

# Infancy, Childhood, Adolescence

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**STATE ORGANIZATION of newborn** – “predictable unpredictability” – irregular feeding and sleeping schedules; by 2 months infant’s demands become regular!

## NUTRITION

For infants, drinking and eating are intense experiences, comprise most of their socializing, and are integral parts of their developmental progress (i.e. feeding provides emotional and psychologic benefits, gratifies both sucking and nutritional needs).

AAP recommends **exclusive breastfeeding** for 6 mo → continuing **breastfeeding with solid foods** for 1 yr → after age 1 yr, breastfeeding continues as long as is desired, but breastfeeding should complement **full diet of solid foods and fluids**.

### FEEDING ROUTE

- **term infant** can receive oral feedings immediately after birth (do not delay for > 4 h); can be **bottle- or breast-fed** on demand, as long as attention is paid to fluid balance.
- **preterm infant 34-38 weeks' gestational age** should be fed q 3-4 hours by **bottle, breast**, or **gavage**.
- **preterm infant < 34 weeks' gestational age** does not have well-coordinated suck-and-swallow reflex - feed by **gastric bolus** via **feeding tube** (q 2-3 hours).
- **infant < 1000 g** (limited gastric volume; may experience intermittent hypoglycemia and hypoxia when given bolus feedings) - **continuous gastric** or **transpyloric\*** **feeding**.  
 \*esp. useful for infant with *endotracheal tube and mechanical ventilation* - **transpyloric feeding** prevents gastric reflux and aspiration
- **sick infants** may require **total parenteral nutrition** because of GI disorders (e.g. necrotizing enterocolitis) or nonGI disorders (e.g. respiratory disease, sepsis).

### FEEDING SOLUTION, NUTRITIONAL NEEDS

**Calcium and phosphorus supplement** are needed only for preterm infants!

**Fluoride supplements** should not be given to infants < 6 months of age - danger of **fluorosis!**;  
 at age 6 months ÷ 3 years, if local water supply contains fluoride < 0.3 ppm → daily supplement of 0.25 mg **fluoride**;  
 at age 3 years → dental check-up;  
 at age 3-6 years, if local water supply contains fluoride 0.3-0.6 ppm → daily supplement of 0.25 mg **fluoride** (increase to 0.50 mg/day if water has fluoride < 0.3 ppm).  
 at age 6-16 years, values are 0.50 mg/day if 0.3-0.6 ppm, 1.00 mg/day if < 0.3 ppm.

**Term infants** - all of water, calorie, protein, and vitamin requirements are met by:

- human milk**
  - commercial 20 kcal/oz cow's milk-based formula**.
- specific nutritional needs:  
 80-100 mL **water**/kg/d (→ 120-135 mL/kg/d at 1 yr → 40-50 mL/kg/d at 18 yr)  
 100-120 **kcal**/kg/d (→ 100 kcal/kg at 1 yr → 40 kcal/kg in late adolescence)  
 2-3 g/kg/d of **protein** (→ 1.2 g/kg/d at 1 yr → 0.9 g/kg/d at 18 yr).  
 40% of daily calorie requirements should be derived from carbohydrates, with remainder provided by dietary fats.

Commercially available **formulas** are now fortified with vitamins, minerals, and trace elements (otherwise, iron supplementation is necessary).

**Commercial formula-fed** term infants do not require vitamin or mineral supplementation.

### Human Milk

If mother's diet is adequate, no dietary supplement\* is needed for **breast-fed** infant

- \*except 200-400 U **vitamin D** daily (beginning in 1st 2 mo) for all infants (if exclusively breastfed) or only in areas with little sunshine (esp. those with dark skin, esp. in winter).
- **breast-fed** infants may receive multiple-vitamin supplement containing vitamins A, D, and C.
- in **breast-fed\*** infants, **iron** supplementation may await introduction of iron-fortified cereal at 4-6 months of age (term infants deplete their prenatally acquired iron stores by ≈ 6 month).

- *breast-fed* infants should not be given additional water (risk of **hyponatremia**).  
\*human milk has increased bioavailability of iron.

**Preterm infants** (small body stores, gastric motility↓, intestinal lactase activity↓, calcium & phosphorus requirements↑)

Preterm infants should routinely receive **multiple-vitamin supplement** (A, D, B and C); infant < 36 weeks' gestational age should also receive vitamin E to prevent hemolytic anemia.

