
CHAPTER 3 – PEDIATRIC PREVENTION AND HEALTH MAINTENANCE

First Nations and Inuit Health Branch (FNIHB) Pediatric Clinical Practice Guidelines for Nurses in Primary Care.
The content of this chapter has been reviewed July 2009.

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PEDIATRIC PREVENTION ACTIVITIES

Prevention consists of activities directed toward decreasing the probability of specific illnesses or disabilities in individuals, families and communities. It is the concept of reducing unwanted health outcomes by reducing or eliminating risk factors that might lead to those adverse outcomes.

Prevention has three components: primary, secondary and tertiary prevention.

Primary Prevention

Activities aimed at intervention before pathological changes have begun and within the natural history of susceptibility. Immunization is an example of primary prevention.

Secondary Prevention

Activities aimed at early detection of disease and prompt treatment to cure disease during its earliest stages or to slow its progression, to prevent complications and to limit disability when cure is not possible. A screening program is an example of secondary prevention.

Tertiary Prevention

Activities aimed at limiting the effects of disease and disability for people in the earlier stages of illness and providing rehabilitation for people who already have residual damage. Pain control is an example of tertiary prevention.

IMMUNIZATION

For a detailed discussion of all issues related to vaccines and immunization refer to the latest Canadian Immunization Guide, or for more recent updates on immunization refer to the National Advisory Committee on Immunization. Follow regional or provincial immunization schedules (see “*Canadian Immunization Guide*” at <http://www.phac-aspc.gc.ca/publicat/cig-gci/index-eng.php> and “*National Advisory Committee on Immunization*” at <http://www.phac-aspc.gc.ca/naci-ccni/>).

INJURIES

An injury is the result of any type of trauma, whether intentional or unintentional. Injuries are preventable.

In terms of potential years of life lost, injuries are significant contributors to total mortality. They are the leading causes of death and a major cause of morbidity in children ≤ 14 years of age in Canada. For example, in Canada, poisoning forms 6% of all unintentional injuries in children < 15 years of age.¹ Children of low socioeconomic status are more at risk for death and disability due to injury than those of high socioeconomic status.²

MOST COMMON TYPES OF INJURIES

*Infants, Toddlers and Pre-schoolers*³

- Falls
- Drowning (or near drowning)
- Burns, scalds
- Poisoning
- Abuse
- Motor vehicle trauma
- Choking and suffocation

School-Age Children

- Injuries related to sports
- All-terrain vehicle (ATV) and snowmobile accidents
- Motor vehicle trauma
- Drowning (or near drowning)
- Abuse

Adolescents

- Firearm-related injuries
- ATV and snowmobile accidents
- Motor vehicle trauma
- Poisoning (ingesting a large amount of one or more substances, for example, pharmaceutical agents, drugs and/or alcohol)

INJURY PREVENTION STRATEGIES

Preventing injuries requires effort from the entire community. It requires a detailed history of exposure to potentially injurious activities at home, at school and in the community. Identifying children and families at risk is a critical step in preventing injuries. A large part of preventing injuries is educating parents and caregivers about potential dangers to children and methods of avoiding injuries. It also involves educating adolescents. In particular, it has been demonstrated that education is positively associated with poisoning, and prevention should include strategies to raise awareness.⁴ These are important roles for health care workers, particularly nurses, to take on during well-baby clinics and episodic visits. Environments and behaviours can be modified by construction (for example, fences around water, safer roads) and by regulations (for example, requiring seatbelts and bicycle helmets).

The Consumer Product Safety web site of Health Canada has many different resources on how to ensure child safety with regard to topics such as sun, cribs and trampolines (see “Consumer Product Safety” at <http://www.hc-sc.gc.ca/cps-spc/pubs/cons/index-eng.php>).

ANTICIPATORY GUIDANCE AND COUNSELLING^{5,6}

The parents or caregiver should be educated about the following strategies to minimize the risk of injury.

