight.

b) LENGTH

- Lay the infant on a flat surface in a recumbent position.
- Place a hand over the knees so that the infant's legs are extended.
- With the foot flexed, draw a line marking the bottom of the heel.
- Continue to immobilize the infant and draw a line at the infant's head.
- Remove the infant and measure the distance between the two points.

c) HEAD CIRCUMFERENCE

- Wrap measuring tape around the largest area of the infant's head, over the occipital, parietal, and frontal prominences. Begin above the eyebrows and ears, and continue around the back of the head. Take the largest of several measurements.
- **NOTE:** Cranial molding or scalp edema may affect the measurements.
- Measure head circumference (HC) daily or as ordered if abnormal results are obtained.

d) CHEST CIRCUMFERENCE

- Place the measuring tape under the infant's back at a level corresponding to the xiphoid process and bring each end toward front under the axilla at the nipple line.
- Secure the zero end over the sternum and then pull the other portion of the tape so it fits snugly around the chest.
- Read the measurement when the infant exhales.

e) ABDOMINAL GIRTH

- Place the tape under the infant's back at a level corresponding to the position of the umbilicus.
- Secure the zero mark above the umbilicus.

- Pull the other portion of the tape until it fits snugly around the abdomen.
- Read measurement at the point where the zero mark meets the other portion of the tape when the infant exhales.

3. Complete Physical Examination of the Newborn

AREA	SPECIFICS	USUAL FINDINGS	VARIATIONS	ABNORMALITIES
HEAD	Shape	<ul style="list-style-type: none"> • Symmetrical • Molded (with vaginal birth) • Round (if cesarean birth) • Palpable anterior and posterior fontanels and sutures • Anterior fontanel flush with neighbouring parts (can be expected to be slightly depressed when child is in sitting position) • Sutures are normally felt as ridges immediately after birth or as depressions within a day 	<ul style="list-style-type: none"> • Asymmetry due to molding, • Scalp lesions or abrasion • Cephalohematoma • Caput succedaneum • Posterior fontanel may be difficult to palpate if sutures are overriding • Overriding of the sutures (observe and notify MD) 	<ul style="list-style-type: none"> • Severe molding, especially if accompanied by abnormal transition • Tension of the anterior fontanel (To be determined when the infant is in a sitting position) • Remarkable pulsation of fontanels • Depressed fontanel (dehydration) • Full bulging fontanels (intracranial pressure) • Depressed skull fracture (notify MD immediately) • Unusually large or small head in relation to body size • Unusual hair pattern or texture • Subgaleal hemorrhage (notify MD immediately)
EYES	Symmetry	<ul style="list-style-type: none"> • Correct placement on face in relation to one another 		<ul style="list-style-type: none"> • Centered or deviated to right or left
	Appearance	<ul style="list-style-type: none"> • Edema • Blink reflex present • Fused < 25 weeks approx. 		<ul style="list-style-type: none"> • Marked edema or inflammation • Drooping • Setting-sun sign
	Discharge	<ul style="list-style-type: none"> • None 		<ul style="list-style-type: none"> • Purulent
	Sclera	<ul style="list-style-type: none"> • Bluish-white 		<ul style="list-style-type: none"> • Hemorrhage, jaundice
EARS	Shape	<ul style="list-style-type: none"> • Well-formed • Cartilage present • Upper part of ear should be on same plane or above angle of eye 	<ul style="list-style-type: none"> • Preauricular papillomas (ear tags) may be present • Amt. of cartilage varies (less with prematurity) • May be folded or creased 	<ul style="list-style-type: none"> • Malformations • Low placement
NOSE	Symmetry	<ul style="list-style-type: none"> • Midline of face 		<ul style="list-style-type: none"> • Deviated to the right or left
	Shape	<ul style="list-style-type: none"> • Appears flattened 		<ul style="list-style-type: none"> • Malformation or unusual flattening
	Patency	<ul style="list-style-type: none"> • Should breathe easily through nose when mouth is closed 	<ul style="list-style-type: none"> • Some mucous present in nares may interfere with breathing 	<ul style="list-style-type: none"> • Flaring of nares, • Stenosis of naris (choanal atresia)