- *initial feeding solution* - *dilute, whey-based formula* [angl. whey – *išrūgos*] or *human milk*.
- *as positive nitrogen balance is achieved*, infant is advanced to *formula* high in calcium, phosphorus, and protein, or to *fortified human milk*.  
N.B. for very low-birth-weight infants (i.e. < 1500 g) *breast milk* does not provide sufficient Ca, phosphorus, and protein; H: add *breast milk fortifier* or use *specific premature infant formulas* (contain 20-24\* kcal/oz).  
\*24 kcal/oz formula is reserved for infants whose water intake must be restricted, cannot tolerate adequate feeding volumes, or have increased caloric requirements (e.g. infant who have bronchopulmonary dysplasia).

## BREASTFEEDING

- *during pregnancy*, ↑ **ESTROGEN** and **PROGESTERONE** → breast hypertrophy and inhibition of **PROLACTIN** release.
- *after placenta delivery*, hormone levels ↓↓↓ → **PROLACTIN** release → milk production.
  - in primiparas, lactation is **fully established in 72-96 h**; less time is required in multiparas.
- periodic infant suckling → further release of **PROLACTIN** and **OXYTOCIN** (myoepithelial cell contraction → milk ejection - “let-down reflex”).

## CONTRAINDICATIONS

- 1) maternal **HIV infection**
- 2) maternal **active hepatitis (HBV, HCV)**
- 3) maternal use of certain **medications** (tetracycline, chloramphenicol, warfarin)  
**Drugs in Lactating Mothers** → see p. 909 (4) >>  
- **water soluble** drugs are more easily secreted into colostrum; **lipid soluble** – into milk.

## COLOSTRUM

- high-caloric, high-protein, thin yellow fluid present in breast before birth (can be expressed by gentle massage starting from 16<sup>th</sup> week) and for first few days thereafter (within one week postpartum, mature milk is produced).
- rich in **antibodies (IgA)**, **lymphocytes**, **macrophages** – passive immunity, protect against enteric bacteria.
- rich in **nutrients**.
- stimulates passage of meconium.

## HUMAN MILK

- nutrition of choice - provides balanced diet!
- highest **lactose** content of mammalian milks (readily available energy source).
- large amounts of **vitamin E** (prevents anemia by increasing erythrocyte life span).
- **calcium : phosphorus** ratio = 2 : 1 (ratio in cow's milk is almost reversed) - prevents calcium-deficiency tetany.
- favorably changes **pH** of stools and intestinal flora - protects against bacterial diarrheas.
- transfers **antibodies** (especially *colostrum*) from mother to infant.  
All infectious diseases are less frequent in breastfed infants!
- contains **ω-3** and **ω-6 fatty acids** and their **very long-chain polyunsaturated derivatives** (LC-PUFAS), **arachidonic acid (ARA)** and **docosahexaenoic acid (DHA)** - contribute to enhanced visual and cognitive outcomes of breastfed.
- contains **cholesterol**, **taurine** - important for brain growth.

## ADVANTAGES TO CHILD

- nutritional and cognitive; protection against **infection**, **allergies**, **obesity**, **Crohn's disease**, and **diabetes**.

## BENEFITS TO MOTHER

- 1) reduced fertility
- 2) more rapid return to normal prepartum condition (uterine involution, weight loss); ↓risk of obesity, osteoporosis
- 3) ↓risk of ovarian and premenopausal breast cancers.

## MOTHER'S DIET

- avoid foods that may cause *colic* (garlic, onions, legumes, cabbage, chocolate, excessive amounts of exotic or seasonal fruits - melons, rhubarb, peaches).
- add extra 600 **kcal**.
- add extra 400 mg **calcium** (to total 1200 mg/d) - dairy products are excellent source.
- vitamin supplementation is unnecessary (but average U.S. diet is low in B<sub>6</sub>, and vegetarian diets also may be low in B<sub>12</sub>).

