# CHAPTER 1 – PEDIATRIC HEALTH ASSESSMENT

*First Nations and Inuit Health Branch (FNIHB) Pediatric Clinical Practice Guidelines for Nurses in Primary Care*.
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# INTRODUCTION

The clinical assessment of infants and children differs in many ways from that for adults. Because children are growing and developing both physically and mentally, values for parameters such as dietary requirements and prevalence of disease, expected normal laboratory values and responses to drug therapy will be different from those observed in adults.

For more information on adolescent health assessment, *see the chapter "Adolescent Health."*

# HEALTH MAINTENANCE REQUIREMENTS

Healthy children should have regular health maintenance visits, often done at well-baby clinics. Such visits customarily occur at 1 and 2 weeks of age, at 1, 2, 4, 6, 9, 12 and 18 months of age, and subsequently at 1- or 2-year intervals.

At each visit, the child should undergo an appropriate history, physical examination and developmental assessment. Immunizations should also be given according to provincial guidelines. Anticipatory guidance should be provided about the following topics:

- Appropriate nutrition
- Safety measures *(see "Pediatric Prevention Activities" in the chapter "Pediatric Prevention Activities and Health Maintenance")*
- Expected developmental and behavioural events

In addition, an assessment should be made of the quality of physical care, nurturing and stimulation that the child is receiving.

The most important components that should be assessed at each health maintenance visit are shown in Table 1.

**Table 1 – Components of Well-Child Assessments at Various Ages**

| Health Parameter | Most Important Ages for Assessment |
|---|---|
| Height, weight | Every visit, from birth to 16 years of age |
| Head circumference | Every visit in the first 2 years of life |
| Growth chart plotting | Every visit |
| Blood pressure | Once in the first 2 years, then every year starting at age 3[1] |
| Eye assessment | Every visit in the first year of life, then every well-child visit |
| Strabismus assessment | Every visit in the first year of life, then every well-child visit |
| Visual acuity testing | Initial screening (for example, Snellen chart) at 3–5 years of age; every 2 years between 6 and 10 years of age, then every 3 years until 18 years of age |
| Dental assessment | Every visit |
| Speech assessment | Every visit |
| Developmental assessment* | Every visit |
| Sexual development | Every visit |
| School adjustment | Every visit after child reaches school age |
| Chemical abuse | Consider during assessments of children > 8 years of age |
| Immunizations | According to provincial schedule: often at 2, 4, 6, 12 and 18 months and at 4–6 and 14–16 years |
| Hemoglobin | Screen at 6–12 months |
| Safety counselling | Every visit |
| Nutrition counselling | Every visit |
| Parenting counselling | Every visit |
| Parent/caregiver–child interactions | Every visit[2] |

*Formal developmental testing is done only if there is a concern on the part of the parents or caregiver or the health care professional. Refer to the appropriate primary health care provider (for example, speech-language pathologist, physician, psychologist) for assessment.

The Rourke Baby Record (RBR), revised May 2009, is an evidence-based health supervision guide for primary health care practitioners of children in the first 5 years of life.

The forms are available from the Rourke Baby Record web site (http://www.rourkebabyrecord.ca).

– Rourke Baby Record 2009: Evidence-based infant/child health maintenance guides I–IV (birth to 5 years) and immunization record

The Greig Health Record is an evidence-based child and adolescent health promotion guide for primary health care practitioners caring for children aged 6 to 17 years *(see* Greig Health Record at http://www.cps.ca/english/statements/cp/PreventiveCare.htm*)*.

# PEDIATRIC HISTORY

## TIPS AND TECHNIQUES

### CHILDREN

Children who can communicate verbally should be included as historians, with additional details provided as necessary by parents or caregivers. Health care professionals should interact (for example, smile, coo) or play with children so as to not scare them or make them cry.

Questions, explanations and discussions occurring with children present should take into account their level of understanding. Young children may be assisted in providing details of the history by such techniques as having them play roles or draw pictures. The interviewer should gain an understanding of the child's terminology for various body parts.

### ADOLESCENTS

Adolescents should be granted privacy and confidentiality.

- Interview the adolescent alone
- Discuss with parents or caregiver separately, with the adolescent's permission

*See also the chapter, "Adolescent Health"* for more information.

## COMPONENTS OF THE PEDIATRIC HISTORY[3]

The pediatric history includes many of the same components as the adult history, including:

- Identifying data
- Chief complaint
- History of present illness
- History of past illnesses
- Allergies
- Medication history
- Tobacco, alcohol and/or drug use
- Family history
- Personal and social history (including grade level, family of origin, interests, lifestyle)
- Review of systems

In addition, the pediatric history should include the following information:

- Who the primary caregiver is
- Who is providing the history
- Pregnancy and perinatal history
- Birth history, including Apgar score
- Immunization history
- Detailed dietary history for the first year of life, including history of vitamin supplements and fluoride use. Also include dietary intake for other age groups, including how much tea, carbonated beverages and juice are being consumed
- Developmental history (including physical, cognitive, language, social and emotional)
- Social history, including questions about how many people live in the home, recent separations, deaths, family crises, friends, peer relationships, daycare arrangements, progress in school, smoking in the home and secure food access for child and family
- Physical environment at home, including presence of mold and poor heating or insulation

# PHYSICAL EXAMINATION OF THE NEWBORN

Observe the entire infant at the beginning of the examination, before the assessment of specific organ systems. It is important that the infant be completely undressed and in a warm environment with adequate illumination.

## GENERAL APPEARANCE

Assess the following:

- Level of consciousness, alertness, general behaviour and appearance (how well the baby looks)
- Symmetry of body proportions
- Posture of limbs (flexed, extended)
- Body movements (for example, arms and legs, facial grimace)
- State of nutrition and hydration
- Colour
- Any sign of clinical distress (for example, respiratory distress includes dyspnea, pallor, cyanosis, irritability)

## VITAL SIGNS

Average values of vital signs for newborns:

- Temperature 36.5°C to 37.5°C
- Heart rate 120–160 beats/minute
- Respiratory rate 30–60/minute, up to 80/minute if infant is crying or stimulated
- Systolic blood pressure 50–70 mm Hg

## GROWTH MEASUREMENTS

Measure and record length, weight and head circumference. If the infant appears premature or is unusually large or small, assess gestational age *(see Table 3, "Assessment of Gestational Age")*.

