
CHAPTER 7 – NUTRITION

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.

Table of contents

NUTRITIONAL PRINCIPLES	7-1
Types of Nutrients	7-1
NUTRITIONAL ASSESSMENT	7-3
INFANT FEEDING CHOICES	7-4
Breastfeeding	7-4
Problems of Lactation	7-10
Drugs and Breastfeeding	7-11
Alternate Milk (Formula) Feeding	7-12
Vitamin and Mineral Supplements	7-14
Solid Foods	7-15
FEEDING CHILDREN BETWEEN 1 AND 2 YEARS OF AGE	7-15
FEEDING CHILDREN OVER 2 YEARS OF AGE	7-16
PEDIATRIC NUTRITIONAL PROBLEMS	7-16
Nutritional Deficiency Disorders	7-16
COMMON NUTRITIONAL PROBLEMS	7-18
Obesity	7-18
Nutritional Rickets	7-21
SOURCES	7-23

NUTRITIONAL PRINCIPLES

For normal growth, a child's nutritional intake must include protein, fat, carbohydrate, water, vitamins, minerals and trace elements in adequate amounts. For many nutrients, deficiency states can occur if intake is inadequate. Similarly, a variety of diseases are associated with excess intake of specified nutrients.

TYPES OF NUTRIENTS¹

Energy (expressed as kilocalories [kcal]):

Needed for metabolic functions and growth; available from protein, carbohydrate and fat

Protein

Contributes to energy intake and supplies amino acids for tissue growth and replacement; important for immune function; gives 4 kcal/g of protein

Carbohydrates

Provides caloric energy and thus helps limit the need for protein and fat; major energy source for central nervous system function; gives approximately 4 kcal/g of glucose

Fats

Contribute substantially to energy needs because of high caloric density (9 kcal/g); some essential fatty acids are important for growth of the infant's nervous system; carries fat soluble vitamins (A, D, E, K)

Water

Necessary to sustain life and growth

Vitamins

Essential cofactors in metabolic processes; some are fat soluble (vitamin A, D, E, K) and some are water soluble (B, B1, B2, B3, B6, B12, C, biotin, folic acid, pantothenic acid)

Minerals and trace elements

Necessary in small quantities for growth and metabolism; deficiency states are clinically recognized for only a few minerals and trace elements; they include calcium, magnesium, phosphorus, chromium, copper, fluoride, iodine, iron, manganese, molybdenum, selenium, zinc

Table 1 – Vitamins and Mineral Functions and Food Sources

Vitamin or Mineral	Function	Good Food Sources
Vitamin A	Formation and maintenance of epithelial tissue, normal bone and tooth development, growth and spermatogenesis, antioxidant	Liver, kidney, fish oils, milk and milk products, egg yolk, carrots, sweet potatoes, squash, apricots, spinach, collards, broccoli, cabbage, artichokes
Vitamin B1 (thiamine)	Coenzyme in metabolism, needed for healthy nervous system	Pork, beef, liver, legumes, nuts, whole or enriched grains and cereals, green vegetables, fruits, milk, brown rice
Vitamin B2 (riboflavin)	Coenzyme in metabolism, needed for healthy skin	Milk and milk products, eggs, organ meat, enriched cereals, some leafy green vegetables, legumes
Vitamin B3 (niacinamide)	Coenzyme in metabolism, needed for healthy nervous system, skin and normal digestion	Meat, poultry, fish, peanuts, beans, peas, whole or enriched grains (except corn and rice)
Vitamin B6 (pyridoxine hydrochloride)	Coenzyme in metabolism, needed for formation of antibodies and hemoglobin and utilization of some minerals	Meats, especially liver and kidney, cereal grains (wheat and corn), yeast, soy beans, peanuts, tuna, chicken, salmon
Vitamin B12 (cyanocobalamin)	Coenzyme in protein synthesis, normal functioning of nervous tissue	Meat, liver, kidney, fish, shellfish, poultry, milk, eggs, cheese, nutritional yeast
Pantothenic Acid (B vitamin)	Coenzyme in metabolism, synthesis of amino acids, fatty acids and steroids	Liver, kidney, heart, salmon, eggs, vegetables, legumes, whole grains
Vitamin C (ascorbic acid)	Increases iron absorption, antioxidant	Citrus fruits, strawberries, tomatoes, potatoes, cabbage, broccoli, cauliflower, green peppers, spinach, cantaloupe, watermelon, enriched fruit juice
Vitamin D	Absorption of calcium and phosphorus	Milk, milk products, enriched cereals, margarine, breads, also from direct sunlight
Vitamin E	Red blood cell production and protection, muscle and liver integrity	Vegetable oils, milk, egg yolk, muscle meats, fish, whole grains, nuts, legumes, spinach, broccoli
Folic Acid	Coenzyme, necessary for red blood cell formation, prevention of neural tube defects	Green leafy vegetables, cabbage, asparagus, liver, kidney, nuts, eggs, whole grain cereals, legumes, bananas
Biotin	Coenzyme in metabolism	Liver, kidney, egg yolk, tomatoes, legumes, nuts
Copper	Hemoglobin production, component of some enzyme systems	Organ meats, oysters, nuts, seeds, legumes, corn oil margarine
Iron	Formation of hemoglobin, component of several enzymes and proteins	Liver, red meat, poultry, clams, oysters, beans, ham, whole grains, iron-enriched formula, enriched cereals and breads, legumes, nuts, seeds, dried fruits, potatoes, molasses
Iodine	Thyroid hormone production, normal reproduction	Seafood, kelp, iodized salt, sea salt, enriched bread, milk
Magnesium	Bone and tooth formation, protein production, nerve conduction, enzyme activation for metabolism	Whole grains, nuts, soy beans, meat, green leafy vegetables (uncooked), tea, cocoa, raisins
Phosphorus	Bone and tooth development, chemical reactions, acid-base balance	Dairy products, eggs, meat, poultry, legumes, carbonated beverages
Potassium	Acid-base and fluid balance, muscle contraction, nerve conduction, release of energy	Bananas, citrus fruit, dried fruits, meat, fish, bran, legumes, peanut butter, potatoes, coffee, tea, cocoa
Zinc	Components of some enzymes, wound healing, immune system, coagulation	Seafood, meat, poultry, eggs, wheat, legumes
Calcium	Bone and tooth development, muscle contraction, blood clotting, nerve conduction	Dairy products, leafy green vegetables, dried peas and beans, egg yolks, sardines, canned salmon with bones
Sodium	Acid-base and fluid balance, muscle contraction	Table salt, seafood, meat, poultry, prepared foods

Adapted from Hockenberry MJ. *Wong's nursing care of infants and children*. St. Louis: Mosby; 2003. p. 561-64.

NUTRITIONAL ASSESSMENT^{2,3}

Nutrition affects growth, development, cognition and learning. Therefore, a nutritional assessment should be part of a complete health history for every child.

The following aspects should be evaluated:

- Usual feeding times and/or habits (for both foods and fluids for the child and family, both during the week and on the weekend)
- Food diary including times, food amount, food content, preparation, who with, eating location and related factors like feelings toward food; particularly if difficulties arise (for example, in obese or underweight children)
- Child's usual appetite
- Identification of caloric intake beyond calculated norms for age
- Medication, supplemental vitamins, minerals and herbs history
- Food allergies
- Special diets
- Favourite foods/fluids and dislikes
- Recent weight gain or loss
- Feeding difficulties (for example, colic, regurgitation, difficulty swallowing)
- Types of exercise
- Cultural practices and/or foods
- Use of foods as rewards or as part of social function
- Identification of foods high in calories and low in nutritional value that can be reduced, eliminated or replaced (for example, fruit-flavoured or sports drinks). Refer to *Canada's Food Guide for Smart Snacking* (see <http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/using-utiliser/snacks-collations-eng.php>).
- Birth history (for example, birth weight, prematurity)
- Infancy feeding history (for example, breastfed or formula and duration – history of or currently)
- Past medical history, surgeries, hospital admissions, including gastrointestinal and emotional difficulties
- Who shops for and/or prepares meals
- How much money is spent on groceries each week
- How most foods are prepared (for example, baked, fried)
- How often the family eats out and what kind of restaurants

INFANT FEEDING

Healthy infants obtain nutrition in a pattern that encourages social interaction with parents and caregivers. Thus, infant feeding provides both nutrition for growth and an opportunity for social interaction. Both are crucial to the infant's well-being. Infants should always be held while being fed in an effort to prevent nursing bottle caries of the teeth.

ADEQUACY OF INTAKE⁴

Adequacy of intake is best determined by observing weight gain. Expected gain is as follows:

- 30 g/day in the first 3 months
- 15–20 g/day in the second 3 months

Six well-soaked diapers and yellowish stool daily are also indicators of adequate nutritional intake.

Average daily energy requirement from 4 months to 1 year is 110 kcal/kg, although there is some variation from one child to another. The average caloric content of formulas and breast milk is 20 kcal/oz or 67 kcal/100 mL (1 oz = 30 mL).

INFANT FEEDING CHOICES

BREASTFEEDING^{5,6}

Exclusive breastfeeding (including vitamins, minerals or medicine, but not water, formula, solid food or other liquids) for the first 6 months of life is the optimal food for infants. In the first 6 months of life, an infant's requirements for water, energy and major nutrients can best be met by human milk. For this reason, as well as for the emotional benefits to the child and the immunologic benefits (protection against infection), it is even more beneficial in populations where refrigeration is lacking or water supplies are suspect for infection. Breast milk is considered the best choice for feeding infants and may continue beyond 2 years.