Home Safety

- Ensure that the house is equipped with fire alarms, fire extinguishers and carbon monoxide detectors; check batteries regularly
- Establish emergency exit routes, and ensure that all members of the family are aware of them
- Ensure that firearms, weapons and ammunition are stored safely and securely at all times
- Set water heater thermostat below 54°C to prevent scalding
- Safely store dangerous substances and medications, and keep them out of reach of younger children (that is, in upper or locked cupboards)
- Keep the telephone number for poison control by the phone

All Children

- Do not hold a child while consuming hot drinks or smoking
- Use sunscreen, long-sleeved clothing and a hat when a child will be exposed to sun
- Correctly use an approved child safety seat and/or seatbelt in vehicles to protect the child
- Raise children in a smoke-free and drug-free environment
- Use childproof lids on medication bottles
- Supervise children’s activity, particularly when close to vehicular traffic
- When a child is near water (including wading pools), ensure that he or she is wearing a life jacket and is under continual supervision
- Wash fruits and vegetables well
- Allow one person on the trampoline at a time
- Teach children to be safe around strangers (for example, avoid contact, never go with and never accept things from strangers)
- Teach dental care by cleaning teeth with a washcloth or soft brush and water until age 2. After 2, only use a pea-sized amount of toothpaste. A fluoride supplement can be given after 6 months if fluoride ingestion from all sources is low⁷ (see “Vitamin and Mineral Supplements” in the chapter, “Nutrition”)

All Infants and Toddlers

- Never leave a child unattended in bathtub, car, changing table or other areas from where they can fall
- Children like to put things in their mouths, so keep small, hard objects that could be swallowed out of reach, and avoid toys with strings, cords, or small, sharp or detachable parts that could come off while in the child’s mouth
- Keep occlusive materials (for example, plastic bags and balloons) away from children
- Remove small objects, tablecloths, dangling cords and/or appliances that may be within an infant’s reach
- Avoid nuts, peanut butter, seeds, hot dogs, gum, popcorn, grapes and round candies (they are easily aspirated)
- Advise older children not to share small food items or objects (for example, gum, peanuts, grapes, hot dogs, pennies) with an infant or toddler
- Do not share a bed with a child

Infants Birth to 6 Months

- Position child on back for sleeping (to prevent sudden infant death syndrome)
- Support the neck of the young infant and handle child with care when picking up or moving them (also supervise other children playing with an infant)
- Never shake an infant
- All women should be encouraged and helped to breast feed their infants
- Ensure that the mattress fits snugly in crib against railings and that it provides good body support (that is, not made of feathers, not too soft); space between bars should be approved by CSA International

Infants 6–12 Months

- Cover electrical outlets
- Keep electrical cords and plugs out of reach or covered to prevent burns from chewing exposed cords or putting plugs in mouth
- Avoid use of baby walkers, which represent a significant cause of injury
- Use gates at steps and stairways to protect from falls

Toddlers and Pre-schoolers

- Turn pot handles away from edge of stove
- Use caution while cooking with children around
- Ensure that a child wears a helmet while bicycling or skateboarding
- Teach children sidewalk, street and road safety
- Avoid transporting pre-school children on ATVs and snowmobiles
- Keep matches and lighters out of reach
- Teach children to share and to control their temper
- Teach children to avoid animals they do not know, particularly if the animal is eating

School-Age Children

- Ensure that child wears a helmet for bicycle, ATV, snowmobile and skateboard use

- Teach children how to prevent playground injuries and how to use playground equipment safely
- Teach bicycle safety
- Ensure that children receive instruction about water safety and swimming skills
- Encourage children to be active
- Teach children about fire safety and first aid
- Provide instruction about the dangers of flammable and toxic materials and how to handle them safely

Adolescents

- Provide guidance about risk-taking behaviour (particularly alcohol and substance abuse)
- Provide guidance about sexual activity, including how to say No to unwanted touching
- Provide opportunities to talk about values, fears, and perceptions
- Discuss needs related to self-harming actions (for example, cutting or suicide ideation) and how to deal with anger and violence
- Provide instruction about gun safety
- Provide instruction about boating, ATV and snowmobile safety
- Do *not* allow children younger than 16 to operate an ATV, boat or snowmobile
- Encourage adolescents to take a driver's education course when legally able
- Reinforce the danger of driving while drinking or using drugs
- Encourage adolescents to be active
- Ensure helmet use for bicycle, ATV, snowmobile and skateboard activities
- Ensure that the adolescent receives instruction about water safety (for example, do water activities with a friend, checking depth before jumping or diving) and swimming skills
- Teach first aid and CPR and consider automated external defibrillator (AED) training⁸

HEALTH MAINTENANCE

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.