- Average length at birth 50–52 cm
- Average weight at birth 3500–4400 g
- Average head circumference at birth 33–35 cm (this is done only at well-child visits unless hydrocephalus is suspected)

These parameters should be recorded on gender-appropriate growth curves, which should form part of the child's health record. Printable electronic versions of the growth charts are available at:

- Growth charts for boys: Birth to 36 months, and 2 to 20 years (http://www.cps.ca/english/statements/CP/Rourke/RourkeGrowthBoys2006.pdf)
- Growth charts for girls: Birth to 36 months, and 2 to 20 years (http://www.cps.ca/english/statements/CP/Rourke/RourkeGrowthGirls2006.pdf)

For additional information about growth measurements, *see "Growth Measurement" in the chapter, "Pediatric Prevention Activities and Health Maintenance."*

## SKIN

### COLOUR

- Pallor associated with low hemoglobin or vasoconstriction (for example, in shock)
- Cyanosis associated with hypoxemia
- Plethora associated with polycythemia or vasodilation
- Cherry red face associated with carbon monoxide poisoning
- Jaundice associated with elevated bilirubin

### LESIONS

- *Milia*: Pinpoint white papules of keratogenous material, usually on nose, cheeks and forehead, which last several weeks and then spontaneously resolve
- *Miliaria:* Obstructed eccrine (sweat) ducts appearing as pinpoint vesicles on forehead, scalp and skin folds; usually clear within 1 week
- *Transient neonatal pustular melanosis:* Small vesicopustules, generally present at birth, containing white blood cells (WBCs) and no organisms; intact vesicle ruptures to reveal a pigmented macule surrounded by a thin skin ring; spontaneously resolves by 3 months of age
- *Erythema toxicum:* Most common newborn rash, consisting of variable, irregular macular patches and lasting a few days

- *Stork bite:* Pink and flat nevus simplex, usually on face or back of the neck; those on face usually disappear by 18 months[4]
- *Café au lait spots:* Irregular brown, flat macules. Suspect neurofibromatosis if there are many (more than 5 or 6) large spots
- *Mongolian spots*: dark bluish/purplish patches present at birth, usually on back and buttocks but may be on limbs; common in First Nation's and Inuit children; usually fade away in first year of life

## HEAD AND NECK

### HEAD

Check for:

- Overriding sutures
- Anterior and posterior fontanelles (size, consistency, bulging or sunken)
- Abnormal shape of head (for example, caput succedaneum, molding, cephalohematomas, encephaloceles, microcephaly)
- Bruising of head, behind the ears or periorbitally

Measure head circumference.

### EYES: INSPECTION

- Check cornea for cloudiness (sign of congenital cataracts)
- Check conjunctiva for erythema, exudate, orbital edema, subconjunctival hemorrhage, jaundice of sclera
- Check for pupillary size, shape, equality and reactivity to light (PERRL: pupils equal, round, reactive to light), accommodation normal
- Red reflex: hold ophthalmoscope 15–20 cm (6–8 inches) from the eye and use the +10 diopter lens. If normal, the newborn's eye transmits a clear red colour back; black dots may represent cataracts; a whitish colour may suggest retinoblastoma

### EARS: INSPECTION

- Check for asymmetry, irregular shape, setting of ear in relation to corner of eye (low-set ears may suggest underlying congenital problems such as renal anomalies, fetal alcohol spectrum disorder or Down's sydrome)
- Look for fleshy appendages, lipomas or skin tags
- Dimples may suggest a brachial cyst
- Perform otoscopic examination; check canals for discharge and colour, and tympanic membranes for colour, brightness, perforation, effusion, bony landmarks and light reflex

### NOSE: INSPECTION

- Look for nasal flaring, which is a sign of increased respiratory effort
- Look for hypertelorism or hypotelorism (increased or decreased space between eyes)
- Check for choanal atresia (posterior nasal passage blockage uni- or bilaterally), as manifested by respiratory distress. Neonates are obligate nose breathers, so first check to determine if air is coming from nostrils; if not and choanal atresia is suspected, a soft nasogastric tube can be passed through each nostril to check patency

### PALATE: INSPECTION AND PALPATION

- Check for defects, such as cleft lip (some may have a membrane covering the cleft so it may not be obvious) and palate or a high arched palate

### MOUTH: INSPECTION

- Observe size and shape of mouth
- Microstomia (small mouth): seen in trisomy 18 and 21
- Macrostomia: seen in mucopolysaccharidosis
- "Fish mouth": seen in fetal alcohol syndrome
- Epstein pearls: small white cysts containing keratin, frequently found on either side of the median line of the palate (benign)

### TONGUE: INSPECTION

- Macroglossia: indicates hypothyroidism or mucopolysaccharidosis

### TEETH: INSPECTION

- Natal teeth (usually lower incisors) may be present
- Risk of aspiration if these are attached loosely

### CHIN: INSPECTION

- Micrognathia (abnormally small lower jaw) may occur with Pierre Robin syndrome, Treacher Collins syndrome and Hallerman-Streiff syndrome

### NECK: INSPECTION

- Symmetry of shape
- Alignment: torticollis is usually secondary to sternocleidomastoid hematoma
- Tracheal tug: can occur with dyspnea
- Neck mass (cystic hygroma is the most common type)

### NECK: PALPATION

- Palpate all muscles for lumps and the clavicles for possible fracture
- Neck range of motion for nuchal rigidity: decreased movement may be present in meningitis
- Lymph nodes cannot usually be palpated at birth; their presence usually indicates congenital infection