ADVANTAGES^{5,7}

- Fewer respiratory, GI and otitis media infections for the infant
- Ideal food: easily digestible, nutrients well absorbed, less constipation
- May decrease risk of sudden infant death syndrome and childhood allergies
- May enhance cognitive development of infant
- Economical, portable, affords ease of meeting infant's feeding needs quickly
- Increased contact between mother and baby and perhaps added self-esteem for mother
- Prolonged lactational amenorrhea and increased postpartum weight loss for mother
- More rapid and complete reversion of mother's pelvis and uterus to pre-puerperal state
- Mothers often like it more than bottle-feeding (no need to clean bottles)

POSSIBLE CONTRAINDICATIONS⁵

- Infant has galactosemia
- HIV infection, active TB or active herpes lesions around or near the nipple
- Hepatitis (unless infant is immunized)
- Illicit drug use
- Use of certain prescription medications (*see Table 2, "Drugs and Breastfeeding" for information about drugs that are passed into milk*)
- Alcohol consumption (habitually more than 2 drinks/day)
- Mother receiving chemotherapy or radioactive compounds for diagnosis or treatment of illness

ASSESSMENT

Antepartum

- Assess the woman, including personal and community variables that may influence breastfeeding rates; her intent to breastfeed; her supports for breastfeeding; the attitudes toward breastfeeding among health care providers, significant others and peers
- Physical exam including breasts and nipples for findings that may affect her ability to breastfeed⁸

Postpartum

- Asses the mother, including intrapartum medications; level of physical discomfort; observation of positioning, latching and sucking; signs of milk transfer; maternal ability to identify feeding cues; mother-infant interaction and response to feeding cues; mother's perception of infant satisfaction; mother's ability to identify significant others who support and are available to help with breastfeeding; her delivery experience
- Infant physical assessment (including tongue tie)⁹
- A LATCH scoring system assesses 5 criteria (L: latch; A: audible swallow; T: type of nipple; C: comfort; H: hold/position) and is a modest predictor of breastfeeding duration due to the sub-score for breast comfort¹⁰ (*see Latch Scoring chart next page*)

PHYSIOLOGY¹¹

- Stimulation of areola causes secretion of oxytocin
- Oxytocin is responsible for let-down reflex, whereby milk is ejected from cells into milk ducts
- Sucking stimulates the secretion of prolactin and oxytocin, which in turn triggers milk production; it can also be triggered by the baby crying or the mother thinking about the baby
- Milk is therefore created in response to nursing, that is, nursing increases the supply of milk
- Fear, anxiety, embarrassment, self-confidence and/or physical discomfort can decrease milk production
- Milk is produced based on supply and demand; inhibiting the let-down reflex or failing to empty the breast completely and frequently will decrease milk supply

LATCH SCORING**L = Latch A = Audible swallowing T = Type of nipple C = Comfort (breast/nipple) H = Hold (positioning)**

	0	1	2
L	<ul style="list-style-type: none"> • Too sleepy or reluctant; • No latch achieves. 	<ul style="list-style-type: none"> • Repeated attempts; • Hold nipple in mouth; • Stimulate to suck. 	<ul style="list-style-type: none"> • Grasps breast; • Tongue down; • Lips flanged; • Rhythmic sucking.
A	<ul style="list-style-type: none"> • None. 	<ul style="list-style-type: none"> • A few with stimulation. 	<ul style="list-style-type: none"> • Spontaneous & intermittent < 24 hours old; • Spontaneous & intermittent > 24 hours old.
T	<ul style="list-style-type: none"> • Inverted. 	<ul style="list-style-type: none"> • Flat. 	<ul style="list-style-type: none"> • Everted.
C	<ul style="list-style-type: none"> • Engorged; • Cracked, bleeding, large blisters, or bruises; • Severe discomfort. 	<ul style="list-style-type: none"> • Filling; • Reddened / small blisters or bruises; • Mild/moderate discomfort. 	<ul style="list-style-type: none"> • Soft; • Non-tender.
H	<ul style="list-style-type: none"> • Full assist (staff holds infant at breast). 	<ul style="list-style-type: none"> • Minimal assist; • Teach one side, mother does other; • Staff holds and then mother takes over. 	<ul style="list-style-type: none"> • No assist from staff; • Mother able to position/hold infant.
TOTAL	0	5	10

Source: Alberta Region Community Health Neonatal/Infant Assessment – 005-AB-FNIHB-CH July 2003.
 Reprinted from the *Community Health Nursing Data Set (CHNDS) for the Healthy Infant and Child (Ages 0–5 years) Within a First Nations Setting*. Office of Nursing Services (2008) page 94.

TECHNIQUE¹⁴

- It is important that the baby be allowed to nurse within the first hour after birth
- Mother should be in a comfortable position, with a well-supported back, usually sitting or reclining with baby's head in crook of her arm (side-lying position is often useful following delivery by cesarean section)
- Bring baby to mother (to minimize stress on mother's back)
- The nipple should point to the baby's upper lip or nostril
- Baby's belly and mother's belly should almost face each other or touch (belly-to-belly position), however, they should be able to make eye contact
- The baby should be allowed to feed on one breast as long as they are sucking well and positioned correctly; the mother should alternate the breast she starts feeding with to avoid nipple trauma
- After emptying one breast the baby should be burped and then offered the second breast and be burped again

- Suction should be broken by inserting a finger into the baby's mouth beside the nipple, so breast trauma is prevented

See Newman Breastfeeding Clinic for numerous videos, information sheets and help for breastfeeding (*see* <http://www.drjacknewman.com/>).

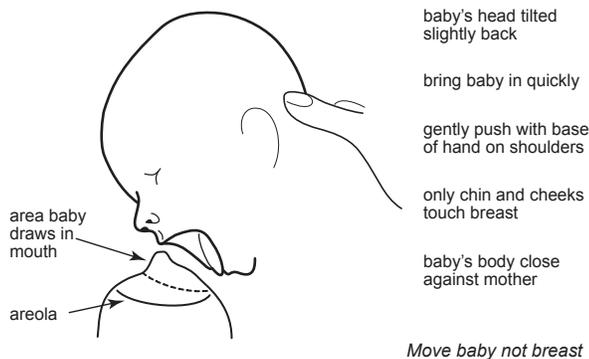
Other on-line resources for breastfeeding positions can be found at Rush University Medical Center: Effective breastfeeding (*see* <http://www.rush.edu/rumc/page-1098987345453.html>).

POSITIONING AND LATCHING ON¹²

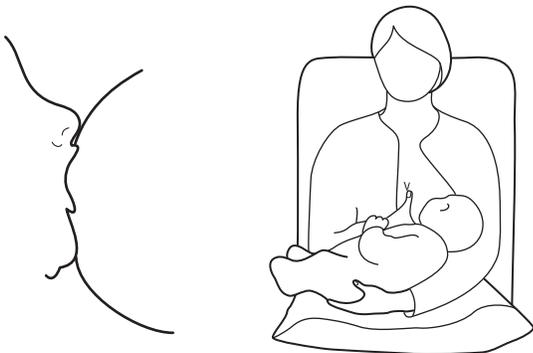
Latching On

- Initiate the rooting reflex by tickling baby’s lips with nipple or finger or running the nipple along the baby’s upper lip lightly; this may have to be repeated a couple of times until the baby’s mouth opens wide
- As the baby’s mouth opens wide, the mother quickly guides her nipple to the back of the baby’s mouth while pulling the baby closer; this maneuver will ensure that the baby’s gums are sucking on the areola, not the nipple (*see illustration, “Mother’s View While Latching Baby”*)
- Once properly latched, the baby’s top lip will be close to the nipple and the lips will be flared; the bottom lip is as far from the nipple as possible; the baby’s chin should be close against the breast and the mouth still open wide. The nose and cheeks are touching or nearly touching the breast^{13,14}

Mother’s view while latching baby



CRADLE POSITION FOR BREASTFEEDING



1. Breastfeed in a sitting position, with good back support.
2. Place a pillow on your lap to bring baby to breast height.
3. Position baby with his or her head resting on your forearm, facing you (belly to belly) with your hand supporting the diaper area.
4. Baby’s face should be across from the breast, the mouth across from the nipple and the head tilted slightly back.
5. Place four fingers under breast and thumb on top, well back from nipple and areola.
6. Lightly tickle baby’s top lip with nipple. Have patience.
7. When mouth opens wide (as big as a yawn) quickly point nipple at the roof of the mouth and pull baby onto breast.
8. If baby is positioned correctly, the head is tilted back slightly with the nose slightly or not touching the breast and the baby’s chin comes into the breast. The chin should be far from their chest.
9. Do not press on breast to make “breathing space.”
10. If there is pain, take baby away from breast and repeat. Breastfeeding should not hurt.
11. Check “latch.” Mouth should be big with lips turned back. Baby should cover more of areola with lower lip than upper lip. *See “Latching On.”*
12. Listen for baby swallowing. If baby is feeding well, you will see short bursts of sucking with pauses between which is the swallowing. The jaw movement goes past the ears, sometimes making the ears wriggle.
13. Let baby feed at first breast until he or she pushes nipple out of mouth; offer a burp and continue on other breast. The baby may not suck for as long on the second breast. Start on that side during the next feeding session.
14. If baby starts wriggling during the feeding, he or she may need to burp. Take the baby off the breast, offer a burp and then latch on again.
15. Each baby is different and each will take a different period of time to feed. If a feeding is taking an hour or more, the baby is probably not latched on properly. Tell the mother to contact someone to watch her nurse and check the latch.

FOOTBALL HOLD FOR BREASTFEEDING

If you have difficulty feeding your baby in the cradle position, try the football hold. This hold can work well in the following situations:

- Cesarean birth
 - Small baby
 - Mother experiencing more difficulty with one side than the other
 - Mother with flat nipples
1. Sit in upright position with good back support.
 2. Place one or two pillows at your side.
 3. Lie baby on pillows at your side.
 4. Support the back of the neck with your hand. This allows the baby's head to tilt back a little. Do not push it against the breast. Pull the baby's bottom into mother's body with your forearm.
 5. The nipple should be pointed toward the roof of the baby's mouth.
 6. Hold your breast as described for the cradle position.
 7. Tickle the baby's top lip. Wait for his or her mouth to open and pull the baby onto the breast. The head is tilted back slightly with the nose slightly or not touching the breast, although the baby's chin comes into the breast. The chin should be far from the chest (*see "Latching On" and steps 8–14 for the cradle position*).

CROSS CRADLE HOLD FOR BREASTFEEDING

1. Sit in upright position with good back support.
2. Place a pillow in front of you.
3. Lie baby across your body facing you. The baby's body and legs should be wrapped around the mother.
4. Hold breast with hand on same side (right breast, right hand).
5. Support back of baby's neck and shoulders with other hand. Do not push it against the breast. Pull the baby's bottom into mother's body with her forearm.
6. The nipple should be pointed toward the roof of the baby's mouth.
7. Tickle the baby's top lip. Wait for the baby's mouth to open wide and pull the baby onto the breast. The head is tilted back slightly with the nose slightly or not touching the breast, although the baby's chin comes into the breast. The chin should be far from the chest. *See "Latching On" and steps 8–14 for the cradle position.*
8. When baby is feeding well, try taking hand from breast and putting it around the baby for support.