WELL-CHILD VISIT

The Rourke Baby Record is an evidence-based infant/child health maintenance guide for primary health care practitioners. It provides an excellent tool, Evidence-Based Infant/Child Health Maintenance Guides I-IV, to guide health maintenance and well-child care for children up to age 5 (*see Rourke Baby Record at <http://www.rourkebabyrecord.ca> and the tool at http://www.rourkebabyrecord.ca/documents/RBR_National_EN.pdf*).

See also “Pre-School Entry Assessment”.

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

PURPOSE OF EACH VISIT⁵

- Immunization
- Screening for growth, developmental or physical problems
- Screening for child maltreatment (*see “Child Maltreatment”*)
- Identify parental concerns
- Parental support and education
- Anticipatory guidance and counselling regarding childhood nutrition (for example, preventing rickets), safety measures (for example, not exposing children to second-hand smoke, (*see “Anticipatory Guidance and Counselling”*), expected developmental and behavioural events and nurturing

COMPONENTS OF WELL-CHILD VISIT

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 ⁹
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 ¹⁰

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

Prior to the Visit

Review the child's health record and the family record, so that you are aware of previous health concerns. Review the child's immunization record. Ensure that consent for immunization is on file. From these, develop a care plan for what needs to be addressed during the current visit.

Health History

Discuss with the parents or caregiver the child's health and progress:

- Any parental concerns
- Current general health
- Developmental milestone achievements (*see "Developmental Milestones" in the chapter "Pediatric Assessment"*)
- Nutritional habits, vitamin supplements (*see "Vitamin and Mineral Supplements" in chapter, "Nutrition"*)
- Sleeping habits
- Behaviour, including play and safety
- Emotional, mental and social well-being
- Physical activity
- Dental care
- Relationships with family members

Physical Examination

Perform a physical examination (*see "Physical Examination of the Infant and Child" in chapter "Pediatric Assessment" for more on examination techniques*). Assess:

- Nutritional status
- Character of cry (in infants < 6 months of age)
- Activity level
- Responses to parental comforting
- Quality of physical care, nurturing and stimulation the child is receiving
- Any other aspect, as dictated by concerns raised in the history
- Skin, specifically colour and moisture
- Hair, scalp
- Fontanelles
- Eyes, ears, nose, mouth (including dentition), throat
- Vision screening (*see "Vision Screening"*)
- Hearing screening (*see "Hearing Screening"*)
- Lungs, heart

- Abdomen, genitalia
- Limbs, specifically muscle tone, grasp patterns, symmetry, gait and hips (for congenital hip dysplasia; at every visit up to 15 months of age)
- Spine
- Reflexes (at all visits until reflex disappears) (*see "Reflexes" under "Physical Examination of the Infant and Child," in the chapter, "Pediatric Health Assessment"*)¹¹
- Growth measurement (*see "Growth Measurement"*)
- Developmental milestone achievements (*see "Developmental Milestones" in the chapter, "Pediatric Health Assessment"*)
- Vital signs, including blood pressure after 2 years of age
- Hemoglobin (in infants aged 6–24 months) (*see "Hemoglobin Screening"*)
- Phenylketonuria and congenital hypothyroidism (ensure screening in hospital for newborn) (*see "Phenylketonuria" and "Congenital Hypothyroidism"*)

Remain alert for ocular misalignment (strabismus), vision disorders (for example, amblyopia), tooth decay, and child abuse or neglect. Any child with growth or developmental problems or other identified abnormalities should be referred to a physician.⁵

GROWTH MEASUREMENT

Measurement of a child's weight, height and head circumference (up to 36 months) is most important in the health assessment process, because growth is a major characteristic of childhood. Body mass index (BMI) should be routinely calculated for children after age 2 to identify children who may be at risk for conditions associated with excess body fat. Atypical growth patterns can be indicators of pathologic processes.

Correct measuring techniques and accuracy are essential if the measurements are to be useful in evaluating growth. For proper measuring techniques, see the Canadian Paediatric Society's 2004 publication, *A Health Professional's Guide to Using Growth Charts*. (*see* <http://www.cps.ca/english/statements/N/NutritionNoteGrowth.htm>).

In addition, the measurements must be appropriately recorded on a growth chart and compared to norms for the child's age and to his or her previous growth pattern. Measurements for infants born less than 36 weeks' gestation must be age corrected before being plotted, until at least 24 months (postnatal age in weeks – [40 weeks – gestational age]). If the child's measurements consistently follow the relevant growth curve, the growth pattern is considered normal. A graph gives an easily understood pictorial display of the child's growth and should alert the observer early to deviations from normal, if done consistently.