## RESPIRATORY SYSTEM

### VITAL SIGNS

- Respiratory rate

### INSPECTION

- Cyanosis, central or peripheral (transient bluish colour may be seen in extremities if infant is cooling off during the examination)
- Respiratory effort, rate and pattern (for example, periodic breathing, gasping, periods of true apnea)
- Observe chest movement for symmetry and retractions
- Anatomical abnormalities of chest (for example, pectus excavatum)
- Use of accessory muscles, tracheal tug, indrawing of intercostal or subcostal muscles

### PALPATION

- Any abnormal masses (palpate gently)
- Breasts may be slightly enlarged secondary to presence of maternal hormones

### AUSCULTATION

- Breath sounds
- Inspiratory to expiratory ratio
- Adventitious sounds (for example, stridor, crackles, wheezes, grunting)

Percussion is of little clinical benefit and should be avoided, especially in low-birth-weight or preterm infants, as it may cause injury (for example, bruising, contusions)

## CARDIOVASCULAR SYSTEM

### VITAL SIGNS

- Heart rate
- Blood pressure in upper and lower extremities

### INSPECTION

- Colour: pallor, cyanosis, plethora

### PALPATION

- Locate usual point of maximal impulse (PMI) by positioning one finger on the chest, in the fourth intercostal space medial to the midclavicular line
- Abnormal location of PMI can be a clue to pneumothorax, diaphragmatic hernia, situs inversus viscerum, congenital heart disease or other thoracic problem
- Capillary refill (< 2 seconds is normal)
- Peripheral pulses: note character of pulses (bounding or thready; equality); any decrease in femoral pulses or radial-femoral delay may be a sign of coarctation of the aorta

### AUSCULTATION

- Note rate and rhythm
- Note presence and quality of S1 and S2 heart sounds
- Assess for S3 and S4: S3 may be a normal finding in infants and children[3]
- Note presence of murmurs (consider murmurs pathologic, as in congenital heart defects, until proven otherwise)

## ABDOMEN

### INSPECTION

- Shape of abdomen: flat abdomen may signify decreased tone, presence of abdominal contents in chest or abnormalities of the abdominal musculature
- Contour: note any abdominal distension
- Masses
- Visible peristalsis
- Diastasis recti
- Obvious malformations (for example, bowel contents outside of abdominal cavity [omphalocele]; this abnormality has a membranous covering [unless it has been ruptured during delivery], whereas gastroschisis does not)
- Umbilical cord: count the vessels (there should be one vein (large and thin-walled) and two arteries (small and thick-walled); note colour, any discharge

### AUSCULTATION

- Bowel sounds

### PALPATION

- Check for any abnormal masses
- Liver and spleen: it may be normal for the liver to be located about 2 cm below the right costal margin; spleen is not usually palpable; if it can be felt, be alert for congenital infection or extramedullary hematopoiesis
- Kidneys: should be about 4.5–5 cm vertical length in the full-term newborn
- Techniques for kidney palpation: place one hand with four fingers under the baby's back, then palpate by rolling the thumb over the kidneys; or place the right hand under the left lumbar region and palpate the abdomen with the left hand to palpate the left kidney (do the reverse for the right kidney)
- Check for hernias: umbilical or inguinal

Percussion usually omitted unless a problem such as abdominal distension is noted.

Inspect the anal area for patency and for presence of fistulas or skin tags.

## GENITALIA

The genitalia should be carefully assessed, with particular attention to any malformation, abnormalities or sexual ambiguity.

### MALE GENITALIA

#### *Inspection*

- Glans: colour, edema, discharge, bleeding
- Urethral opening: should be located centrally on the glans (in hypospadias, the opening is found on the undersurface of the penis)
- Foreskin (prepuce): never force retraction of the foreskin
- Scrotum: in full-term infant, scrotum should have brownish pigmentation and should be fully rugated
- Palpation
- Testes: ensure that both testicles are descended into scrotum. Palpate inguinal area. If one or both are not descended, consult a physician

### FEMALE GENITALIA

#### *Inspection*

- Check labia, clitoris, urethral opening and external vaginal vault
- Whitish discharge is often present; this is normal, as is a small amount of bleeding, which usually occurs a few days after birth and is secondary to maternal hormone withdrawal
- Hymenal tags, if they occur, are normal

## MUSCULOSKELETAL SYSTEM

### INSPECTION AND PALPATION

#### *Spine*

- Check for scoliosis, kyphosis, lordosis, spinal defects, a patch of hair along the spine, meningomyelocele

### *Upper Extremities*

- Assess the shoulder girdle for injury and the clavicles for fracture (especially if the delivery was traumatic and in large infants with a history of shoulder dystocia)
- Assess mobility of the shoulder and extension of the elbow
- Inspect palmar creases for assessment of gestational age *(see Table 3, "Assessment of Gestational Age")*: they may appear different in some hereditary syndromes
- Count the fingers

### *Lower Extremities*

- Assess the feet and ankles for deformity and mobility
- Count the toes
- Examine foot creases for assessment of gestational age *(see Table 3, "Assessment of Gestational Age")*
- Examine the hips for neonatal hip instability using Ortolani and Barlow maneuvers *(see descriptions below)*. These tests may be somewhat unreliable depending on the examiner's experience, so further assessment may be needed[5]

### *Ortolani Maneuver*

- Flex the knee and hip
- Place middle fingers over greater trochanters
- Position thumbs on medial sides of knees
- Abduct the hip to 90° by applying lateral pressure with thumb
- Push forward with the middle fingers that are over greater trochanters
- If there is a "clunk," the hip may be dislocated

### *Barlow Maneuver*

- Flex the knee and hip
- Place thumbs on knees
- Place middle fingers over greater trochanters
- Adduct the hip medially and push backward on the knee with thumbs
- If there is a "clunk" or telescoping sensation, the hip may be dislocatable

## CENTRAL NERVOUS SYSTEM

- Assess state of alertness
- Check for lethargy or irritability
- Posture: For term infant, normal position is one with hips abducted and partially flexed and with knees flexed; arms are adducted and flexed at the elbow; the fists are often clenched, with fingers covering the thumb
- Assess tone: for example, support the infant with one hand under the chest; the neck extensors should be able to hold the head in line for 3 seconds. There should not be more than 10% head lag when the infant is moved from a supine to a sitting position

### REFLEXES[6,7]

Reflexes are involuntary movements or actions that help to identify normal brain and nerve activity and development. Some are present at birth and serve a variety of purposes, others develop later. Abnormal reflexes – ones that persist after an age they should disappear, or are absent at birth when they should be present – can help identify neurological or motor disease early *(see Table 7, "Newborn and Infant Reflexes")*.