SIDE-LYING HOLD FOR BREASTFEEDING¹⁵

1. The mother lies on her side with pillows supporting her head, back and legs and her lower arm flexed up.
2. The baby is positioned side-lying facing the mother with the mother's nipple at the baby's nose. The baby's neck is extended so eye contact with the mother can be made.
3. The mother's hand should be across the baby's upper back to pull the baby into her.

4. Tickle the baby's top lip. Wait for the baby's mouth to open wide and pull the baby onto the breast. The head is tilted back slightly with the nose slightly or not touching the breast, although the baby's chin comes into the breast. The chin should be far from the chest (*see "Latching On" and steps 8–14 for the cradle position*).

MOTHER'S DIET WHILE NURSING

- Adequate caloric intake (breastfeeding mothers require more calories than non-breastfeeding) by following *Eating Well with Canada's Food Guide* or *Eating Well with Canada's Food Guide – First Nations, Inuit and Métis* (*see* <http://web.hc-sc.gc.ca/fn-an/food-guide-aliment/fnim-pnim/index-eng.php>)
- Plenty of fluids to satisfy thirst¹⁶
- Prenatal vitamins (including folate)
- Limit intake of alcohol
- Encourage smoking cessation

SIGNS OF ADEQUATE NURSING FOR EXCLUSIVELY BREASTFEEDING BABIES^{13,17,18}

- Six or more wet diapers in 24 hours, daily after 4th day of life
- Bowel movements are starting to become lighter by day 3 of life. The baby's breastfeeding has a characteristic pattern with pauses when the mouth is wide open; the longer the pause the more milk the baby gets and the more they drink; swallowing is audible
- Baby is satisfied after feeding and mother's breast softens while feeding
- Weight gain is appropriate (less than 7% loss in the first week; return to birth weight by 14 days of age; average 1 oz or 28 g gain per day in the first few months). Growth spurts should be anticipated around 10 days, 6 weeks, 3 months and 4–6 months. During growth spurts, the baby will nurse more often over a period of several days, which will increase milk production to allow for further adequate growth

CLIENT EDUCATION

Antepartum

Promote advantages of breastfeeding early and regularly during the course of the pregnancy. It is a superior method of infant feeding due to the immune advantages. Provide small, informal health education classes on breastfeeding.

Postpartum^{5,6,17,19}

Counsel women on the following aspects of breastfeeding:

- Technique
- Natural progression
- Colostrum present in breast at birth but may not be seen
- If baby is feeding well, he or she will be adequately nourished (*see "Signs of Adequate Nursing for Exclusively Breastfeeding Babies"*)
- When to get help (for example, baby is hard to wake for feedings, nipples are sore or mother has a fever or a red painful area on the breast)
- Milk will not come in before third day postpartum
- Frequent nursing (at least 8–12 times in 24 hours) will lead to milk coming in sooner and in greater quantities (supply and demand); feeding frequency will decrease as the infant gets older
- Mother should allow baby to determine duration of each nursing session on each breast by their interest in feeding
- Baby will lose weight over the first few days and may not regain birth weight until 14 days
- Supplemental vitamin D is necessary for breastfeeding babies until their diet provides at least 400 IU/day (10 micrograms/day) of vitamin D (*see "Vitamin and Mineral Supplements"*)
- Breast milk alone is an adequate food source for the first 6 months
- Growth patterns of breastfed infants is different than those formula fed
- Nutrient-rich complementary foods, with particular attention to iron, should be introduced at 6 months
- Expressed breast milk can be stored in the fridge up to 3 days for a healthy baby, in the fridge's freezer for 3 months or in a deep freeze for 6 months

Weaning from Breastfeeding

Weaning from breastfeeding can be planned (for example, before the mother returns to work) or when the child is ready. Slow, child-led weaning should be the method of choice when possible. However, this usually takes place between 2 and 4 years of age and is often frowned upon in today's society.

Mothers who are planning to return to work should start switching the baby to cup or bottle-feeding at least a week ahead of time. A gradual, planned weaning schedule should start by switching the child's least favourite feeding with a cup or bottle of pumped breast milk, formula or cow's milk (only if the baby is over 9 months old). The baby may take it more easily while being held and cuddled by the other parent or another caregiver. Start giving a second substitute feeding when the baby is accepting the cup or bottle well. To increase the likelihood that the baby will occasionally take a bottle, introduce the bottle once or twice a week once breastfeeding has been well established. Also, offering the cup or bottle when the baby is sleepy can help if the infant is refusing. Continue to offer more and more substitute feedings for the periods that the mother is going to be away. This pace is ideally determined by the mother and baby. This can continue until the infant is no longer breastfeeding for women who want the baby totally weaned.²⁰

See "Weaning your child from breastfeeding" for helpful information for parents (<http://www.caringforkids.cps.ca/pregnancy&babies/Weaning.htm>).

Breast Care²¹

- Porous breast shields collect any milk that drips; shields should be changed when wet to prevent skin maceration
- Correct positioning (with nipple and areola well into the infant's mouth; baby's ear, shoulder and hip aligned), ensuring proper latch, holding the baby close when feeding and using a finger to break suction before removing the baby from the breast help prevent nipple soreness and cracked nipples
- Do not allow the baby to sleep with the nipple in the mouth
- For cracked nipples, a purified lanolin (for example, Lansinoh, Purelan) may be applied after feeding to provide moisture to the nipples and facilitate healing²²

- When one nipple is sore, feedings should be started on the side that is not sore; it may be helpful to change the feeding position (for example, from sitting to lying) when nipples are sore
- Ensure breast is being fully emptied

POSSIBLE COMPLICATIONS

Blocked Milk Ducts^{13,23,24}

Mother is well except for painful, swollen, firm mass in one or both breasts, without fever. Skin overlying the blocked duct is red, but less intense than in mastitis.

Blocked ducts will usually resolve spontaneously within 24–48 hours of onset. The baby may be fussy, as the milk flow may be slower than usual.

Apply wet heat (for example, warm saline compress or soak nipple in bath) to mass(es) before and during nursing. Massage the breast before feeding. The mother should continue to nurse on the affected side and do so frequently. Ensure good technique. To drain the area better, use breast compression and/or point the baby's chin toward the area of hardness. If a small blister has formed on the end of the nipple, or a bleb (bulla) is observed (white spot on the nipple caused by a tiny amount of milk seeping into the nipple tissue at a duct outlet²⁵), use a clean towel to apply light friction or breastfeed the infant to allow drainage. The mother should get plenty of rest.

Mastitis¹³

Poor latch (poor breast draining) predisposes one to mastitis.

Mastitis presents as a very painful, swollen, firm mass in one or both breasts, accompanied by fever. Skin overlying the mass is more reddened. The mother may be quite ill. Other possible sources of fever should be ruled out (in particular, endometritis and pyelonephritis).

Apply moist hot packs to the mass(es) before and during nursing. The mother should continue to nurse on the affected side to help it resolve quicker.

If symptoms of mastitis are present for greater than 24 hours and not improving, administer antibiotics, most often for *Staphylococcus*. The mother should get more rest and use acetaminophen (Tylenol) or ibuprofen as necessary for fever or pain. The fever should resolve within 48 hours; otherwise, consider changing the antibiotic and consult. The mass should also resolve within 4 days. A persistent lump may be an abscess, which must be drained surgically. The redness may stay for over a week.

Engorgement²⁶

Engorgement usually develops just after milk first comes in (day 3 or 4). It is characterized by warm, hard, sore breasts.

To resolve, offer baby more frequent nursing (every 1.5–3 hours) around the clock. Taking a warm shower or applying warm compresses can trigger let-down. The mother may have to hand-express a little milk to soften the areola enough to let baby latch on. The baby should be allowed to nurse long enough to empty the breasts, and starting breasts should be alternated. A mild analgesic can be taken before feeding if it is very uncomfortable. The problem usually resolves within a day or two.

Flat or Inverted Nipples²⁷

When stimulated, inverted nipples will retract inward, whereas flat nipples remain flat. Check for either of these conditions during the initial prenatal physical.

Nipple shells (doughnut-shaped inserts) can be worn inside the bra during the last month of pregnancy to gently force the nipple through the center opening of the shell. The baby can nurse successfully even if the shell does not correct the problem before birth. Use a hand to shape the nipple when starting to nurse. Applying ice or using a breast pump for a couple of minutes before feeding can help with nipple erection. A lactation consultant or a member of the La Leche League may be a good resource in this situation.

PROBLEMS OF LACTATION

INSUFFICIENT LACTATION

This problem is almost always due to improper feeding techniques, which can be remedied. Occasionally, it is due to problems other than technique.

Signs

- Insufficient weight gain in an infant who is receiving food only by breastfeeding
- Infant may latch on poorly
- Infant may suck inconsistently
- Let-down reflex may be inconsistent
- Some infants appear hungry (indicated by crying soon after feedings), whereas others are content, but gain poorly

Risk Factors

- Mother has previous experience with this problem
- Physical abnormality of the breast
- No breast enlargement during pregnancy
- History of breast surgery

Management^{13,21,28}

Goal is to preserve breastfeeding if possible by:

- Massaging breasts, applying a warm pack and/or taking a shower before nursing
- Frequent feeding sessions
- Establishing a routine with baby for initiating feedings
- Feeding in a quiet, private place with no distractions
- Allowing the baby at least 10–15 minutes per side to trigger the let-down reflex
- Alternating breasts
- Breast pumping (with an electric pump, if available) after each feeding
- Increasing maternal fluid intake
- Ensuring mother gets adequate rest
- Monitoring the infant's well-being; if signs of failure to thrive or dehydration appear, consult a lactation specialist and a physician

If all else fails, consult a lactation specialist and/or a physician about the possibility of a medication to increase milk production. Rarely, it may be necessary to give formula supplements after breastfeeding sessions, or a switch to formula feeding may be indicated.

DRUGS AND BREASTFEEDING

Most maternal medications are secreted in some quantity into breast milk (see Table 2, “Drugs and Breastfeeding”). Medication use should be avoided if possible. The risks of discontinuing the mother’s medication must be weighed against the risks to the baby. Sometimes the medication can be replaced, and most of the time the effect on the baby is not sufficient for concern. The younger an infant, the slower their drug metabolism rate. The infant and mother should be monitored for side effects to any medications started.