The Canadian Paediatric Society¹² recommends using the Centers for Disease Control Growth Charts, specific to each sex: Growth Chart for Boys (*birth to 36 months, and 2 to 20 years*, see http://www.rourkebabyrecord.ca/documents/Boys_Charts_4pg.pdf) and Growth Chart for Girls (*birth to 36 months, and 2 to 20 years* see http://www.rourkebabyrecord.ca/documents/Girls_Charts_4pg.pdf).

Evaluation of Children with an Abnormal Growth Curve

1. Check the growth data for accuracy. Small measurement errors can be significant.
2. If a growth problem is substantiated, assess the child closely for associated symptoms, abnormal findings on physical examination or delays in development.
3. Any abnormality in a child's rate of growth requires further assessment. Consult a physician for advice. Children with suspected growth abnormalities who are otherwise normal should be followed closely to determine their growth rate.
4. Always consider the parents' height and weight.

Abnormal Growth Problems

Body Mass Index^{13,14,15}

- Abnormal growth is considered:
 - if a child is above the 85th percentile for his/her age; or
 - in a child whose BMI crosses percentile lines: particularly when combined with a family history of obesity or diabetic risk factors, consider further assessment for comorbidities and underlying genetic or endocrine causes; or
 - if a child is overweight or obese

- For infants under age 2, use a weight/height ratio: if percentile lines are crossed upward and remain so for two to three months or are above the 97th percentile, consider the possibility of overweight starting, and discuss nutrition with parents
- Below the 5th percentile in BMI for age: consider underweight due to recent malnutrition, dehydration, failure to thrive or a genetic disorder

Weight¹²

- Above-normal weight combined with normal height: consider over-nutrition, genetics (often seen in First Nation's and Inuit children in the first year of life)
- Above-normal weight combined with below-normal height: consider a genetic cause (for example, Down's syndrome) or endocrine problems (for example, hypothyroidism, Cushing's disease)
- Below-normal weight combined with normal height and head circumference: consider under-nutrition, failure to thrive (see final bullet), iron deficiency, psychosocial deprivation, hypothyroidism
- Below-normal weight combined with below-normal height and head circumference: consider organic cause (for example, renal failure, iron deficiency, lead intoxication, immune deficiencies, inborn errors of metabolism, HIV infection)
- Weight drops by two or more lines on the growth chart: failure to thrive should be suspected and child is considered at high risk. (*see "Failure to Thrive" in chapter "Hematology, Endocrinology, Metabolism and Immunology"*). Investigations should be considered if they are below the 3rd percentile in weight for length

Height^{13,16}

- Above-normal height combined with normal weight and head size: in 90% of cases, this combination of growth parameters represents a familial tendency; the rate of growth is normal, although the absolute percentile value is greater than normal; may also be caused by excess production of growth hormone, hyperthyroidism or Marfan's syndrome
- Above-normal height, weight and head size: consider a pathologic process (for example, acromegaly) or a chromosomal disorder (for example, Klinefelter's syndrome)

- Below-normal height (less than 3rd percentile): consider parental stature, pathologic process (for example, deficiency of growth hormone, hypothyroidism, chronic anemia), a chromosomal disorder (for example, Turner’s syndrome) or failure of a major organ system (for example, GI, renal, pulmonary or cardiovascular)

Head Circumference¹³

Disproportionate Microcephaly

- Head size that is small relative to the child’s height and weight is often an indicator of a pathologic process
- Below-normal head size (< 3rd percentile) combined with normal weight and height: consider craniostylosis, prenatal insult (for example, maternal drug or alcohol abuse), maternal infection, complications during pregnancy or birth, chromosome defects
- Disproportionate microcephaly requires immediate evaluation (at the time of diagnosis)

Disproportionate Macrocephaly

- If the head size is large relative to the child’s height and weight, close attention must be given to the physical examination and assessment of developmental status – look for associated physical findings such as a bulging fontanelle or split sutures, neurologic abnormalities or delays in reaching developmental milestones
- Above-normal head size (> 97th percentile) combined with normal weight and height: consider primary hydrocephalus, hydrocephalus secondary to associated disease of the central nervous system, primary megalcephaly or megalcephaly secondary to associated disease of the central nervous system or to a metabolic storage disease (for example, Krabbe’s disease)

SCREENING TESTS

The idea of screening for early detection of disease is appealing, but it is valuable only if the following principles are present, amongst other population-based principles:

- The disease can be diagnosed reliably by a suitable test or examination
- There is an accepted treatment for a patient with the recognized disease

- The benefits (for example, quality of life) exceed the risks and costs and are economically balanced in relation to expenditures on medical care as a whole¹⁷

The following situations are those in which screening is thought to be useful in children.