### DEEP TENDON REFLEXES

These are not normally examined in the child under 5 years.

## APGAR SCORE

Apgar scoring is done at 1 and 5 minutes after birth. If necessary, it is repeated at 10 minutes after birth.

### INTERPRETATION

**At 1 Minute**

< 7: depression of nervous system

< 4: severe depression of nervous system

**At 5 Minutes**

> 8: no asphyxia

< 7: high risk for subsequent dysfunction of central nervous system

5–7: mild asphyxia

3–4: moderate asphyxia

0–2: severe asphyxia

**Table 2 – Determination of Apgar Score**

| Feature Evaluated | 0 Points | 1 Point | 2 Points |
|---|---|---|---|
| Heart rate | 0 | < 100 beats/min | > 100 beats/min |
| Respiratory effort | Apnea | Irregular, shallow or gasping breaths | Vigorous, crying |
| Colour | Pale or blue all over | Pale or blue extremities | Pink |
| Muscle tone | Absent | Weak, passive tone | Active movement |
| Reflex irritability | Absent | Grimace | Active avoidance |

* Sum the scores for each feature. Maximum score = 10; minimum score = 0.

## ASSESSMENT OF GESTATIONAL AGE

Gestational age can be assessed on the basis of the newborn's external characteristics.

**Table 3 – Assessment of Gestational Age**

| External Characteristic | 28 Weeks | 32 Weeks | 36 Weeks | 40 Weeks |
|---|---|---|---|---|
| Ear cartilage | Pinna soft, remains folded | Pinna harder, but remains folded | Pinna harder, springs back into place when folded | Pinna firm, stands erect from head |
| Breast tissue | None | None | Nodule 1–2 mm in diameter | Nodule 6–7 mm in diameter |
| Male genitalia | Testes undescended, scrotal surface smooth | Testes in inguinal canal, a few scrotal rugae | Testes high in scrotum, more scrotal rugae | Testes descended, scrotum pendulous, covered in rugae |
| Female genitalia | Prominent clitoris with small, widely separated labia | Prominent clitoris; larger, well-separated labia | Clitoris less prominent, labia majora cover labia minora | Clitoris covered by labia majora |
| Plantar surface of foot | Smooth, no creases | 1 or 2 anterior creases | 2 or 3 anterior creases | Creases cover the sole |

## SCREENING TESTS

### PHENYLKETONURIA

- All newborns should be screened for phenylketonuria (PKU) by means of a capillary blood sample before discharge from the hospital.
- For any newborn who undergoes this type of screening at less than 24 hours of age, the screening test *must* be repeated between 2 and 7 days of age.

For more information on PKU see http://www.mayoclinic.com/health/phenylketonuria/DS00514

### CONGENITAL HYPOTHYROIDISM

- All newborns should be screened by taking a thyroid-stimulating hormone (TSH) or thyroxine (T4) level by means of a dried capillary blood sample in the first week of life
- If a child was born in hospital, verify that this type of screening was done before discharge
- For more information on congenital hypothyroidism *see* http://www.healthlinkalberta.ca/Topic.asp?GUID={B3B69F4F-4A42-42BA-9ECB-5F3F9E6ACD84}

### OTHER SCREENING TESTS

For more information, see specific procedures for hemoglobin screening, developmental screening, hearing screening and vision screening under *"Screening Tests" in the chapter, "Pediatric Prevention Activities and Health Maintenance."*

# PHYSICAL EXAMINATION OF THE INFANT AND CHILD[8,9,10]

Clinicians should be aware of the different sizes of body parts in children relative to adults: the head is relatively larger, limbs relatively smaller and, in small children, the ratio of surface area to weight is relatively larger.

## TECHNIQUE

Much information can be obtained by observing the child's spontaneous activities while the history is being conducted, without touching the child. For this purpose it is useful to have an age-appropriate toy available. Approach infants and young children slowly and start by playing with them to gain their trust.

For a young child, do as much of the physical examination as possible with the child either being held by the parent or caregiver or supported on that person's lap.

Generally, the least stressful parts of the exam should come first, with more intrusive or distressing parts later (for example, examination of the pharynx and/or ears with the child restrained). Allowing the child to play with the equipment can often decrease anxiety about certain parts of the exam.

One must choose the quietest moment to do the respiratory and cardiac exam. This is usually at the beginning of the exam. **The order of the examination must be varied to suit the situation.**

Care should be taken to select appropriate-sized equipment when examining a child (for example, blood pressure cuff width should be greater than two-thirds of the length of the upper arm).