## DETAILS, TECHNIQUE

- physician should discuss breastfeeding (incl. techniques) with mother prenatally.
- preparing nipple before delivery is unnecessary.
- **manual breast expression prepartum** may lead to mastitis or early labor.
- lubricant from *Montgomery's glands* protects surface of areola and nipple; this lubricant should not be buffed away with towel or with nipple exercises.
- almost all mothers can produce good milk even if their diet is not perfect.
- start feeding within 4 hours of birth;
  - at delivery, if mother has had little medication and normal delivery and newborn is alert and active, breastfeeding may start immediately for few minutes until newborn is satiated - newborn will receive small amount of colostrum.
- mother should assume whatever comfortable, relaxed **position** works best (such as lying almost flat and turning from one side to other to offer each breast).
- newborn should face mother, ventral surface to ventral surface.
- mother should **support breast** with thumb and index finger above and three fingers below nipple to ensure that it is centered in newborn's mouth, minimizing any soreness.
  - mother may use warm compresses and express her milk manually just before nursing (to get swollen areola into newborn's mouth).
- center of newborn's lower lip should be stimulated with nipple so that rooting will occur and mouth will open wide and grasp nipple and areola.
- infant should be encouraged to take in as much of breast and areola as possible, placing lips 2.5-4 cm from base of nipple.
- newborn's tongue compresses teat against hard palate.
- suction should be broken with finger before removing newborn from breast.

- alternate sides with each feeding.
- initially, it takes at least 2 min for *let-down reflex* to act (excessive suckling should be avoided initially).
  - milk production is dependent on *adequate suckling time!* (90 min/day suckling divided into 6 to 8 sessions is minimal to produce enough milk)
- women who work outside home require **breast pump** to increase / maintain milk production (pumping frequency should approximate infant's feeding schedule)
  - *pumped breast milk* should be immediately refrigerated (if it is to be used within 48 h) or immediately frozen (if it is to be used after 48 h).
  - refrigerated milk that is not used within 96 h should be discarded (high risk of bacterial contamination).
  - frozen milk should be thawed by placing it in warm water; microwaving is not recommended.
- nursing times are gradually increased until "milk is in"; volume of milk increases as infant grows and stimulation from suckling increases.
- at least 10 min is needed at first breast to allow fat-rich hind milk to flow.
- infant should nurse on one breast until breast softens and suckling slows or stops; if infant is still hungry, second breast can be offered.
- if infant *falls asleep* before adequately nursing, mother can remove infant when suckling slows, burp infant, and move infant to other side (this "switch" nursing keeps infant awake for feedings and stimulates milk production in both breasts).
 

Feeding duration is generally determined by infant!
- feedings should be on demand rather than by clock;  $\approx$  every 1½ - 3 h\* (8-12 feedings/d); frequency gradually diminishes over time.
  - \*some newborns < 2500 g may need to feed even more frequently to prevent hypoglycemia.
- in first few days, newborns may need to be wakened and stimulated; schedule that allows newborn to sleep as long as possible at night is usually best for both newborn and family.
- if mother is fatigued first night or two in hospital, 2 AM feeding may be replaced with water supplement until full milk secretion begins, but with never > 6 h between breastfeedings during first few days!

### LACTATION SUPPRESSION

(if mother is not going to breastfeed):

- 1) firm support by tight binding (gravity stimulates let-down reflex).
  - 2) restriction of oral fluids.
  - 3) **ASPIRIN** prn.
- avoid BROMOCRIPTINE – gives seizures!

### BREAST WEANING

- whenever mother and infant mutually desire after 12 mo - there is no correct schedule!

- *gradual weaning* over weeks ÷ months during time solid food is introduced is most common; (some mothers and infants *stop abruptly* without problems)
- one breastfeeding/day should be replaced by bottle or cup of fruit juice or modified formula when infant is  $\approx$  7 mo old; weaning to cup can be completed by 10 mo; some infants will continue 1 or 2 nursings daily for  $\geq$  24 mo.
- *whole cow's milk* may replace iron-fortified formula or breast milk at 12 months of age; low-fat or skimmed milk is not recommended until after 2 yrs of age.