AREA	SPECIFICS	• USUAL FINDINGS	• VARIATIONS	• ABNORMALITIES
MOUTH	Lips	<ul style="list-style-type: none"> • Pink • Rooting reflex 	<ul style="list-style-type: none"> • Transient circumoral cyanosis 	<ul style="list-style-type: none"> • Cleft • Persistent cyanosis
	Tongue	<ul style="list-style-type: none"> • Pink • Positioned inside mouth • Normal size 		<ul style="list-style-type: none"> • Thrush • Protrusion • Frenulum linguae (tongue tie) (may interfere with sucking) • Large and thick
	Palate	<ul style="list-style-type: none"> • Pink and well formed 	<ul style="list-style-type: none"> • Epstein's pearls 	<ul style="list-style-type: none"> • Cleft
	Gums	<ul style="list-style-type: none"> • Pink 	<ul style="list-style-type: none"> • Rear gums whitish • Can appear jagged • Neonatal teeth can be present or inclusion cysts (whitish tooth-like cysts) 	
NECK	Appearance	<ul style="list-style-type: none"> • Short, straight 		<ul style="list-style-type: none"> • Masses • Distended veins or edema • Webbing
	Motion	<ul style="list-style-type: none"> • Unrestricted range of motion 		<ul style="list-style-type: none"> • Congenital torticollis • Opisthotonus
CHEST	Shape	<ul style="list-style-type: none"> • Almost circular 	<ul style="list-style-type: none"> • Depressed sternum 	Barrel
	Clavicles	<ul style="list-style-type: none"> • Straight, smooth 		<ul style="list-style-type: none"> • Fractures (crepitation, tenderness, palpable mass)
	Expansion	<ul style="list-style-type: none"> • Symmetry of movement with respirations 		<ul style="list-style-type: none"> • Asymmetrical movements (e.g. diaphragmatic hernia, pneumothorax)
	Respirations	<ul style="list-style-type: none"> • Rate 40-60/min 		<ul style="list-style-type: none"> • Laboured breathing • Grunting on expiration • Retractions with respirations • Tachypnea
	Breast Tissue	<ul style="list-style-type: none"> • Present in both sexes 	<ul style="list-style-type: none"> • Excessive amount of breast tissue • Breast engorgement 	
	Nipples	<ul style="list-style-type: none"> • Symmetrical placement of nipples 	Presence of supernumerary nipples	Asymmetrical placement of nipples