## GENERAL APPEARANCE

Without touching the child, observe (if applicable):

- Level of consciousness, alertness, general behaviour and appearance (how well the infant/child looks)
- Symmetry of body
- Posture of limbs (flexed, extended)
- Body movements (for example, arms and legs, facial grimace)
- State of nutrition and hydration
- Colour
- Any sign of clinical distress (for example, respiratory distress includes dyspnea, pallor, cyanosis, irritability)
- Gait
- Breathing frequency and pattern
- Responses to sound
- Fine and gross motor skills as the child plays
- Lesions (for example, petechiae, eczema, impetigo)
- Responses to parental comforting measures
- Ability to entertain themself while the caregiver is talking
- Quality of infant's cry or quality of child's voice
- Interaction pattern, speech and nature of child's responses to parent(s) and health care staff

## VITAL SIGNS

Assess for:

- Heart rate
- Blood pressure
- Respiratory rate
- Temperature (if warranted) (*see "Temperature Measurement in Children"*)
- Oxygen saturation (if warranted)

Blood pressure measurements are influenced by sex, age and height. Therefore blood pressure charts should be used to interpret the values *(see printable charts on the National Institutes of Health web site,* http://www.cc.nih.gov/ccc/pedweb/pedsstaff/bp.html*)*. Blood pressure should be recorded once in the healthy child under 2 years and then annually after that.[1]

**Table 4 – Normal Pediatric Heart Rate, Blood Pressure and Respiratory Rate By Age** (adapted from[11,12,13])

| Age | Heart Rate Range (beats/minute [mean]) | Lower Limit of Systolic Blood Pressure (mm Hg) | Respiratory Rate Range (breaths/minute) |
|---|---|---|---|
| Birth to 6 months | 80–180 [140] | 60 | 30–60 |
| 6 months to 12 months | 70–150 [130] | 70 | 30–50 |
| 1 to 3 years | 90–150 [120] | 72–76 | 24–40 |
| 3 to 5 years | 65–135 [110] | 76–80 | 22–34 |
| 5 to 12 years | 60–120 [85–100] | 80–90 | 16–30 |
| 12 years to adult | 60–100 [80] | 90 | 12–20 |

### TEMPERATURE MEASUREMENT IN CHILDREN

Proper temperature measurement is essential for clinical decision making in the pediatric population. Children should be unbundled for at least 15 minutes prior to taking their temperature. One needs to be aware of the normal temperature ranges for each measurement method and use recommended temperature measurement methods in children *(see Table 5 and Table 6)*.

**Table 5 – Normal Temperature Ranges**[14]

| Measurement Method | Normal Temperature Range |
|---|---|
| Rectal | 36.6 to 38°C |
| Tympanic | 35.8 to 38°C |
| Oral | 35.5 to 37.5°C |
| Axillary | 34.7 to 37.3°C |

**Table 6 – Recommended Temperature Measurement Methods in Children**[14]

| Age | Definitive Method | Method to Screen Low-risk Children |
|---|---|---|
| Less than 2 years | Rectal | Axillary |
| 2–5 years | Rectal | Axillary |
| | | Tympanic |
| Older than 5 years | Oral | Axillary |
| | | Tympanic |

Tympanic temperature measurement is contraindicated in newborns due to the shape of the ear canal and the potential for vernix or amniotic fluid in the canal.

## GROWTH MEASUREMENTS

Weight should be done at each visit for any infant under 1, those presenting for a well-child visit, at least annually for older children, and for any infant or child who presents with vomiting, diarrhea, signs of shock, or in need of a medication where dosage is dependent on weight.

Measurements of recumbent length (until 24 months old) or height, weight and head circumference (until 24 months old) should be part of every health maintenance visit. These parameters should be recorded on gender-appropriate growth curves, which should form part of the child's health record.

The Canadian Paediatric Society[15] recommends using the Centers for Disease Control Growth Charts, specific to each sex. They can be found at:

Growth chart for boys (Birth to 36 months, and 2 to 20 years):

http://www.rourkebabyrecord.ca/documents/Boys_Charts_4pg.pdf

Growth chart for girls (Birth to 36 months, and 2 to 20 years):

http://www.rourkebabyrecord.ca/documents/Girls_Charts_4pg.pdf

Printable electronic versions of the growth charts are *available at* http://www.cdc.gov/nchs/nhanes/growthcharts/clinical_charts.htm

For additional information about growth measurements, *see "Growth Measurement" in the chapter, "Pediatric Prevention Activities and Health Maintenance."*

## SKIN

Note colour, condition and lesions on all aspects of the body.

### COLOUR

- Pallor associated with low hemoglobin or vasoconstriction (for example, in shock)
- Cyanosis associated with hypoxemia
- Plethora associated with polycythemia or vasodilation
- Cherry red face associated with carbon monoxide poisoning
- Jaundice associated with elevated bilirubin

### LESIONS

- *Stork bite*: Pink and flat nevus simplex; usually on face or back of the neck; those on face usually disappear by 18 months[4]
- *Café au lait spots*: Irregular brown, flat macules. Suspect neurofibromatosis if there are many (more than 5 or 6) large spots
- *Mongolian spots:* dark bluish/purplish patches present at birth, usually on back and buttocks but may be on limbs; common in First Nation's and Inuit children; usually fade away in first year of life
- *Acne*: blackheads, whiteheads; more severe forms have papules, pustles and nodules; usually on face and sometimes on back, chest and shoulders; most common in adolescence

## HEAD AND NECK

### HEAD AND FACE

- Palpate anterior and posterior fontanelles (size, consistency, bulging or sunken) and cranium
- Bruising of head, behind the ears or periorbitally
- Size and shape of the head
- Facial symmetry at rest and while crying for the infant

### EYES: INSPECTION

To open the infant's eyes, support their head and shoulders and gently lower the infant backward.

- Check cornea for cloudiness (sign of congenital cataracts)
- Check the lids and external structures; note palpebral slant
- Assess for nystagmus
- Check conjunctiva for erythema, exudate, orbital edema, subconjunctival hemorrhage, jaundice of sclera
- Check for position and alignment of the eyes using cover-uncover test
- Check for corneal light reflex and ability to track movement for cardinal fields of gaze
- Check for pupillary size, shape, equality and reactivity to light (PERRL: pupils equal, round, reactive to light), accommodation normal
- Red reflex: hold ophthalmoscope 15–20 cm (6–8 inches) from the eye and use the +10 diopter lens; if normal, the newborn's eye transmits a clear red colour back; black dots may represent cataracts; a whitish colour may suggest retinoblastoma
- Inspect fundus, if possible
- Check visual acuity in children over 3 years of age

See also vision screening procedures under *"Screening Tests" in the chapter, "Pediatric Prevention Activities and Health Maintenance"* for more details.