### MOTHER COMPLICATIONS OF BREASTFEEDING

1. **Sore nipples** (easier to prevent than to cure) - usually due to *poor positioning*.
  - sometimes newborn will draw in his lower lip and suck it, which is irritating to nipple (H: ease lip out with thumb).
  - after feedings, express little milk, letting milk dry on nipples (may use hairdryer set on low for 5 min); lanolin-based cream is also good.
2. **Painful breast engorgement** (increasing milk amount) occurs during early lactation.
  - may last 24-48 h
  - may be minimized by *early frequent feeding*, comfortable *nursing brassiere* worn 24 h/day for support (plastic brassiere liners should be avoided!), applying *cool compresses* after nursing, *mild analgesic* (e.g. ibuprofen).
  - manually expressing milk during warm shower may provide comfort.
  - *excessive milk expression* between feedings encourages continued engorgement and should be done only enough to relieve discomfort.
3. **Plugged ducts** - mildly tender / not tender lumps appear in different places in breasts; H:
  - 1) continued nursing ensures adequate emptying of breast.
  - 2) warm compresses and massage of affected area before nursing may further aid emptying.
  - 3) alternate nursing positions (different areas of breast empty better depending on infant's position at breast).
  - 4) good nursing brassiere (regular brassieres with wire stays or constricting straps contribute to milk stasis).
  - 5) do not sleep prone.
4. **Mastitis** - tender, warm, swollen, wedge-shaped area of breast. see p. 2915 >>
5. Maternal **anxiety, frustration, and feelings of inadequacy** ( $\rightarrow$  early breastfeeding termination) - result from lack of experience with breastfeeding, mechanical difficulties holding infant and getting infant to latch on and suck, fatigue, difficulty assessing if nourishment is adequate, postpartum physiologic changes; H: early follow-up with pediatrician or consultation with lactation specialist.

### BOTTLE FEEDING

- formulas are preferable to whole cow's milk (not nutritionally complete)!
  - AAP recommends that *whole cow's milk* not be used in 1<sup>st</sup> year of life! i.e. only acceptable alternative to breastfeeding in 1<sup>st</sup> yr is **formula**.
- **cow's milk-based formula** is standard choice (unless fussiness, spitting up, or gas suggests sensitivity to cow's milk protein or lactose intolerance [rare in neonates]  $\rightarrow$  **soy formula**\*).
  - \*all soy formulas in US are lactose free
- formula must contain **iron**!
- **nonproprietary formulas** are not recommended by AAP!
  - nonproprietary formula: 13 oz of *evaporated milk*, 1-3 tbsp of *sugar* (for additional calories), and 19 oz *fluoridated water*; infant should also receive supplemental vitamins A, C, and D daily.
- first feeding offered should be **regular-strength infant formula** (*test feeding* of water or 5% D/W is not needed unless sucking and swallowing ability is in question, e.g. excessive amount of mucus regurgitated); if this feeding is not regurgitated, continue formula with each subsequent feeding.
- infants are fed on demand and tend to wake for feedings every 3-4 h.
- volume consumed in first feeding is up to 15 mL; feeding volume should increase gradually (e.g. in next 48 h volume gradually increased to 30-45 mL per feeding).
- **prepackaged sterile formulas** are available in hospital in 4-oz bottles providing 20 (full strength) kcal/oz with adequate vitamins for normal newborn.
  - full-term newborns can tolerate 20 kcal/oz at birth.
  - newborn should be offered water between feedings, particularly in hot, dry environments.
  - if infant is exceeding his calculated intake of formula, water should be offered to avoid overfeeding.
- infant should be held semi-upright; bottle should never be propped - protection for eustachian tube + good eye contact and socialization.

## STARTING SOLID FOODS

- infants do not need solids before age 6 mo.
  - neurologic development** for tongue and mouth movement is sufficient to handle solids at  $\approx$  4 mo in full-term infants.
  - infants can swallow solids at younger age (if food is placed on back of tongue), but refusal is normal.
- solids are offered by spoon and introduced individually to determine tolerance (one new, "single-ingredient" food must be introduced per week - food allergies can so be identified!);
  - foods should be prepared **without added salt**.
  - iron-fortified rice cereal** is traditionally 1<sup>st</sup> food introduced (need to start replenish iron stores).
  - commercial preparations of carrots, beets, turnips, collard greens, and spinach are preferable before 1 yr if available.
  - many commercial baby foods (esp. desserts and soup mixtures) are *high in starch* (no vitamins or minerals, high in calories) and *cellulose* (poorly digested by infants).
  - some commercial baby foods have *high sodium content* ( $> 200$  mg/jar) and should be avoided (daily infant sodium requirement is 17.6 mg/kg).
  - pureed home foods are adequate.
  - meat** (pureed to prevent aspiration) should be introduced in preference to high-carbohydrate foods, but many infants tend to reject meat.
  - wheat, eggs, peanuts, and chocolate** should be avoided until 1 yr old (to prevent food sensitivities).
  - honey** should be withheld until 1 yr (risk of infant botulism).
  - nuts** should be avoided until age 2-3 (they do not fully dissolve with mastication and small pieces can be aspirated).
  - after 1 yr, child can begin drinking **whole cow's milk**; reduced-fat milk is avoided until 2 yr.
- foods that could obstruct child's airway if aspirated** should be avoided (e.g. nuts, round candies), pureed (e.g. meat), or cut into small pieces (e.g. grapes).
- some parents coax infant to take large amounts of solid food in effort to get him to sleep through night - no sound evidence supports this practice!
- with increasing fine motor control, **finger foods** are encouraged.
- weaning from bottle to cup** should commence by end of 1<sup>st</sup> year.
- by end of 1<sup>st</sup> year, 3 meals/day schedule is feasible.
- use of spoon** is possible by age of 15 months.
- at age 2 yrs, child's diet will essentially resemble that of rest of family!
  - limit **milk intake** to 16-20 oz/day in young children (higher intake can reduce intake of other important sources of nutrition and contribute to iron deficiency).
  - juice** is poor source of nutrition, contributes to dental caries, and should be limited to 4-6 oz/day.