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
- Refer to the Mayo Clinic 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
- Refer to Health Link Alberta for more information on congenital hypothyroidism (*see* <http://www.healthlinkalberta.ca/Topic.asp?GUID={B3B69F4F-4A42-42BA-9ECB-5F3F9E6ACD84}>)

Hemoglobin Screening

The prevalence of anemia is high among Aboriginal children 6–24 months of age. Other risk factors for anemia are prematurity, birth weight, exclusive breastfeeding beyond 6 months of age, lack of access to or inability to consume iron-fortified products, diet of cow’s milk only in the first year of life and low socioeconomic status.

All children between 6 and 12 months of age, optimally at 9 months, should be screened for hemoglobin level, according to the Canadian Task Force on Preventive Health Care (*see Table 2, “Normal Hemoglobin Levels in Children”*). Hemoglobin should be monitored more frequently in children in whom anemia has been identified and treatment has begun. There is evidence that children who were iron deficient in infancy have lower scores on psychomotor function testing.

Table 2 – Normal Hemoglobin Levels in Children

Age	Hemoglobin Level (g/L)
1 month	115–180
2 months	90–135
3–12 months	100–140
1–5 years	110–140
6–14 years	120–160

See “Iron Deficiency Anemia in Infancy” in the chapter “Hematology, Endocrinology, Metabolism and Immunology.”

Developmental Screening

In monitoring the health of children, developmental assessment is an important function that should not be neglected. Such 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.¹⁸

Assess achievement of developmental milestones for all children at every opportunity, or at least at the 2, 4, 6, 12, 18 and 24 month well-child visits and at 4–5 years of age, during pre-school entry assessment. General developmental milestones are described in the Rourke Baby Record (*see* http://www.rourkebabyrecord.ca/documents/RBR_National_EN.pdf) or Table 9, “Developmental Milestones by Age and Type” in the chapter “Pediatric Health Assessment.”). The earlier developmental and behavioural delays are detected, the sooner an intervention can be undertaken. Early intervention will minimize the long-term impact on the child. It is critical that steps be taken to alleviate developmental problems before the child reaches school age.

Developmental screening tools (for example, Ages and Stages Questionnaires, Child Development Inventories, Parents’ Evaluations of Developmental Status and Nipissing District Developmental Screen) should be completed at 2, 4, 6, 12, 18 and 24 month well-child visits and at 4–5 years of age, during pre-school entry assessment. They should also be completed if a concern about developmental delay is either expressed by the parent or caregiver or is suspected by the health care professional. Screening tools are not diagnostic, but help to determine when further assessment is needed. Regular and repeated screening is more likely to identify problems. Any child with a suspected delay(s) should be referred promptly to the appropriate primary health care provider (for example, speech-language pathologist, physician, psychologist) for assessment.¹⁹

See “Developmental Milestones” in the chapter “Pediatric Health Assessment”.

Hearing Screening

Hearing impairment is one of the most important causes of speech delay and educational, social-emotional and behavioural difficulties. Early intervention can help to prevent significant speech and educational delays. Therefore, the most important time to screen is during infancy. Care providers should be aware whether their province and/or referral hospitals do universal newborn hearing screening for congenital hearing loss and obtain these reports. If not done, screening should, if possible, be done before 1 month of age in the hospital or by an audiologist. If the child does not pass, a comprehensive assessment should be done by 3 months of age. Unfortunately, this is also the most difficult time to test a child’s hearing.²⁰

The parents or caregiver should be asked about the child’s hearing ability as part of every well-child visit, as hearing loss can be progressive. A checklist titled Your Child’s Hearing Development is available from the National Institute on Deafness and Other Communication Disorders. It provides a list of appropriate questions to ask and/or have the parents complete for each age group (*see* <http://www.nidcd.nih.gov/health/hearing/silence.asp>).

In addition, the clinician should observe the child’s response(s) to sounds and do appropriate developmental screening. A physician should be consulted about any concerns.