### EARS

- Check for asymmetry, irregular shape, setting of ear in relation to corner of eye (low-set ears may suggest underlying congenital problems such as renal anomalies, fetal alcohol spectrum disorder or Down's sydrome)
- Look for fleshy appendages, lipomas or skin tags
- Palpate and inspect auricles
- Perform otoscopic examination; check canals for discharge, foreign bodies and colour, and tympanic membranes for colour, brightness, perforation, effusion, bony landmarks and light reflex

See also hearing screening procedures under *"Screening Tests" in the chapter, "Pediatric Prevention Activities and Health Maintenance"* for more details.

### NOSE: INSPECTION

- Determine if nares are patent. Look for foreign body
- Look for nasal flaring, which is a sign of increased respiratory effort
- Look for hypertelorism or hypotelorism (increased or decreased space between eyes)
- Note nasal discharge or sneezing
- Look at the mucosa, septum and turbinates with otoscope

### MOUTH

- Inspect lips, gums, palate, buccal mucosa, tongue, palate, tonsils
- Inspect tongue size and frenulum of tongue in infants
- Inspect teeth for number, character, condition, position and caries
- Palpate palate in young infants
- Note if uvula is midline

### NECK: INSPECTION

- Symmetry of shape, midline trachea
- Alignment: torticollis is often secondary to positional plagiocephaly
- Tracheal tug: can occur with dyspnea
- Neck mass

### NECK: PALPATION

- Palpate any masses (may signify congenital cysts), trachea, lymph nodes and thyroid
- Neck range of motion for nuchal rigidity: may be present in meningitis; in older children (over 5) Kernig and Brudzinski reflex may be helpful in assessing for meningitis
- Palpate clavicles

## RESPIRATORY SYSTEM

### INSPECTION

- Cyanosis, central or peripheral (transient bluish colour may be seen in extremities if infant is cooling off during the examination)
- Respiratory effort, rate and pattern (for example, periodic breathing, gasping, periods of true apnea)
- Observe chest movement for symmetry and retractions
- Note any movement of the abdomen with respirations
- Note chest size, shape, configuration and anatomical abnormalities of chest (for example, *pectus excavatum*)
- Use of accessory muscles, tracheal tug, indrawing of intercostal or subcostal muscles
- Note any nipple and breast development

### PALPATION

- Any abnormal masses (palpate gently)
- Nipples and breast tissue – it may be slightly enlarged secondary to presence of maternal hormones in infants

### AUSCULTATION

- Breath sounds
- Rate and rhythm
- Inspiratory to expiratory ratio
- Adventitious sounds (for example, stridor, crackles, wheezes, grunting)

Percussion as indicated.

## CARDIOVASCULAR SYSTEM

### INSPECTION

- Colour: pallor, cyanosis, plethora
- Pulsations on precordial area

### PALPATION

- Locate point of maximal impulse (PMI) by positioning one finger on the chest and note this location. Abnormal location of PMI can be a clue to pneumothorax, diaphragmatic hernia or other thoracic problems
- Palpate chest wall for thrills
- Capillary refill (< 2 seconds is normal)
- Peripheral pulses in each extremity and femoral: note character of pulses (bounding or thready; equality); compare strength of femoral pulses with radial pulses

### AUSCULTATION

- Note rate and rhythm
- Note presence and quality of S1 and S2 heart sounds
- Assess for S3 and S4: S3 may be a normal finding in infants and children[3]
- Note presence of murmurs (consider murmurs pathologic, as in congenital heart defects, until proven otherwise)

## ABDOMEN

### INSPECTION

- Shape of abdomen: flat abdomen may signify decreased tone or abnormalities of the abdominal musculature
- Periumbilical area
- Contour: note any abdominal distension
- Masses
- Visible peristalsis
- Diastasis recti
- Anal area for presence of fistulas, excoriation or fecal soiling

### AUSCULTATION

- Bowel sounds

### PERCUSSION

- All quadrants

### PALPATION

- Note muscle tone, skin turgor and underlying organs
- Check for any abnormal masses
- Check for enlarged organs
- Techniques for kidney palpation with infants: place one hand with four fingers under the infant's back, then palpate by rolling the thumb over the kidneys; or place the right hand under the left lumbar region and palpate the abdomen with the left hand to palpate the left kidney (do the reverse for the right kidney)
- Check for hernias: umbilical or inguinal
- Check for inguinal lymph nodes

## GENITALIA

Inspect the external genitalia and note stage of sexual maturity.

### MALE GENITALIA

#### *Inspection*

- Glans: colour, edema, discharge, bleeding
- Urethral opening: should be located centrally on the glans (in hypospadias, the opening is found on the undersurface of the penis)
- Foreskin (prepuce): never force retraction of the foreskin
- Testes: ensure that both testicles are descended into scrotum in infants. Palpate inguinal area. If one or both are not descended, consult a physician
- If masses are present, transilluminate the scrotum

### FEMALE GENITALIA

#### *Inspection*

- Check labia, clitoris, urethral opening and external vaginal vault
- Hymenal tags, if they occur, are normal

## MUSCULOSKELETAL SYSTEM

### INSPECTION AND PALPATION

#### *Spine*

– Check for scoliosis, kyphosis, lordosis, spinal defects, a patch of hair along the spine, meningomyelocele

#### *Upper Extremities*

– Inspect and note ROM and muscle tone of the shoulder, wrist and elbow
– Note aligment of arms and hands
– Inspect fingers and palmar creases

#### *Lower Extremities*

– Inspect and note ROM and muscle tone of the toes, knees, and ankles
– Note alignment of legs, feet and toes
– Note arch of foot
– In infants, examine the hips for hip instability using Ortolani and Barlow maneuvers *(see descriptions below)*. These tests may be somewhat unrealiable depending on the examiner's experience, so further assessment may be needed[5]