Table 2 – Drugs and Breastfeeding^{29,30,31,32}

Drug	Excreted in Milk	Possible Effect on Infant and Recommendations
Alcohol	Yes	<p>Infants more susceptible to effects.</p> <p>Casual alcohol use: (1 glass of wine or beer/day) is unlikely to cause problems in the nursing infant, especially if the mother waits 2 to 2.5 hours per drink before nursing.</p> <p>Chronic alcohol use: Daily heavy use of alcohol (more than 2 drinks/day) may have adverse effects on infants and appears to decrease the length of time that mothers breastfeed their infants. Chronic or heavy consumers of alcohol should not breastfeed.</p>
Ampicillin	Yes	Ampicillin is considered compatible with breastfeeding.
ASA	Yes	ASA is best avoided during breastfeeding, especially with very young infants, although an occasional single low dose of ASA daily is unlikely to cause problems in the infant.
Benzodiazepines	Yes	<p>Benzodiazepines are not contraindicated in breastfeeding if used occasionally as a sedative. It is preferable to choose those with shorter half-lives and no active metabolites, such as lorazepam and oxazepam, when breastfeeding.</p> <p>Chronic benzodiazepine use may cause drowsiness in nursing infants and should be discouraged in breastfeeding women.</p>
Caffeine	Yes	Moderate intake of caffeinated beverages (2 to 3 cups/day) is expected to have no effect on the infant. Irritability and poor sleeping pattern are possible with very high intake (10 or more cups of coffee/day). Caffeine is excreted slowly in newborns.
Carbamazepine	Yes	The American Academy of Pediatrics lists carbamazepine as a medication usually compatible with breastfeeding. The infant should be monitored for jaundice, drowsiness, adequate weight gain and developmental milestones, especially in younger, exclusively breastfed infants and when using combinations of anticonvulsant or psychotropic drugs.
Cephalexin	Yes (low)	Cephalexin is considered compatible with breastfeeding.
Codeine	Yes (trace, unless rapid metabolizer)	Should be avoided if possible early after birth. Limit maternal dosage and supplement with non-narcotic analgesics if necessary. If the baby shows signs of increased sleepiness (more than usual), difficulty breastfeeding, breathing difficulties or limpness, a physician should be contacted immediately as the mother may be a rapid metabolizer.
Contraceptives	Yes	Progestin-only contraceptives are preferred because estrogen can decrease milk yield. Oral contraceptives should not be started until breastfeeding is firmly established (approximately 6 weeks).
Erythromycin	Yes	Erythromycin is considered compatible with breastfeeding.

Table 2 – Drugs and Breastfeeding^{29,30,31,32}

Drug	Excreted in Milk	Possible Effect on Infant and Recommendations
Ibuprofen	Yes (minimal)	Preferred choice as an analgesic or anti-inflammatory in breastfeeding mothers.
Isoniazid (INH)	Yes (low)	Considered compatible with breastfeeding but infants should be monitored for rare instances of jaundice. Giving the once-daily dose before the infant's longest sleep period will decrease the dose the infant receives.
Levothyroxine	Yes	Levothyroxine is considered compatible with breastfeeding; infant's thyroid unlikely to be affected.
Metronidazole	Yes	Alternative antibiotics can often be substituted, so unnecessary exposure should be avoided. For breastfeeding mothers receiving a single oral dose of metronidazole for trichomoniasis, breastfeeding can be interrupted for 12 to 24 hours during which time the mother can express her milk and discard it.
Nitrofurantoin	Yes (trace)	Use an alternative unless the infection is not responding to other therapy. Avoid in infants < 1 month.
Nystatin, topical	No	Remove excess cream from the nipple before breastfeeding.
Omeprazole	Yes	Although data is limited, low doses of omeprazole (for example, 20 mg/day) are not expected to cause adverse effects in the breastfed infant.
Penicillin	Yes	Penicillin is acceptable to use during breastfeeding.
Phenytoin	Yes	Except for rare idiosyncratic reactions, phenytoin used alone usually causes no difficulties in breastfed infants. Combination therapy with sedating anticonvulsants may result in infant sedation or withdrawal reactions.
Prednisone	Yes	Prednisone is considered compatible with breastfeeding.
Propylthiouracil	Yes	Safe in lower doses; take right after nursing and wait 3–4 hours until next feed.
Senna	No	None.
Sulfonamide antibiotics	Yes	Kernicterus (avoid in first month and in jaundiced, ill, stressed or premature infants).
Tetracycline	Yes	Risk of discoloration of teeth; prolonged or repeated use not recommended; avoid if possible.
Thiazide diuretics	Yes	Thiazide diuretics are considered compatible with breastfeeding. High doses for intense diuresis may decrease milk production.

For other drugs see the Drugs and Lactation Database (LactMed) or contact the Motherisk Program (<http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgn?LACT>).

MOTHERISK PROGRAM

The Motherisk Program at The Hospital for Sick Children in Toronto is a good resource for information on drugs and breastfeeding. Motherisk provides authoritative information and guidance to pregnant or lactating women and health care providers about fetal risks associated with drug, chemical, infection, disease and radiation exposure during pregnancy.

Women and health care professionals can reach Motherisk counselors by phone at (416) 813-6780 or **1-877-327-4636** (see <http://www.motherisk.org/women/index.jsp>).

ALTERNATE MILK (FORMULA) FEEDING^{5,33,34,35}

Commercially prepared formulas closely resemble breast milk in composition, except for the immunologic components. Formula takes longer to digest than breast milk, so the infant may go longer between feedings. They should be fed on demand (see Table 3, “Approximate Volume and Frequency of Formula Feedings”). Commercial infant formula that is fortified with iron is now the standard recommendation for all infants who are fed formula from birth. Infants weaned from the breast before 9 months of age should receive an iron-fortified formula. Iron-fortified formula should be continued until the infant is eating a variety of iron-containing foods.

The composition of whole cow's milk is inappropriate for young infants for a number of reasons, including possible blood loss from the gut and low iron content. Pasteurized, whole (3.25%) cow's milk can be used after the first 9 months of life when combined with other foods. Whole milk continues to be recommended through the 2nd year of life, though 2% milk can be provided if the child is eating a variety of foods and growing at an acceptable rate. Partly skimmed (1%) and skimmed milk should not be used in the first 2 years of life; the fat is required to meet energy and fatty acid needs.

Soy-based formulas should not be used as a sole source of nutrition, if possible, or to treat infantile colic because of potential risks in addition to soy protein being an important allergen in infants. The exception to this would be the use of soy-based formulas in premature infants or infants with congenital hypothyroidism. In the case of a suspected cow's milk protein allergy, a protein hydrolysate formula or breastfeeding should be recommended over a soy-based formula. However, soy-based formula can be used up to 2 years of age if cow's milk is culturally or religiously inappropriate. Other soy, rice or vegetarian beverages are not recommended.

Follow-up formulas can be used in place of regular formula starting at 6 months of age and once the infant is already eating solid foods. They are an alternative to cow's milk. These formulas provide more appropriate nutrient forms, quantities and energy compared to whole cow's milk.

Table 3 – Approximate Volume and Frequency of Formula Feedings³⁶

Age	No. of Bottles per 24 Hours	Intake (mL/bottle)
1st week	6–10	30–80
1–4 weeks	7 or 8	60–120
1–4 months	5 or 6	120–180
5–9 months	3–5	160–240

(30 mL = 1 ounce)

FORMULA PREPARATION

General

- Water should be boiled > 2 minutes (longer if under a boil-water advisory) and then cooled to ensure it is pathogen free before mixing with formula for infants < 4 months

- Bottles and nipples need to be cleaned and sterilized after each use; bottles can be boiled or put in the dishwasher to do this
- Heat bottles or non-spill cup of formula or milk by running hot water over it; never heat them in the microwave; check the temperature of the liquid by putting a few drops on your wrist; if it feels warm it is cool enough to feed the baby
- Discard formula or milk that is left after each feeding

Commercial Infant Formulas⁵

- Ready to feed: give as is, without dilution
- Concentrate: follow instructions carefully (usually mix 1:1 with water)
- Powdered: follow instructions carefully; over-dilution of powdered formula can be dangerous
- Prepared formula can be stored in the refrigerator for up to 48 hours

Homemade Formula

- Homemade formula is not recommended as an alternative to breast milk or commercial infant formula since it is nutritionally incomplete (low in iron, essential fatty acids and high in renal solutes)
- Where mothers are forced by circumstances to use canned evaporated milk, appropriate mixing is essential (*see below*)
- Only evaporated whole milk should be used
- For infants up to 6 months: 30 mL evaporated whole milk, 60 mL water and 5 mL sugar
- For infants over 6 months: 1 part evaporated whole milk and 1 part water; no sugar is added
- After 4 months of age, a source of essential fatty acids (vegetable oils) should be introduced
- Daily ferrous sulfate supplements are recommended if the infant is not breastfeeding or using iron-fortified formula, and for the at-risk infant (for example, low birth weight and premature infants, or a history of iron deficiency in siblings); for prophylaxis recommendations (*see “Iron Deficiency Anemia in Infancy” in the chapter, “Hematology, Endocrinology, Metabolism and Immunology”*)

FEEDING TECHNIQUE³⁷

1. Sit in upright and comfortable position with good back support.
2. Cradle the baby close to adult's body with their head slightly elevated (feeding flat may result in otitis media).
3. Hold the bottle (no propping, as it leads to caries, choking and/or aspiration).
4. The nipple should have a hole that permits drops to flow when bottle is inverted. A larger opening may cause overfeeding and/or regurgitation.
5. The nipple should be full of formula (to avoid air ingestion) and then pointed directly into the mouth on top of the tongue.
6. The baby should be burped regularly, at least in the middle and at the end of the feeding.
7. Infants should be encouraged, but not forced, to feed.

VITAMIN AND MINERAL SUPPLEMENTS**FLUORIDE³⁸**

Fluoride is effective in preventing caries. Ingesting too much fluoride can result in fluorosis. The action of fluoride is topical. No fluoride should be given before the teeth have erupted. Children in some First Nations and Inuit communities may require fluoride supplementation, except if the community has high levels of natural fluoride in the water supply. The regional dental officer can provide information on the situation in your community. Supplemental fluoride should be given only after 6 months of age and only in the following conditions:

1. The concentration of the fluoride in the water is < 0.3 ppm;
2. The child does not brush their teeth (or have them brushed by an adult) at least twice a day; and
3. If, in the judgement of a dentist or physician the child is a high risk for cavities (for example, family history, trend in community or area).