AREA	SPECIFICS	USUAL FINDINGS	VARIATIONS	ABNORMALITIES
CIRCULATION	Heart Rate	<ul style="list-style-type: none"> • Rate 100-160 bpm • Rate increased following physical or emotional stimulus 		<ul style="list-style-type: none"> • Heart sounds heard on right side (dextrocardia) • Tachycardia
	Capillary Refill	<ul style="list-style-type: none"> • < 3 seconds 		<ul style="list-style-type: none"> • > 3-4 seconds (poor perfusion)
	Murmur	<ul style="list-style-type: none"> • Absent 	<ul style="list-style-type: none"> • Intermittent during first few days of life 	<ul style="list-style-type: none"> • Persistent • Muffled heart sounds • Extra sound
	Pulses	<ul style="list-style-type: none"> • Equal bilaterally 		<ul style="list-style-type: none"> • Absent or weak • Bounding (PDA) • Upper > lower
ABDOMEN	Shape	<ul style="list-style-type: none"> • Contour cylindrical and relatively prominent • Soft 		<ul style="list-style-type: none"> • Asymmetry • Distention • Gastroschisis • Bladder extrophy • Localized bulging (e.g. hernia) • Scaphoid abdomen (e.g. diaphragmatic hernia)
	Umbilical Stump	<ul style="list-style-type: none"> • Bluish white • 3 vessels • Dry within several hours after birth 	<ul style="list-style-type: none"> • Umbilical hernia may be present and is usually insignificant 	<ul style="list-style-type: none"> • Abnormal redness • Bleeding or oozing • Odour • Omphalocele
	Sounds	<ul style="list-style-type: none"> • Transient in first 24 hrs 	<ul style="list-style-type: none"> • Intermittent 	<ul style="list-style-type: none"> • Hypermobility
ANUS	Patency	<ul style="list-style-type: none"> • Normal position • Dimpled or puckered appearance 		<ul style="list-style-type: none"> • Imperforated anus
GENITALIA	Appearance	<p>Female</p> <ul style="list-style-type: none"> • Labia minora quite prominent and protrude over labia majora <p>Male</p> <ul style="list-style-type: none"> • Prepuce usually adherent to the glands • Testicles usually in scrotum • Scrotum small and firm or fairly loose, relaxed and pendulous • Meatal opening should appear as a slit 	<ul style="list-style-type: none"> • Smegma • Vaginal discharge - mucoid or blood tinged • Undescended testicles on either side 	<ul style="list-style-type: none"> • Excessive vaginal bleeding • Malformations (e.g. epispadias, hypospadias, phimosis) • Hydrocele • Ambiguous (both male/female)

AREA	SPECIFICS	USUAL FINDINGS	VARIATIONS	ABNORMALITIES
EXTREMITIES	Appearance	<ul style="list-style-type: none"> • Generally flexed but can be passively put through a full range of motion • Alignment of parts and presence of all limbs and extremities 	<ul style="list-style-type: none"> • May retain in utero position when sleeping 	<ul style="list-style-type: none"> • Limitation of movement in any joint (e.g. fractures, paralysis). • Presence of defects or missing parts of all extremities (club feet, webbing, palmar or plantar simian crease, extra digits)
	Color	<ul style="list-style-type: none"> • Acrocyanosis may last for several hours after birth 		<ul style="list-style-type: none"> • Difference in colour or temperature between the extremities
SKIN	Appearance	<ul style="list-style-type: none"> • Pink • Varies with race and ethnic origin 	<ul style="list-style-type: none"> • Hemangiomas • Lanugo • Milia • Vernix caseosa • Peeling • Birthmarks • Mongolian spots • Petechiae (rapid delivery) • Meconium stained • Erythema • Bruising 	<ul style="list-style-type: none"> • Pallor • Jaundice in 1st 24 hrs of life • Central cyanosis (e.g. cardiac, neurological or respiratory problem) • Pustules • Abrasions • Lacerations

(Creehan, 2008; Tappero & Honeyfield, 2009; The Ottawa Hospital, 2006; Zaichkin & Askin, 2010)