Possible indicators of hearing impairment:^{21,22}

- Speech is not progressing (for example, not saying single words by 12 months), the child stops babbling, or their language development is delayed or difficult to understand
- Does not react to or seem to hear loud noises around the house (for example, telephone)
- Ear pain or frequent ear infections
- Difficulty locating sounds (for example, does not turn toward sounds by 9 months)
- Speech is too soft or too loud
- Unless the speaker is facing them, they do not understand simple instructions
- Increasing the TV volume to a very high level
- Behavioural or academic difficulties and often labelled as being inattentive or disruptive, particularly for listening activities
- Often asks, “What?” or needs things to be repeated
- Speech is not clear or sounds different
- Reduced vocabulary and words are often missing endings
- Easily frustrated (more than other children of the same age)

Risk factors for hearing impairment:

- Caregiver concerns (hearing, developmental or speech)
- Family history of permanent childhood hearing loss
- Exposure to ototoxic medications (for example, gentamicin) or loop diuretics
- In utero infections (for example, cytomegalovirus, rubella)
- Head trauma
- Chemotherapy
- Neonatal intensive care stay of more than 5 days
- Hyperbilirubinemia requiring an exchange transfusion
- Assisted ventilation
- Craniofacial or outer or middle ear anomalies
- Syndromes associated with hearing loss (for example, neurofibromatosis, Usher syndrome)
- Neurodegenerative disorders (for example, Hunter syndrome) or sensory motor neuropathies
- Postnasal infections associated with sensorineural hearing loss (for example, bacterial and viral)
- Repeated ear infections

Formal hearing screening by such methods as tympanometry or pure-tone audiometry is reserved for high-risk children (see list above) or children not meeting speech-language milestones.²⁰

The Canadian Task Force on Preventive Health Care does not recommend routine formal testing of asymptomatic children for hearing impairment in the pre-school years. Furthermore, such testing is of little benefit in asymptomatic older children and adolescents.

Temporary conductive hearing loss secondary to otitis media or serous otitis media with effusion is common in Aboriginal communities and may persist for long periods of time (months). Consultation with a physician is important for management of chronic otitis media to try to prevent long-term hearing loss.

Hearing Screening Procedures²³

Perform gross hearing screening for all children during well-child visits or for episodic care if the child has not been seen for well-child care. Gross screening includes questioning the parents or caregiver about the child’s hearing ability, observing the response to a sound stimulus (for example, clapping hands) in a younger child. It also involves pure-tone audiometric screening in the older child (2 years of age) if a concern has been raised about hearing. Audiometry can detect unilateral and mild hearing loss.

Infants and Pre-School Children²⁴**Table 3 – Hearing Screening Procedures in Infants and Pre-school Children**

Age	Procedure	Method	Normal Response
Newborn to 2 months	Startle response (Moro reflex)	Produce a loud noise near the child's ear (for example, clap hands or slap table surface)	Child is startled, jumps at the noise, blinks, widens eyes, cries
3–5 months	Ability to track sound stimulus	Produce a noise (for example, ring bell, call child's name, sing)	Child's eyes shift toward sound; child responds to mother's voice or coos when he or she is engaged
6–8 months	Sound recognition	Produce noise out of child's line of vision (for example, ring bell, call child's name, sing)	Child turns head in response to sound; responds to name; babbles in response to verbalization
8–12 months	Sound localization	Call child's name or say words from outside child's field of vision	Child localizes to source by turning head or body toward sound; may try to imitate words
12–24 months	Speech development (normal for age)	Engage child in conversation or question parent or caregiver about speech	First words by 12–15 months; vocabulary of 20–50 words and 50% of speech understood by strangers by 24 months

Toddlers and Pre-School Children (2–5 Years of Age)**Pure Tone Audiometry Using Play Response Procedure**

1. Demonstrate method to child: put on earphones, pretend to hear a sound, say “I hear it” and at the same time, place a block in a box or a plastic ring on a ring holder.
2. Place earphones correctly on child.
3. Give a block or ring to the child.
4. Produce a tone at 50 dB and 1000 Hz, and guide child's hand to place block in box or ring on ring holder.
5. After practice, when child seems to understand the procedure and responds correctly, proceed with the screening.
6. Set audiometer at 25 dB and 1000 Hz and present tone in left earphone.
7. If child responds correctly, proceed to test 2000, 4000 and 6000 Hz at 25 dB.
8. Switch to right ear and present 1000, 2000, 4000 and 6000 Hz at 25 dB.
9. Record results on audiography sheet (child should be able to hear all frequencies at 25 dB).
10. Retest, later in the day, frequencies for which response was “doubtful.”
11. Children who do not hear all frequencies should be referred for further assessment by a physician.