**Ortolani Maneuver**

– Flex the knee and hip
– Place middle fingers over greater trochanters
– Position thumbs on medial sides of knees
– Abduct the hip to 90° by applying lateral pressure with thumb
– Push forward with the middle fingers that are over greater trochanters
– If there is a "clunk," the hip may be dislocated

**Barlow Maneuver**

– Flex the knee and hip
– Place thumbs on knees
– Place middle fingers over greater trochanters
– Adduct the hip medially and push backward on the knee with thumbs
– If there is a "clunk" or telescoping sensation, the hip may be dislocatable

## CENTRAL NERVOUS SYSTEM

– Assess state of alertness
– Check for lethargy or irritability
– Posture
– Assess muscle tone (for example, support the infant with one hand under the chest; the neck extensors should be able to hold the head in line for 3 seconds; there should not be more than 10% head lag when the infant is moved from a supine to a sitting position)

### REFLEXES[16,17]

Reflexes are involuntary movements or actions that help to identify normal brain and nerve activity and development. Some are present at birth and serve a variety of purposes, others develop later. Abnormal reflexes – ones that persist after an age they should disappear, or are absent at birth when they should be present – can help identify neurological or motor disease early. The following are some of the reflexes that should be tested in newborns and infants up to 2 years of age.

**Table 7 – Newborn and Infant Reflexes** (adapted from[18,19,20])

| Reflex | Stimuli | Response | Age Appears/ Disappears | Pathology if Abnormal |
|---|---|---|---|---|
| Rooting | Stroke cheek | Head turns toward stimuli and mouth may open | Birth/3–4 months (up to 12 months during sleep) | May not be present if asleep; CNS disease or depressed infant |
| Sucking | Object touching lips or in mouth | Sucking to stimuli | Birth/4 months (up to 7 months during sleep) | May not respond well if sleeping or satisfied; If premature it may not be present; CNS depression |
| Tonic Neck | Head turned to one side for 15 seconds while laying supine | Arm and leg extension on the side the head is turned toward; arm and leg flexed on opposite side | Birth–2 months/4–6 months | Persistence – neurological damage; infant unable to get out of position is abnormal |
| Palmar Grasp | Put finger onto palm from ulnar side | Grasps finger strong and symmetric | Birth/3–6 months | CNS disease |
| Stepping | Held upright, one foot touches a flat surface | Alternating stepping movements | Birth/2–4 months | Absence – paralysis, depressed infant; cerebral palsy |
| Moro | Sudden drop in position or jarring | Symmetrical arm, spine and leg extension, head moves back and fingers spread; then arms flex toward each other | Birth/4 months at the latest | Asymmetry – paralysis or fractured clavicle; absence or persisting beyond 6 months – brainstem problem |
| Plantar Grasp | Place thumb at base of newborn's toes | Toes curl downward; should be symmetrical | Birth/4–8 months | Cerebral palsy, obstructive CNS lesion |
| Babinski | Lateral sole stroked from heel up and across ball of foot | Hyperextension (fanning) of toes | Birth/Variable (usually by 1 year) | CNS lesion, cerebral palsy |
| Landau | Held around waist in horizontal prone position | Lifts head and legs and extends the neck and trunk | By 3–6 months/ 15–24 months | Hypotonicity indicates motor system deficits; hypertonic arms with internal rotation, arm held at side or arm does not lift is abnormal |
| Parachute | Held around waist in horizontal prone position and lowered quickly head first to surface | Extends arms and hands to break the fall, symmetrically | By 6–8 months/ Never | Asymmetry indicates unilateral motor abnormality |

## DEEP TENDON REFLEXES

Deep tendon reflexes are not usually tested in children under 5 years of age. In older children, deep tendon reflexes may be tested. Reflexes must be symmetric. The child must be relaxed and comfortable. The reflexes include the biceps, brachioradialis, triceps, patellar and achilles.

## CRANIAL NERVE ASSESSMENT

After 2 years of age, cranial nerves can be tested with some modifications according to the developmental stage of the child *(see Table 8, "Cranial Nerve Assessment in Children")*.

**Table 8 – Cranial Nerve Assessment in Children** (adapted from[21])

| Cranial Nerve Number | Name/Function | How to Test |
|---|---|---|
| I | Olfactory | For older children, as in adults |
| II | Optic | Use Snellen chart(s) after age 3; ask parent to hold head if needed to test visual fields |
| III, IV, VI | Extraocular movement | Get child to follow (track) a light or a toy with the parent holding the child's head if needed |
| V | Trigeminal | Play a game, asking them to identify where the cotton ball touched them on the face (sensory); ask the child to clench their teeth or chew and swallow a piece of food |
| VII | Facial | Ask the child to imitate your faces |
| VIII | Acoustic | After age 4, whisper a word while covering one of the child's ears and have the child repeat it |
| IX, X | Swallow and gag | Ask the child to say "ahh" or stick their tongue and observe the the uvula and soft palate; test the gag reflex |
| XI | Spinal accessory | Ask the child to shrug, pushing your hands away, and push your hand away with their head to see how strong they are |
| XII | Hypoglossal | Ask the child to stick out their tongue |

## SCREENING

### DEVELOPMENTAL MILESTONES[22,23]

Assessment of developmental progress should be part of each complete health assessment (well-child visit) and take place at all visits for children who do not present regularly for well-child care. Developmental assessment is done by making inquiries of the parents or caregiver and by clinical observation of the child's achievement of major age-appropriate milestones. These are in areas of gross and fine motor, speech and language, and personal and social development.

Developmental milestones are achieved at different ages in different children. S*ee the Rourke Baby Record* at http://www.rourkebabyrecord.ca/documents/RBR_National_EN.pdf or *Table 9, "Developmental Milestones by Age and Type"* for the ages by which certain developmental milestones should occur.