Toothpaste contains fluoride. Children should use only a "pea-sized" amount of toothpaste and should be encouraged to spit out the excess. Supplemental fluoride should be in mouthwash, lozenges or drops diluted in water and sprayed on the teeth.

Recommended dosages of supplemental fluoride are as follows (if one meets the criteria above):

- 6 months to 3 years: 0.25 mg/day
- > 3–6 years: 0.5 mg/day
- > 6 years: 1 mg/day

VITAMIN D⁶

Infants younger than 1 year of age are vulnerable to vitamin D deficiency if they are breastfed and not supplemented with vitamin D. Vitamin D deficiency is linked to osteoporosis and fracture risk, as well as rickets³⁹ (see "Nutritional Rickets"). Dark-skinned infants are particularly at risk for developing rickets.

- Total vitamin D intake from all sources for premature infants should be 200 IU/kg/day (to a maximum of 400 IU/day)
- Healthy term infants who are breastfed should be given 400 IU/day of vitamin D, as breastmilk supplies little vitamin D. Supplementation should begin at birth and continue until the infant's diet includes at least 400 IU/day of vitamin D or up to 1 year of age (see "Nutrition for Healthy Term Infants – Statement of the Joint Working Group: Canadian Paediatric Society, Dietitians of Canada and Health Canada" and "Vitamin D Supplementation for Breastfed Infants – Questions and Answers for Professionals" for common dietary sources of vitamin D at http://web.hc-sc.gc.ca/fn-an/pubs/infant-nourrisson/nut_infant_nourrisson_term-eng.php and http://www.hc-sc.gc.ca/fn-an/nutrition/child-enfant/infant-nourrisson/vita_d_qa-qr-eng.php)
- Total vitamin D intake from all sources for infants during the first year should be 400 IU/day

OTHER

- Multivitamins are generally not recommended
- For iron, see "Iron Deficiency Anemia in Infancy" in the chapter, "Hematology, Endocrinology, Metabolism and Immunology" for prophylaxis recommendations.

SOLID FOODS^{5,40,41}

Infants 6 months old are ready for new foods, textures and ways of feeding. They are also starting to have increasing nutrient requirements and developmental needs. Start foods when the infant shows interest in foods when others eat and opens their mouth when food approaches. However, they still need adequate amounts of breast milk or formula. By 1 year, they should be eating a variety of foods from all the four food groups in *Canada's Food Guide*.

Iron-containing foods should be the first foods added to the diet around 6 months of age. Single foods should be introduced to make it easier to identify the cause if an allergic reaction occurs. Meat and alternatives or iron-fortified cereal can be introduced at this stage. Iron from meat sources is better absorbed than from cereals.

Vegetables and fruits should be added next to the diet to give colour, flavour, texture and variety. Milk products (for example, cottage cheese, cheese and yogurt) often follow. Prepared baby foods, if used, should be added initially in small quantities, one at a time, after sources of iron have been started.

Table foods, more textured purees and finger foods can be introduced closer to 1 year when the infant is ready to chew and needs more texture. Safe finger foods include dry toast, bread crusts, pieces of soft cooked vegetables and fruits, soft ripe fruit, cooked meat and poultry and cheese cubes. Infants should be encouraged to feed themselves and drink independently from a bottle or cup. Juice should not be given until after 6 months and, if given, intake should be limited to 120–180 mL of 100% juice daily. Water can be given to satisfy thirst.

SAFETY ISSUES WITH FEEDINGS

- To prevent infant botulism, do not use honey when feeding infants < 1 year of age
- To prevent salmonella poisoning, cook all eggs well and do not feed products containing raw eggs
- Hard, small foods and round, smooth and sticky solid foods are not advised; they may cause choking and aspiration (see “*Foods Unsafe for Children Under 4 Years*” and “*Increasing Safety of Foods with a Choking Risk*”)
- Do not feed an infant using a “propped” bottle
- Ensure infants and toddlers are always supervised during feeding
- Egg whites should be avoided until after 1 year of age to minimize the possibility of allergic reaction

FEEDING CHILDREN BETWEEN 1 AND 2 YEARS OF AGE^{5,33}

Toddlers should consume small, frequent, nutritious and energy-dense foods when they are hungry or willing to eat. They should be offered a variety of foods from the four food groups of *Eating Well with Canada's Food Guide – First Nations, Inuit and Métis* (see <http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/>). This is essential in order to meet their nutrient and energy needs. Older infants' appetites will vary depending on growth, activity, fatigue, illness, frustration and social situation. They should be encouraged to feed themselves at the beginning of a meal, but may need help later on if they are tired. Adults decide when, what and where to eat, whereas the child should decide whether and how much to eat. Additionally, children should be encouraged to ask for more food if they are still hungry. Children over 12 months of age should not be given more than 700 mL of milk products a day; otherwise they will be full and not want to eat solid foods.

FOODS UNSAFE FOR CHILDREN UNDER 4 YEARS⁵

Children under 4 years may choke or asphyxiate on the following foods:

- Popcorn
- Hard candies
- Gum
- Cough drops
- Some raw fruit and vegetables such as raisins, grapes or carrots
- Peanuts or other nuts
- Sunflower seeds
- Fish with bones
- Wieners or sausages
- Peanut butter
- Snacks with toothpicks or skewers

INCREASING SAFETY OF FOODS WITH A CHOKING RISK⁵

Prepare food in the following manner to increase safety:

- Fruit – remove pits and seeds; cut into bite-size pieces; cut grapes in quarters
- Vegetables – cook; grate; cut into bite-size pieces
- Peanut butter – use smooth peanut butter rather than crunchy; spread it thinly
- Wieners or sausages – dice

FEEDING CHILDREN OVER 2 YEARS OF AGE^{42,43}

Eating Well with Canada's Food Guide and *Eating Well with Canada's Food Guide – First Nations, Inuit and Métis* (see <http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/>) indicate the type and the amount of food an individual over the age of 2 should consume every day according to age and sex. Advice is given about the kinds of foods to choose and which foods to limit. Parents should be encouraged to follow the food guide to help their children make appropriate choices.

They should also be encouraged to be good role models for eating habits. Children should be offered a variety of foods from the four food groups. Snacks and meals should be small and nutritious.

See *Eating Well with Canada's Food Guide* for the food guide and for a ready-to-use powerpoint presentation (see <http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/fnim-pnim/index-eng.php>).

PEDIATRIC NUTRITIONAL PROBLEMS

NUTRITIONAL DEFICIENCY DISORDERS

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

See also “Failure to Thrive” in the chapter, “Hematology, Endocrinology, Metabolism and Immunology.”

Nutritional deficiencies can present clinically as signs and symptoms in multiple body systems. Common body parts and systems affected include the skin, hair, nails, eyes, mouth, neck, and cardiovascular, musculoskeletal and neurologic systems (see Table 4, “Physical Signs of Nutritional Deficiency Disorders” for the clinical manifestations of common nutritional deficiencies).

Table 4 – Physical Signs of Nutritional Deficiency Disorders

System	Sign	Deficiency
General appearance	Reduced weight for height	Calories
Skin and hair	Pallor	Anemias (iron, vitamin B12, vitamin E, folate and copper)
	Edema	Protein, thiamine
	Nasolabial seborrhea	Calories, protein, vitamin B6
	Dermatitis	Riboflavin, essential fatty acids, biotin
	Photosensitivity dermatitis	Niacin

Table 4 – Physical Signs of Nutritional Deficiency Disorders

System	Sign	Deficiency
	Acrodermatitis	Zinc
	Follicular hyperkeratosis (sandpaper-like)	Vitamin A
	Depigmented skin	Calories, protein
	Purpura	Vitamins C, K
	Scrotal or vulval dermatitis	Riboflavin
	Alopecia	Zinc, biotin, protein
	Depigmented, dull hair	Protein, calories, copper
Subcutaneous tissue	Decreased	Calories
Eyes (vision)	Poor adaptation to dark	Vitamins A, E, zinc
	Poor colour discrimination	Vitamin A
	Bitot's spots, xerophthalmia, keratomalacia	Vitamin A
	Conjunctive pallor	Nutritional anemias
	Fundal capillary microaneurysms	Vitamin C
Face, mouth, neck	Angular stomatitis	Riboflavin, iron
	Cheilosis	Vitamin B6, niacin, riboflavin
	Bleeding gums	Vitamin C, K
	Atrophic papillae	Riboflavin, iron, niacin
	Smooth tongue	Iron
	Red tongue (glossitis)	Vitamins B6, B12, niacin, riboflavin, folate
	Parotid swelling	Protein
	Caries	Fluoride
	Anosmia	Vitamins A, B12, zinc
	Hypogeusia	Vitamin A, zinc
	Goiter	Iodine
Cardiovascular system	Heart failure	Thiamine, selenium, nutritional anemias
Genital	Hypogonadism	Zinc
Skeletal	Costochondral beading	Vitamins D, C
	Subperiosteal hemorrhage	Vitamin C, copper
	Cranial bossing	Vitamin D
	Wide fontanel	Vitamin D
	Epiphyseal enlargement	Vitamin D
	Craniotabes	Vitamin D, calcium
	Tender bones	Vitamin C
	Tender calves	Thiamine, selenium
	Spoon-shaped nails (koilonychia)	Iron
	Transverse nail lines	Protein
Central nervous system	Sensory or motor neuropathy	Thiamine, vitamins E, B6, B12
	Ataxia, areflexia	Vitamin E
	Ophthalmoplegia	Vitamin E, thiamine
	Tetany	Vitamin D, Ca ⁺⁺ , Mg ⁺⁺
	Retardation	Iodine, niacin
	Dementia, delirium	Vitamin E, niacin, thiamine

Source: *Nelson's essentials of pediatrics*. 3rd ed. Behrman & Kleigman, 1998.

COMMON NUTRITIONAL PROBLEMS

OBESITY

Obesity is an excess of body fat. A child over 2 years of age is considered overweight or obese if their:

- a) Body mass index (BMI) is above the 85th percentile for their age; or
- b) BMI crosses higher percentile lines on the growth chart over time

This is particularly true when combined with a family history of obesity or diabetic risk factors. This condition is cause for vigorous intervention. Percentiles are calculated using standard growth charts (*see “Growth Measurement” in the chapter, “Pediatric Prevention and Health Maintenance”*).