School-Age Children (> 4 Years of Age)**Pure Tone Audiometry Procedure**

1. Same as above procedure (using play response), however the child raises their hand or responds verbally to tones heard.

Vision Screening

The Canadian Task Force on Preventive Health Care recommends that all well-child visits during the first 2 years of life include an eye examination to check for abnormalities of vision, including cataracts and retinoblastoma. The Task Force also recommends that initial screening of visual acuity be undertaken in the pre-school period (3–5 years of age).

Vision Screening Procedures

Screen all children for vision abnormalities. Screening should include the techniques included in each age category below. Any abnormalities should result in physician consultation.

Newborn to 3 Months of Age²⁵

- A complete examination of the skin and external eye structures, as well as the conjunctiva, cornea, iris and pupils, is an integral part of the physical examination of all newborns, infants and children

- The retina should be inspected (by means of the red reflex) for opacities of the lens (cataracts) and signs of posterior eye disease (retinoblastoma). Look for symmetrical colour between eyes and for any opacities or any inconsistencies in the redness of each retina
- Failure of visualization of the retina or abnormalities of the red reflex are indications for referral to an ophthalmologist
- Corneal light reflex should be done to test ocular alignment (misalignment = strabismus); if abnormal, a referral to an ophthalmologist is necessary (*see “Tests for Strabismus”*)

6–12 Months of Age

- Examination as for newborn to 3 months of age
- Cover–uncover test to test ocular alignment. It should be normal (*see “Tests for Strabismus”*) otherwise refer to an ophthalmologist
- Observe fixation and following

3–5 Years of Age

- Examination as for 6–12 months of age
- Visual acuity testing (*see “Visual Acuity Testing”*)

6–18 Years of Age

- Examination as for 6–12 months of age
- Visual acuity testing every 2 years until 10 years of age, then every 3 years until 18 years of age (*see “Visual Acuity Testing”*)

Other Suggested Screening Techniques

Birth to 4 Months of Age (Near-Visual Acuity)

Observe child and ensure that the following occur:

- Regards face (of examiner or mother) in line of vision
- Follows object or light to midline
- Follows object or light past midline
- Follows object or light through 180°
- Grasps rattle or interesting object when offered
- Reaches toward an object placed in line of vision

Tests for Strabismus

Procedure for Corneal Light Reflex Test

1. Sit at child’s eye level.
2. Hold a light source (penlight) 13 inches (32 cm) away from the child, in front of your own nose.
3. Ask child to focus on the light if child is old enough to understand and follow the instruction.

4. Observe position of the light reflex as it bounces off the eye.

Responses:

- *Normal*: both eyes are focused in the same position and the light reflects off the same area of the cornea on both eyes, usually slightly to the nasal side of the pupil centre
- *Abnormal*: eyes are not aligned in position and the light reflexes are asymmetric, that is, coming off different areas of the cornea for each eye; this may indicate strabismus

If response is abnormal for the corneal light reflex test, perform the cover–uncover test to further assess for strabismus.

Procedure for Cover–Uncover Test

Perform this test only if the child is able to cooperate.

1. Cover one eye with an opaque object (a large plastic spoon-shaped cover designed for this purpose may be available; otherwise, improvise).
2. Instruct or try to get the child to fix his or her gaze on a light source (held in front of him or her) with the uncovered eye and ensure eye is covered for 2–3 seconds.
3. Quickly remove the cover from the covered eye and observe the position of that eye and any change in position of the uncovered eye.
4. Repeat steps 1, 2 and 3 for the other eye.

Responses:

- *Normal*: both eyes are focused in the same position and do not change with covering or uncovering
- *Abnormal*: covered eye will deviate and may swing back into alignment when the cover is removed and/or the uncovered eye moves inward or outward to focus on the light; in more obvious cases, the eye will remain deviated after the cover is removed or always appears deviated

For further explanation, *see “Strabismus” in chapter, “Eyes.”*

Referral

Children with abnormal responses on the corneal light reflex test and/or the cover–uncover test should be seen as soon as possible by a physician. Referral to an ophthalmologist may be necessary.