References

- ACoRN Editorial Board. (2010). *Acute care of at-Risk Newborns: A resource and learning tool for health care Professionals*. (1st ed.). Vancouver, BC: author.
- Alvaro, R. E. & Rigatto, H. (2005). Cardiorespiratory adjustments at birth. In: *Avery's neonatology pathophysiology & management of the newborn* (6th ed.) (pp. 285-303). Philadelphia, PA: Lippincott Williams & Wilkins.
- Askin, D. (2008). Newborn adaptation to extrauterine life. In: K. R. Simpson & P. A. Creehan (Eds). *AWHONN's Perinatal Nursing* (3rd ed.) (pp. 527-545). Philadelphia, PA: Lippincott Williams & Wilkins.
- Askin, D. (2009). Fetal-to-neonatal transition – What is normal and what is not? Part 1: The physiology of transition. *Neonatal Network*, 28(3), e33-e40.
- Association of Ontario Midwives (2012). Informed choice and neonatal eye prophylaxis. Retrieved from http://www.ontariomidwives.ca/images/uploads/documents/AOM_position_statement_on_Informed_Choice_and_Eye_Prophylaxis_Nov_2012.pdf
- Canadian Paediatric Society & College of Family Physicians of Canada. (Reaffirmed 2014). Routine administration of vitamin K to newborns. Retrieved from <http://www.cps.ca/documents/position/administration-vitamin-K-newborns>
- Creehan, P. A. (2008). Newborn physical assessment. In: K. R. Simpson & P. A. Creehan (Eds). *AWHONN's Perinatal Nursing* (3rd ed.) (pp. 556-574). Philadelphia, PA: Lippincott Williams & Wilkins
- Health Canada. (2000). *Family-centred maternity and newborn care - National guidelines*. Retrieved from http://www.phac-aspc.gc.ca/dca-dea/publications/fcmc06_e.html
- Kattwinkel, J. (Ed.). (2011). *Textbook of neonatal resuscitation* (6th Ed.). Elk Grove, IL: American Academy of Pediatrics and American Heart Association.
- Kenner, C. (2003). Resuscitation and stabilization of the newborn. In C. Keener & J. QW. Lott (Eds.), *Comprehensive neonatal nursing: A physiologic perspective* (3rd ed.) (pp. 210-227). Philadelphia, PA: Saunders.
- Moore, E. R., Anderson, G. C., & Bergman, N. (2007). Early skin-to-skin contact for mothers and their healthy newborn infants. *Cochrane Database of Systematic Reviews*, Issue 3. Art. No.: CD003519. DOI: 10.1002/14651858.CD003519.pub2.



Moore, D. L., MacDonald, N. E. & Canadian Paediatric Society, Infectious Diseases and Immunization Committee (2015). Preventing ophthalmia neonatorum. *Paediatric Child Health*, 20(2), 93-96. Retrieved from <http://www.cps.ca/en/documents/position/ophthalmia-neonatorum>

Provincial Council for Maternal and Child Health. Maternal-Newborn Advisory Committee-Mother Baby Dyad Care Work Group. (2012). *Promotion of mother-baby dyad care*. Retrieved from <http://www.pcmch.on.ca/health-care-providers/maternity-care/pcmch-strategies-and-initiatives/mother-baby-dyad-care/>

Service Ontario (2011). *Health Protection and Promotion Act. R. S. O. 1990, Chapter H. 7*. Retrieved from http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90h07_e.htm#BK39

The Ottawa Hospital (2006). *Assessment of infant*. Ottawa: Author.

Zaichkin, J., & Fraser, D. (2010). The healthy newborn. In: R. J. Evans, M. K. Evans, Y. M. R. Brown, & S. A. Orshan (Eds.). (2010). *Canadian Maternity, Newborn, & Women's Health Nursing*. (1st ed.) (773-851). Philadelphia, PA: Lippincott Williams & Wilkins.

Resources

American Academy of Pediatrics - www.aap.org

Canadian Pediatric Society - www.cps.ca

Champlain Maternal Newborn Regional Program (CMNRP) www.cmnrp.ca

Evans, R. J., Evans, M. K., Brown, Y. M. R., & Orshan, S. A. (2010). *Canadian Maternity, Newborn, & Women's Health Nursing*. (1st Ed.). Philadelphia, PA: Lippincott Williams & Wilkins.

Merenstein, G. B., & Gardner, S. L. (2006). *Handbook of Neonatal Intensive Care*. (6th Ed.) St-Louis, MI: Mosby.

Simpson, K. R., & Creehan, P. A. (2008). *AWHONN's Perinatal Nursing* (3rd Ed.). Philadelphia, PA: Lippincott Williams & Wilkins.

Tappero, E. P. & Honeyfield, M. E. (2009). *Physical Assessment of the Newborn: A Comprehensive Approach to the Art of Physical Examination*. (4th ed.). Santa Rosa, CA: NICU INK Book Publishers.



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