For infants under age 2, where BMI is not calculated, use a weight/height ratio. A crossing of percentile lines on standard growth charts, sustained over 2–3 months, is a warning for the possibility of developing overweight. Many Aboriginal children at birth tend to have a weight/height ratio greater than the 50th percentile for other populations (seen in growth charts).⁴⁴

CAUSES^{45,46}

- Most commonly exogenous due to excessive caloric intake for basal needs and low energy output
- Genetic influences: Obese children < 3 years old without obese parents are at low risk for obesity in adulthood, but among older children, obesity is an increasingly important predictor of adult obesity, regardless of whether the parents are obese. Parental obesity more than doubles the risk of adult obesity among both obese and non-obese children < 10 years old. Other genetic diseases like Prader-Willi syndrome can cause obesity
- Hormonal influences (for example, Cushing’s syndrome)

RISK FACTORS INFLUENCING THE DEVELOPMENT OF OBESITY IN CHILDREN

- Parental/familial overweight
- Maternal diabetes
- Overweight at birth
- Physical inactivity most days (lots of sedentary activities such as TV and video games)
- Irregular snacking
- Poor food choices (food and drinks high in sugar and fat most days)
- Eating to help deal with stress or problems
- Lack of availability of variety of nutritious foods
- Healthy eating and physical activity are not encouraged at home
- Diabetes risk factors
- Genetic or hormonal factors

HISTORY

- Age at onset of obesity (genetic syndromes often have obesity by age 2)
- Nutritional assessment (*see “Nutritional Assessment”*)
- Physical activity pattern:
 - Time spent in play
 - School recess and physical education (frequency, duration and intensity)
 - After school and weekend activities
 - Amount of screen-time (television, video games, computer)
 - Barriers to walking or riding a bike
- Family history of obesity, hypertension, cardiovascular disease, diabetes mellitus, cerebrovascular accident, liver or gallbladder disease, respiratory insufficiency
- Symptoms such as missed developmental milestones, short stature, headaches, snoring, daytime sleepiness, abdominal pain, hip or knee pain, limp, oligo/amenorrhea, urinary frequency, nocturia, polydipsia, polyuria, binge eating or purging, insomnia, anhedonia
- Onset of puberty
- Psychosocial history in older children: school performance, peer relationships, parental relationships, bullying, child’s perception of his or her body, tobacco use, depression symptoms

PHYSICAL FINDINGS

- Overall appearance (including dysmorphic features, affect, mental retardation)
- Blood pressure
- Weight, height and waist circumference (older children) (with exogenous obesity, height for age is usually accelerated; with endocrine or metabolic disorders, height for age is usually retarded)
- Respiratory rate (hypoventilation may suggest Pickwickian syndrome)
- Fat distribution
- Increased subcutaneous tissue
- Increased triceps skin-fold thickness
- Skin: striae, irritations, ecchymoses, acanthosis nigricans, hirsutism, acne (intertrigo)
- Hair: texture, consistency
- Head, eyes (including retina), throat (for example, tonsil size, erosion of tooth enamel)
- Abdomen: tenderness, organomegaly
- Genitourinary: stage of sexual maturation, hypogonadism, undescended testicles
- Musculoskeletal: nonpitting edema, scoliosis, genu valgum, slipped femoral epiphyses, polydactyly, small hands or feet
- Developmental milestones (see “Developmental Screening” in the chapter, “Pediatric Prevention and Health Maintenance”)

DIFFERENTIAL DIAGNOSIS²

- Diabetes mellitus, type II, related to obesity and inactivity
- Hypothyroidism
- Cushing’s disease
- Polycystic ovarian syndrome
- Depression
- Eating disorder
- Central nervous system (CNS) diseases (for example, history of craniopharyngioma, meningitis, brain tumors, cerebrovascular accident or head trauma may be associated with onset of obesity due to hyperphagia and decreased activity)
- Genetic or congenital disorders (for example, Prader-Willi syndrome and Laurence-Moon syndrome)

COMPLICATIONS^{47,48}**Table 5 – Health Complications Associated with Childhood Obesity**

System	Complications
Cardiovascular	<ul style="list-style-type: none"> • Hyperlipidemia (cholesterol and triglycerides) • Hypertension • Metabolic syndrome • Coronary heart disease
Endocrine	<ul style="list-style-type: none"> • Hyperinsulinemia • Glucose intolerance • Decreased levels of growth hormone • Decreased levels of prolactin in girls • Decreased levels of testosterone in boys • Diabetes mellitus (type 2) – the earlier it begins, the more complications there tends to be; diabetes in children is a serious public health threat (see “Diabetes Mellitus in Aboriginal Children”)
Gastrointestinal	<ul style="list-style-type: none"> • Cholelithiasis • Hepatic steatosis
Genitourinary	<ul style="list-style-type: none"> • Amenorrhea and dysfunctional uterine bleeding in girls • Polycystic ovarian syndrome • Early menarche
Pulmonary	<ul style="list-style-type: none"> • Increased respiratory illness in toddlers < 2 years old • Respiratory disorders like asthma • Pickwickian syndrome (increased daytime sleepiness and hypoventilation) • Obstructive sleep apnea
Musculoskeletal	<ul style="list-style-type: none"> • Accelerated bone growth and skeletal maturation • Slipped capital femoral epiphyses • Legg-Calvé-Perthes disease • Genu valgum
Neurologic	<ul style="list-style-type: none"> • Pseudotumor cerebri
Psychosocial	<ul style="list-style-type: none"> • Low self-esteem • Negative body image • Difficulty developing peer relationships • Behavioural and learning problems • Social withdrawal and isolation • Depression • Parental neglect
Other	<ul style="list-style-type: none"> • Accelerated maturation and decreased final height, often seen in girls • Adult obesity leading to increased cardiovascular disease, diabetes, osteoarthritis, infertility and some cancers (endometrial, breast and colon)

DIAGNOSTIC TESTS²

Dependent on suspected cause. May include:

- Random blood glucose, fasting blood glucose and/or glucose tolerance test
- TSH and T₄ levels (if child is of short stature)
- Urinalysis (for glucose)
- Lipid profile
- Liver function tests (if abdominal pain)
- Abdominal or pelvic ultrasonography (if abdominal pain or to rule out polycystic ovaries in adolescent girls with amenorrhea or dysfunctional uterine bleeding; test must be ordered by a physician)
- X-Ray (for hip or knee pain)

MANAGEMENT**Goals of Treatment**

- For obesity due to non-exogenous causes, underlying disorder must be treated
- Change behaviour so that more energy is used by the child for growth, activity and metabolic processes than is consumed
- Parental education about nutrition
- Whole family involvement in the management of this problem

Appropriate Consultation

- Consult a physician if you suspect an underlying physiologic, metabolic or psychologic disorder as the cause of obesity; it may require referral to a pediatric specialist
- In infants and toddlers treatment should be cautious; consult a physician before any investigation or treatment is begun

Nonpharmacologic Interventions**Prevention⁴⁹**

Early preventive measures should be emphasized, particularly with families in which one or both parents are overweight. Obese children have a high risk of becoming obese adults. Preventive measures may eventually result in a reduction in the prevalence of cardiovascular diseases and other related diseases.

- Prolonged breastfeeding (at least to 1 year, may help decrease the prevalence of obesity in childhood)
- Delay the introduction of solid foods until at least 6 months of age

- Avoid feeding calorie-dense and nutrient-poor foods (for example, french fries, over 180 mL of fruit juices per day and carbonated beverages)
- Recognize and respond to hunger and satiation cues (avoid restrictive and coercive food practices; parents responsible for what, when and where to eat, the child is responsible for whether and how much to eat)
- Encourage age-appropriate physical activity
- Avoid TV and all screen time for children < 2 years; limit screen time to < 2 hours/day for all other ages

Older Children with Exogenous Obesity⁴⁸

Program of decreased caloric intake and increased exercise (to at least 30 minutes with 10 of them being vigorous activity initially to goal of 90 minutes/day) over a long period

- Encourage increased consumption of cereal fibre, fruits, vegetables and water over high fat and sugary snacks, juices and soft drinks. Use of *Canada's Food Guide* should be encouraged. See *Eating Well with Canada's Food Guide – First Nations, Inuit and Métis* for resources, including a ready-to-use PowerPoint presentation (see <http://web.hc-sc.gc.ca/fn-an/food-guide-aliment/fnim-pnim/index-eng.php>)
- Encourage parents to be good role models for their children, by doing physical activities together as a family
- Reduce television, videotape and video game use
- Encourage youth to promote physical activities for their peers
- Promote use of *Canada's Physical Activity Guide* as a tool to encourage more activity (see http://www.phac-aspc.gc.ca/pau-uap/paguide/child_youth/index.html)

MONITORING AND FOLLOW-UP

Follow up monthly to monitor height and weight until optimal weight has been achieved.

NUTRITIONAL RICKETS

A group of disorders characterized by failure of growing bone matrix to become mineralized due to low intestinal absorption of calcium. Under-mineralized bones are less rigid than normal, and bone deformities result.

CAUSES

- Vitamin D deficiency (most common)
- Calcium deficiency
- Phosphorus deficiency

CHILDREN AT RISK⁵⁰

- Small, premature infants
- Breastfed infants who do not receive vitamin D supplementation
- Diet lacking in vitamin D or insufficient exposure to sunlight
- Chronic renal failure
- Bowel disease (celiac disease, malabsorption, extensive bowel surgery, inflammatory bowel disease)
- Gastrectomy history
- Advanced cystic fibrosis
- Born to vitamin D deficient mother

HISTORY

- Nutritional assessment (with a focus on calcium, phosphate and vitamin D intake) (*see “Nutritional Assessment”*)
- Diet containing insufficient vitamin D (for example, breast milk, tea or juices as primary fluid sources) and inadequate supplementation of infants with vitamin D
- Low exposure to sun because of pigmented skin or winter season
- Low vitamin D intake by mother during pregnancy
- Use of soy-based formula, antacids, anticonvulsants (phenytoin, phenobarbital), renal insufficiency, hepatic insufficiency, cystic fibrosis; poor calcium absorption with these
- Bone pain
- Delayed onset of standing or walking
- Anorexia
- Seizures
- Pathologic fractures
- Family history of rickets

PHYSICAL FINDINGS⁵⁰

- Initial manifestations are usually in the distal forearm, knee and costochondral junctions
- Slow growth (short stature for age)

Advanced Rickets

- Bossing deformity parietally and frontally
- Delayed closure of the fontanelles
- Craniotabes (soft skull bones)
- Thickening of costochondral junction anterolaterally (rachitic rosary)
- Bowing of legs (progressive bowing of femur and tibia – direction depends on age and use; awkward gait)
- Prominence of wrists and knees
- Bowing of the distal radius and ulna
- Development of Harrison sulcus (muscular pull of the diaphragmatic attachments to the lower ribs)

Extraskeletal Findings

- Dental caries
- Muscle weakness leading to delayed developmental milestones (*see “Developmental Screening” in the chapter, “Pediatric Prevention and Health Maintenance”*)
- Prone to infectious diseases
- Increased sweating
- Seizures (due to low calcium) may be presenting complaint in first year of life

DIFFERENTIAL DIAGNOSIS⁵⁰

- Chronic renal insufficiency
- Inflammatory bowel disease
- Pseudovitamin D deficiency
- Tumor-induced osteomalacia

COMPLICATIONS

- Permanent leg bowing, occasionally requiring corrective surgery
- Contractures of the pelvis may cause difficulty with labour and delivery

DIAGNOSTIC TESTS⁵⁰

Discuss any diagnostic tests with a physician.