**Table 9 – Developmental Milestones by Age and Type (should be present by this age)** (adapted from [24,25,26])

| Age | Gross Motor | Fine Motor | Personal/Social | Language/Cognitive |
|---|---|---|---|---|
| **Newborn** | • Reflex head turn side to side | | | |
| **1 month** | • Back completely rounded when sitting, head forward | • Focuses gaze<br>• Tracks horizontally to midline | • Able to suck on a nipple<br>• Social smile | • Startles to loud or sudden noise |
| **2 months** | | • Follows movement with eyes | • Enjoys being touched | • A variety of sounds and cries |
| **3 months** | • Lifts up on elbows<br>• Head steady when upright | • Unfisted >50% of time<br>• Eye tracks 180 degrees | | |
| **4 months** | • Lifts up on hands<br>• No head lag when pulled to sitting from supine | • Reaches for bright object | | • Turns head toward sounds<br>• Laughs or squeals |
| **6 months** | • Rolls back to front or front to back<br>• Sits with support | • Follows a moving object<br>• Brings objects to mouth | | • Babbles |
| **7 months** | | | • Has stranger anxiety<br>• Plays peek-a-boo | |
| **9 months** | • Sits and stands with support | • Opposes thumb and index finger | • Reaches to be picked up and held<br>• Looks for hidden toy | • Babbles different sounds<br>• Makes sound to get attention |
| **12 months** | • Crawls or 'bum' shuffles<br>• Pulls to stand or walks holding on | • Pincer grasp | • Shows many emotions<br>• Drinks from a cup | • Responds to own name<br>• Understands simple commands<br>• "Talks" making 3 different sounds |
| **15 months** | • Crawls up stairs or steps<br>• Tries to squat (picking up toys) | • Removes socks and tries to untie shoes<br>• Stacks 2 blocks<br>• Picks up and eats finger foods | • Looks at parent/ caregiver to see how to react (for example, for falls or with strangers) | • Attempts 2 or more words (may not be clear)<br>• Tries to get something by reaching, making sounds or pointing |
| **18 months** | • Walks backward 2 steps without support | • Feeds self with spoon and spills little<br>• Removes hat/socks without help<br>• Hand preference | • Behaviour is usually manageable<br>• Usually easy to soothe<br>• Comes for comfort when distressed | • Points to 3 different body parts<br>• Tries to get your attention to see something of interest<br>• Pretend play with toys (for example, feeds animal)<br>• Turns upon hearing name<br>• Imitates speech sounds regularly<br>• Says 3 consonants, for example, P M B W H N<br>• Says 3 or 4 words |

**Table 9 – Developmental Milestones by Age and Type (should be present by this age)** (adapted from [24,25,26])

| Age | Gross Motor | Fine Motor | Personal/Social | Language/Cognitive |
|---|---|---|---|---|
| **2 years** | • Tries running | • Puts objects into a small container | • Copies adult behaviours<br>• Develops new skills<br>• Concept of today | • At least 1 new word/ week<br>• 2-word sentences<br>• Many words |
| **3 years** | | • Twists lids off jars or turns knobs<br>• Turns pages one at a time<br>• Copies circle | • Shares sometimes<br>• Listens to music or stories for 5–10 minutes with an adult<br>• Concept of yesterday | • Understands 2-step directions |
| **4 years** | • Stands on 1 foot for 1–3 seconds | • Draws a person with at least 3 body parts<br>• Copies “+” | • Toilet trained during the day<br>• Tries to comfort someone who is upset | • Understands 3-part directions, if related<br>• Asks lots of questions |
| **5 years** | • Hops on one foot | • Throws and catches a ball<br>• Copies square | • Shares willingly<br>• Works alone on something for 20–30 minutes<br>• Separates easily from parents<br>• Dresses without assistance | • Counts to 10 and knows common colours and shapes<br>• Speaks clearly in sentences |
| **6 years** | | • Copies triangle<br>• Draws 6 part person | | • Well developed vocabulary, quickly retrieves words<br>• May stutter |
| **8 years** | | | • Concept of right and left | • Can follow complex directions<br>• Tells jokes |
| **10 years** | | | • Has a special friend (same sex) | • Able to discuss ideas and understand inflections and metaphors |
| **12 years** | | | • Language is a means of socializing | • Can think about sophisticated concepts<br>• Ability to express emotions |

A developmental screening tool should be used to look at more specific developmental milestones at each well-child visit. Screening tools are not diagnostic, but help to determine when further assessment is needed. There are two broad categories of screening tools: those that rely on information from the parent or caregiver and those that rely on eliciting skills directly from the infant or child. Nurses are encouraged to use the same developmental screening tool that the majority of nurses are using in their province and/or their region and for which they have training. Some developmental screening tools that are appropriate for First Nations and Inuit children are[27]:

– Ages and Stages Questionnaire 3rd Edition (http://www.agesandstages.com)
– Child Development Inventories (http://www.childdevrev.com)
– Nipissing District Developmental Screen (free for use in Ontario) (http://www.ndds.ca)
– Parents' Evaluations of Developmental Status (PEDS) (http://www.pedstest.com)

All of these tools rely on information from parents or caregivers. Some of the tools are also a teaching tool for parents about their child's development.

More detailed assessments are indicated when it appears, or concerns are raised by the parents, caregiver or health professional, that a child is not progressing normally, according to the above measures. Any child with suspected delay(s) should be referred promptly to the appropriate primary health care provider (for example, speech-language pathologist, physician, psychologist) for assessment.

As part of each complete health assessment, attempts should also be made to assess responses to sound and ability to see. For more information, *see "Hearing Screening" and "Vision Screening" in the chapter, "Pediatric Prevention Activities and Health Maintenance."*

## OTHER SCREENING TESTS

Routine screening should be done in infants and children for hemoglobin, development, hearing and vision. See specific procedures for hemoglobin screening, developmental screening, hearing screening and vision screening under *"Screening Tests" in the chapter, Pediatric Prevention Activities and Health Maintenance."*

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**All internet addresses are valid as of June 2010.**

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