Visual Acuity Testing

3–5 Years of Age

If the child is able to comprehend instructions, use the Snellen Tumbling “E” chart or the Allen Object Recognition chart. This test is preferably administered in the child’s own language. Each eye should be tested individually and then both eyes together. Any child with visual acuity less than 20/30 in either eye, or a two-line difference between eyes (even if both individually pass) should be referred for optometric assessment.

6–18 Years of Age

If the child knows the alphabet, use a Snellen chart. Otherwise, use the symbol (Allen Object Recognition) or Snellen Tumbling “E” charts. Each eye should be tested individually and then both eyes together. Any child > 5 with visual acuity less than 20/20 should be referred for optometric assessment.

For more detail, *see* “*Pediatric Eye Care*.”

When Screening Does Not Work

Urine

Routine urinalysis is not recommended for asymptomatic children.

Scoliosis

The natural history of scoliosis is not well understood, and treatments have not been well evaluated. The screening test itself is not very sensitive or specific. Any abnormalities in posture, spinal symmetry or curvature identified by the child or the child’s parents or caregiver should be referred to a physician for assessment.

Observe the spine in children over age 8 who present for well-child care or for other reasons.²⁶

PRE-SCHOOL ENTRY ASSESSMENT

It is important that all children undergo a detailed pre-school assessment in preparation for starting school. The purpose of the assessment is to ensure readiness for school and to identify and correct any health problems that might interfere with the child’s performance in school.

The assessment is generally done at 3–5 years of age, before the child enters kindergarten.

It is best to organize one or more special clinics in the spring of each year to carry out pre-school entry assessments for all children of the appropriate age living in the community. This allows time for any referrals to be made before school starts in the fall.

COMPONENTS OF THE PRE-SCHOOL ENTRY ASSESSMENT

It is important that a parent or the main caregiver accompany the child for this visit.

- Review of child’s past health history, as well as the family’s health history
- Review of child’s present health status

Brief Physical Examination

- Eyes, ears, nose, throat, teeth
- Respiratory system
- Check for cardiac murmurs
- Abdomen
- Genitalia
- Musculoskeletal system

Screening²⁷

- Growth: measure height and weight, calculate BMI, and plot all on growth charts (*see* “*Growth Measurement*”)
- Vision: Snellen E chart or Allen Object Recognition chart (*see* “*Vision Screening*”)
- Hearing (*see* “*Hearing Screening*”)
- Speech: gross screening for articulation
- Developmental screening (*see* “*Developmental Screening*”)
- Hemoglobin, urinalysis: should be done selectively for children whose medical history indicates a past or ongoing problem such as anemia or urinary tract infection (*see* “*Hemoglobin Screening*”)
- Blood pressure
- Review of immunization status: obtain appropriate consents and update immunizations according to accepted schedule (*see* “*Immunization*”)
- Determinants of health (*social, socioeconomic, physical and environmental*)
- Healthy lifestyle (including nutrition, physical activity, sleep, rest, play and safety)
- Emotional and social well-being (including family relationships; sense of belonging at school, in the community and within own culture; self-esteem; friendships and adjustment to school)

Anticipatory Guidance and Counselling^{28,29}

- Nutritional variety (for example, offer more cereal fibres, fruit, vegetables and water, rather than high fat and sugar snacks and drinks)
- Physical activity levels; encourage parents to be positive role models
- Dental care, including fluoride supplementation if appropriate (see “Vitamin and Mineral Supplements” in the chapter, “Nutrition”)
- Provision of intellectual stimulation (for example, exposure to books and reading daily)
- Developmental milestones (for example, they need opportunities to use fine and gross motor skills [play, toileting, feeding, dressing], need to be encouraged to name their feelings, need opportunities to develop social skills, need bedtime ritual) (see “Developmental Milestones” in chapter, “Pediatric Health Assessment”)
- Resources available for school-age children (for example, dental care, audiology, optometry, speech therapy)
- Allow time to discuss the results of the assessment with the parents or caregiver and to let them raise concerns or ask questions
- Initiate referrals to specific health care professionals or agencies as required to address any identified health problems (with parental approval and consent)
- Instruct the parents or caregiver to notify the school of any identified health problem that might have implications for the child’s school attendance or performance

RELATED INFORMATION

See “Adolescent Health” for specific issues for preventive care of adolescents.

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