- Blood tests may be necessary; possibly alkaline phosphatase, creatinine, serum phosphorus, serum calcium, parathyroid hormone, vitamin D
- Knee and wrist x-ray, if available (one view only, as rickets is a symmetric condition)
- X-ray will show irregular cortices and bony margins, widened metaphyses, widened growth plates, pseudofractures and/or osteopenia

MANAGEMENT***Nonpharmacologic Interventions*****Prevention**

- Vitamin D and calcium supplementation during pregnancy
- Nutrition education

Consider vitamin D supplementation for children < 2 years if rickets is common in the community.

Pharmacologic Interventions**Prevention**

- Total vitamin D intake from all sources for premature infants should be 200 IU/kg/day (to a maximum of 400 IU/day)
- Healthy term infants who are breastfed should be given 400 IU/day of vitamin D, as breastfeeding supplies little vitamin D. Supplementation should begin at birth and continue until the infant's diet includes at least 400 IU/day of vitamin D or up to 1 year of age
- Total vitamin D intake from all sources for infants during the first year should be 400 IU/day
- Women and children who do not consume milk products or fortified soy beverage may need a vitamin D supplement
- Calcium supplementation should be considered if intake of milk or fortified soy beverages is lower than recommended in *Canada's Food Guide*
- Soft drinks and fruit juices should be discouraged because they contain little calcium and replace calcium-containing drinks such as milk. Colas also have caffeine which is implicated in calcium loss from bone

TREATMENT

Discuss with a physician the initial vitamin D dose for treating rickets. Calcium supplements may also be needed. Treatment is continued until healing is demonstrated in x-rays.

MONITORING AND FOLLOW-UP⁵⁰

- Blood and urinary calcium levels should be monitored if vitamin D therapy is used. Discuss with a physician the frequency of monitoring, and which blood tests and x-rays should be monitored; usually the first x-ray check is made after 3 months

REFERRAL

Refer all cases of suspected rickets to a physician for evaluation as soon as possible.

SOURCES

Internet addresses are valid as of June 2010.

BOOKS AND MONOGRAPHS

- Behrman RE, Kliegman R (eds.). *Nelson's essentials of pediatrics*. 3rd ed. Philadelphia: W.B. Saunders; 1998.
- Berkowitz CD. *Pediatrics: A primary care approach*. Philadelphia: W.B. Saunders; 2001.
- Briggs GG, Freeman RK, Yaffe SJ. *Drugs in pregnancy and lactation: A reference guide to fetal and neonatal risk*. 6th ed. Baltimore, MD: Lippincott Williams & Wilkins; 2001.
- Canadian Task Force on the Periodic Health Examination. *Canadian guide to clinical preventive health care*. Ottawa, ON: Health Canada; 1994. Ca No. H21-117-1994E.
- Cheng A, et al. *The Hospital for Sick Children handbook of pediatrics*. 10th ed. Toronto: Elsevier; 2003.
- Davidson MR, Ladewig PAW, London ML. *Clinical handbook for Olds' maternal-newborn nursing & women's health across the lifespan*. 8th ed. Upper Saddle River, NJ: Pearson Prentice Hall; 2008.
- Enkin M, Keirse M, Neilson J, Crowther C, Duley L, Hodnett E, et al. *A guide to effective care in pregnancy and childbirth*. New York: Oxford University Press; 2007.
- Hendricks KM, Duggan C. *Manual of pediatric nutrition*. 4th ed. Hamilton, ON: BC Decker; 2005.
- Hockenberry MJ. *Wong's nursing care of infants and children*. St. Louis: Mosby; 2003.
- Mandleco BL. *Growth & development handbook: Newborn through adolescence*. Canada: Thomson Delmar Learning; 2004.
- Newman J, Pitman T. *Dr Jack Newman's guide to breastfeeding*. Harper-Collins; 2003.
- Ryan-Wenger NA (ed.). *Core curriculum for primary care pediatric nurse practitioners*. St. Louis: Mosby Elsevier; 2007.

JOURNAL ARTICLES AND INTERNET GUIDELINES

- Canadian Paediatric Society. The use of fluoride in infants and children. *Paediatr Child Health* 2002;7(8):569-72. Available at: <http://www.cps.ca/english/statements/N/n02-01.htm>
- Canadian Paediatric Society. (2005, reaffirmed February 2008) Exclusive breastfeeding should continue to six months. *Paediatr Child Health* 2005;10(3):148. Available at: <http://www.cps.ca/english/statements/N/BreastfeedingMar05.htm>
- Canadian Paediatric Society. (2009). Weaning your child from breastfeeding. Available at: <http://www.caringforkids.cps.ca/pregnancy&babies/Weaning.htm>
- Canadian Paediatric Society: Community Paediatrics Committee. (2004, reaffirmed February 2009) Weaning from the breast. *Paediatr Child Health* 2004;9(4):249-53. Available at: <http://www.cps.ca/english/statements/CP/cp04-01.htm>
- Canadian Paediatric Society, Dieticians of Canada and Health Canada. *Nutrition for healthy term infants*. Ottawa, ON: Minister of Public Works and Government Services Canada; 2005. Available at: http://www.hc-sc.gc.ca/fn-an/pubs/infant-nourrisson/nut_infant_nourrisson_term-eng.php#table
- Canadian Paediatric Society: First Nations and Inuit Health Committee. Growth assessment in Aboriginal children: Is there need for change? *Paediatr Child Health* 2004;9(7):477-79. Available at: <http://www.cps.ca/english/statements/II/FNIH04-01.pdf>
- Canadian Paediatric Society: First Nations, Inuit and Métis Health Committee. Vitamin D supplementation: Recommendations for Canadian mothers and infants. *Paediatr Child Health* 2007;12(7):583-89. Available at: <http://www.cps.ca/english/statements/II/FNIM07-01.htm>
- Canadian Paediatric Society: Healthy Active Living Committee. Healthy active living for children and youth. *Paediatr Child Health* 2002;7(5):339-45. Available at: <http://www.cps.ca/english/statements/hal/hal02-01.htm>

Canadian Paediatric Society: Nutrition Committee. Dietary manipulations for infantile colic. *Paediatr Child Health* 2003;8(7):449-52. Available at: <http://www.cps.ca/english/statements/N/NutritionNoteSept03.htm>

Canadian Paediatric Society: Nutrition Committee. The new Canada Food Guide. *Paediatr Child Health* 2007;12(4):329-30. Available at: <http://www.cps.ca/english/statements/N/PracticePoint.htm>

Canadian Paediatric Society: Nutrition Committee. Concerns for the use of soy-based formulas in infant nutrition. *Paediatr Child Health* 2009;14(3):109-13. Available at: <http://www.cps.ca/english/statements/N/InfantSoyConcern.htm>

Childhood Obesity Foundation (n. d.). Available at: <http://www.childhoodobesityfoundation.ca/index.php>

Godel JC. Breast-feeding and anemia: Let's be careful [editorial]. *CMAJ* 2000;162(3):343-44. Available at: <http://www.cmaj.ca/cgi/reprint/162/3/343>

Health Canada. (2000). *Family-centred maternity and newborn care: National guidelines – Breastfeeding* (Ch. 7). Available at: http://www.phac-aspc.gc.ca/dca-dea/publications/pdf/fcmc07_e.pdf

Health Canada. (2004). *Exclusive breast feeding duration: 2004 Health Canada recommendation*. Available at: http://www.hc-sc.gc.ca/fn-an/nutrition/child-enfant/infant-nourisson/excl_bf_dur-dur_am_excl-eng.php

Health Canada. (2007). *Eating well with Canada's Food Guide*. Available at: <http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/>

Newman J. (2005). *Canadian breastfeeding foundation: Blocked ducts and mastitis*. Available at: <http://www.canadianbreastfeedingfoundation.org/basics/mastitis.html>

Newman J, Kernerman E. (2008). *Newman breastfeeding clinic*. Available at: <http://www.drjacknewman.com/>

Newman J, Kernerman E. (2008). *When latching*. Available at: <http://www.drjacknewman.com/pdfs/When%20latching-2008.pdf>

Public Health Agency of Canada. (2007). *Physical activity guides for children and youth*. Available at: http://www.phac-aspc.gc.ca/pau-uap/paguide/child_youth/index.html

Rauch F. (2007, January 18). *Overview of rickets in children*. UptoDate Online 16.3. Available at: <http://www.uptodate.com/online/content/topic.do?topicKey=pediendo/9651>

Rauch F. (2008, October 14). *Etiology and treatment of hypocalcemic rickets in children*. UptoDate Online 16.3. Available at: http://www.uptodate.com/online/content/topic.do?topicKey=pediendo/11968&selectedTitle=1~150&source=search_result

Registered Nurses Association of Ontario (RNAO). *Breastfeeding best practice guidelines for nurses*. Toronto, ON: RNAO; 2007. Available at: <http://www.rnao.org/Page.asp?PageID=924&ContentID=795>

Stuebe A, Fiumara K, Lee KG. (2008, October 7). *Principles of medication use during lactation*. UptoDate Online 16.3.

United States National Library of Medicine. (2008). *Toxnet toxicology data network: Drugs and lactation database (LactMed)*. Available at: <http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?LACT>

ENDNOTES

- Hendricks KM, Duggan C. *Manual of pediatric nutrition*. 4th ed. Hamilton, ON: BC Decker; 2005. p. 56-69.
- Klish WJ. (2008, February 12). *Clinical evaluation of the obese child and adolescent*. UptoDate Online 16.3. Available at: http://www.uptodate.com/online/content/topic.do?topicKey=pedigast/11089&selectedTitle=4~150&source=search_result
- Mandleco BL. *Growth & development handbook: Newborn through adolescence*. Canada: Thomson Delmar Learning; 2004.
- Ryan-Wenger NA (ed.). *Core curriculum for primary care pediatric nurse practitioners*. St. Louis: Mosby Elsevier; 2007. p. 201.
- Canadian Paediatric Society, Dieticians of Canada and Health Canada. *Nutrition for healthy term infants*. Ottawa, ON: Minister of Public Works and Government Services Canada; 2005. Available at: http://www.hc-sc.gc.ca/fn-an/pubs/infant-nourisson/nut_infant_nourisson_term-eng.php#table
- Health Canada. (2004). *Exclusive breast feeding duration: 2004 Health Canada recommendation*. Available at: http://www.hc-sc.gc.ca/fn-an/nutrition/child-enfant/infant-nourisson/excl_bf_dur-dur_am_excl-eng.php

- 7 Canadian Paediatric Society. (2005, reaffirmed February 2008) Exclusive breastfeeding should continue to six months. *Paediatr Child Health* 2005;10(3):148. Available at: <http://www.cps.ca/english/statements/N/BreastfeedingMar05.htm>
- 8 Registered Nurses Association of Ontario (RNAO). *Breastfeeding best practice guidelines for nurses*. Toronto, ON: RNAO; 2007. p. 10. Available at: <http://www.rnao.org/Page.asp?PageID=924&ContentID=795>
- 9 Registered Nurses Association of Ontario (RNAO). *Breastfeeding best practice guidelines for nurses*. Toronto, ON: RNAO; 2007. p. 11. Available at: <http://www.rnao.org/Page.asp?PageID=924&ContentID=795>
- 10 Agency for Healthcare Research and Quality (AHRQ) National Guidelines Clearinghouse. *Guidelines for the evaluation and management of neonatal ankyloglossia and its complications in the breastfeeding dyad*. Initially published 2007, verified 2008. Available at: http://www.guideline.gov/summary/summary.aspx?ss=15&doc_id=11228&nbr=5875
- 11 Davidson MR, Ladewig PAW, London ML. *Clinical handbook for Olds' maternal-newborn nursing & women's health across the lifespan*. 8th ed. Upper Saddle River, NJ: Pearson Prentice Hall; 2008. p. 228-31.
- 12 Newman J, Kernerman E. (2008). *When latching*. Available at: <http://www.drjacknewman.com/pdfs/When%20latching-2008.pdf>
- 13 Newman J, Kernerman E. (2008). *Newman breastfeeding clinic*. p. 1-4. Available at: <http://www.drjacknewman.com/>
- 14 Registered Nurses Association of Ontario (RNAO). *Breastfeeding best practice guidelines for nurses*. Toronto, ON: RNAO; 2007. p. 93. Available at: <http://www.rnao.org/Page.asp?PageID=924&ContentID=795>
- 15 Registered Nurses Association of Ontario (RNAO). *Breastfeeding best practice guidelines for nurses*. Toronto, ON: RNAO; 2007. p. 88-89. Available at: <http://www.rnao.org/Page.asp?PageID=924&ContentID=795>
- 16 Butte NF. (2008, August 4). *Maternal nutrition during lactation*. UptoDate Online 16.3. Available at: http://www.uptodate.com/online/content/topic.do?topicKey=neonatal/11216&selectedTitle=16~150&source=search_result
- 17 Health Canada. (2000). *Family-centred maternity and newborn care: National guidelines – Breastfeeding* (Ch. 7). Available at: http://www.phac-aspc.gc.ca/dca-dea/publications/pdf/fcmc07_e.pdf
- 18 Registered Nurses Association of Ontario (RNAO). *Breastfeeding best practice guidelines for nurses*. Ottawa, ON: RNAO; 2007. p. 45. Available at: <http://www.rnao.org/Page.asp?PageID=924&ContentID=795>
- 19 Registered Nurses Association of Ontario (RNAO). *Breastfeeding best practice guidelines for nurses*. Ottawa, ON: RNAO; 2007. p. 32, 35, 42-45, 91-92. Available at: <http://www.rnao.org/Page.asp?PageID=924&ContentID=795>
- 20 Canadian Paediatric Society: Community Paediatrics Committee. (2004, reaffirmed February 2009). Weaning from the breast. *Paediatr Child Health* 2004; 9(4):249-53. Available at: <http://www.cps.ca/english/statements/CP/cp04-01.htm>
- 21 Davidson MR, Ladewig PAW, London ML. *Clinical handbook for Olds' maternal-newborn nursing & women's health across the lifespan*. 8th ed. Upper Saddle River, NJ: Pearson Prentice Hall; 2008. p. 228-33.
- 22 Schanler RJ, Potak DC. (2009, May). *Common problems of breastfeeding and weaning*. Available at: http://www.uptodate.com/online/content/topic.do?topicKey=neonatal/21625&selectedTitle=1~70&source=search_result#5
- 23 Davidson MR, Ladewig PAW, London ML. *Clinical handbook for Olds' maternal-newborn nursing & women's health across the lifespan*. 8th ed. Upper Saddle River, NJ: Pearson Prentice Hall; 2008. p. 232-33.
- 24 Walker M. *Breastfeeding management for the clinician: Using the evidence*. New Mexico: Jones & Bartlett Publishers Inc.; 2006.
- 25 Fiock G. (2008). *Blebs, nipple blister and blocked ducts*. p. 1. Available at: <http://www.pamf.org/children/newborns/feeding/blebs.html>
- 26 Davidson MR, Ladewig PAW, London ML. *Clinical handbook for Olds' maternal-newborn nursing & women's health across the lifespan*. 8th ed. Upper Saddle River, NJ: Pearson Prentice Hall; 2008. p. 233.
- 27 Davidson MR, Ladewig PAW, London ML. *Clinical handbook for Olds' maternal-newborn nursing & women's health across the lifespan*. 8th ed. Upper Saddle River, NJ: Pearson Prentice Hall; 2008. p. 232.
- 28 Ryan-Wenger NA (ed.). *Core curriculum for primary care pediatric nurse practitioners*. St. Louis: Mosby Elsevier; 2007. p. 191-93.
- 29 United States National Library of Medicine. (2008). *Toxnet toxicology data network: Drugs and lactation database (LactMed)*. Available at: <http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?LACT>

- 30 Ito S, Brochet MS. Drug use during lactation. In: Repchinsky C, editor. *Compendium of pharmaceuticals and specialties*. Ottawa (ON): Canadian Pharmacists Association; 2008.
- 31 American Academy of Pediatrics, Committee on Drugs. The transfer of drugs and other chemicals into human milk. *Pediatrics* 2001;108:776-89.
- 32 Briggs GG, Freeman RK, Yaffe SJ. *Drugs in pregnancy and lactation*. 8th ed. Baltimore, MD: Williams and Wilkins; 2008.
- 33 Canadian Paediatric Society. (2009). *Weaning your child from breastfeeding*. Available at: <http://www.caringforkids.cps.ca/pregnancy&babies/Weaning.htm>
- 34 Canadian Paediatric Society: Nutrition Committee. Dietary manipulations for infantile colic. *Paediatr Child Health* 2003;8(7):449-52. Available at: <http://www.cps.ca/english/statements/N/NutritionNoteSept03.htm>
- 35 Canadian Paediatric Society: Nutrition Committee. Concerns for the use of soy-based formulas in infant nutrition. *Paediatr Child Health* 2009;14(3):109-13. Available at: <http://www.cps.ca/english/statements/N/InfantSoyConcern.htm>
- 36 Hockenberry MJ. *Wong's nursing care of infants and children*. St. Louis: Mosby; 2003.
- 37 Davidson MR, Ladewig PAW, London ML. *Clinical handbook for Olds' maternal-newborn nursing & women's health across the lifespan*. 8th ed. Upper Saddle River, NJ: Pearson Prentice Hall; 2008. p. 231, 234.
- 38 Canadian Paediatric Society. The use of fluoride in infants and children. *Paediatr Child Health* 2002;7(8):569-72. Available at: <http://www.cps.ca/english/statements/II/FNIM07-01.htm>
- 39 Fletcher RH, Fairfield KM. (2009, February 2). *Vitamin supplementation in disease prevention*. UptoDate Online. Available at: <http://www.uptodate.com/online/content/topic.do?topicKey=nutritio/5166>
- 40 Hendricks KM, Duggan C. *Manual of pediatric nutrition*. 4th ed. Hamilton, ON: BC Decker; 2005. p. 134-43.
- 41 Ryan-Wenger NA (ed.). *Core curriculum for primary care pediatric nurse practitioners*. St. Louis: Mosby Elsevier; 2007. p. 201-03.
- 42 Canadian Paediatric Society: Nutrition Committee. The new Canada Food Guide. *Paediatr Child Health* 2007;12(4):329-30. Available at: <http://www.cps.ca/english/statements/N/PracticePoint.htm>
- 43 Health Canada. (2007). *Eating well with Canada's Food Guide*. Available at: <http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/>
- 44 Canadian Paediatric Society: First Nations and Inuit Health Committee. Growth assessment in Aboriginal children: Is there need for change? *Paediatr Child Health* 2004;9(7):477-79. Available at: <http://www.cps.ca/english/statements/II/FNIH04-01.pdf>
- 45 Childhood Obesity Foundation (n. d.). Available at: <http://www.childhoodobesityfoundation.ca/index.php>
- 46 Ryan-Wenger NA (ed.). *Core curriculum for primary care pediatric nurse practitioners*. St. Louis: Mosby Elsevier; 2007. p. 178-79.
- 47 Ryan-Wenger NA (ed.). *Core curriculum for primary care pediatric nurse practitioners*. St. Louis: Mosby Elsevier; 2007. p. 179-80.
- 48 Canadian Paediatric Society: Healthy Active Living Committee. Healthy active living for children and youth. *Paediatr Child Health* 2002;7(5):339-45. Available at: <http://www.cps.ca/english/statements/hal/hal02-01.htm>
- 49 Ryan-Wenger NA (ed.). *Core curriculum for primary care pediatric nurse practitioners*. St. Louis: Mosby Elsevier; 2007. p. 180-87.
- 50 Rauch F. (2007, January 18). *Overview of rickets in children*. UptoDate Online 16.3. Available at: <http://www.uptodate.com/online/content/topic.do?topicKey=pediendo/9651>