## FULL NUTRITION

- for **obesity** prevention:

- child should be guided away from **frequent snacking** and foods high in **calories, salt, and sugar**.
  - soda** is major contributor to obesity.

## FEEDING PROBLEMS

**vomiting** → see p. 1846 (1-5) >>

**diarrhea** → see p. 1855-1856 (4) >>, esp. p. 1856 (3) >>

**constipation** → see p. 1857-1858 (3) >>

**colic** → see p. 1858 (4) >>

**allergy to cow milk, maternal milk** → see p. 1665 (8) >>

**failure to thrive** → see p. Ped3 >>

**Regurgitation, spitting mucus** (5-10 mL) during or soon after feedings are common first day but should clear spontaneously within 48 h.

- causes:** lax gastroesophageal smooth muscle, rapid feeding and air swallowing, overfeeding.
- when too-rapid feeding is cause → use bottles with firmer nipples and smaller holes + more frequent burping; no need to change diet!
- if excessive regurgitation continues → empty stomach by gently aspirating through No. 5-8 French feeding tube and lavage with 5% D/W until mucus clears.
- if mucus persists → complete upper GI and respiratory tract evaluation.
- occasional vomiting may also be normal.

**Underfeeding** → **dehydration** (→ **hypernatremia**) and **hyperbilirubinemia**.

- adequately fed infants become quiet or sleep soon after feeding; underfed infant remains restless, almost seems to look around for more to eat, and awakens 1-2 h after being fed, appearing hungry.
- risk factors for underfeeding: **small / premature infants, primiparous** mothers who **become ill**.
- underfeeding may be sign of **parental inadequacy** (e.g. neglect).
- signs of feeding adequacy:**
  - daily diaper counts** (by 5 days of age, normal neonate wets at least 6 diapers/day and soils 2-3 diapers/day; lower numbers suggest underhydration / undernutrition).
  - weight** (gain  $< 200$ -250 g/wk in infant  $<$  age 4 mo is inadequate).
  - constant **fussiness** before age 6 wk, when colic may develop unrelated to hunger or thirst, may also indicate underfeeding.
  - signs of dehydration** - ↓ vigor of infant's cry, skin turgor ↓ → lethargy and sleepiness.
- management:**
  - instruct parents.
  - breastfed infant's → supplement diet with milk formula and cereal; formula-fed infant → change formula constituents and increase in total quantity of formula.
  - follow-up weight checks.

## Refusing food

- by  $\approx$  1 yr, growth rate slows - children require less food and may refuse it at some meals!!!**
- child may refuse passive spoon feedings with **increasing independence**.
- parents are advised to *assess child's intake over week* rather than at single meal or during day.
- underfeeding is only concern when child fails to achieve expected weights!

**Overfeeding** - too-rapid weight gain on growth chart, crying, excessive regurgitation after meals.  
N.B. problems of obesity may begin with excessive eating in infancy!

- encourage parents to **reduce amounts offered**.

## GROWTH

- increase in size of all organs (except lymphatic tissue, which decreases in size).

### Growth Spurts:

- in utero
- birth ÷ 1-2 yrs
- pubertal (adolescent) - gain of up to 25% of adult height and 50% of adult weight.

- term neonates lose 5-8%\* of birth weight in first 3 days (urinary and insensible fluid losses, passage of meconium, loss of vernix caseosa, drying of umbilical cord, suboptimal caloric intake).  
\*prematures - up to 15%
  - term infants after 1<sup>st</sup> week gain 14-30 g/d (by 10-14 days should be back to birth weight).
  - weight gain confirms adequate feeding.
  - *birth weight is double at ≈ 5 mo, triple at 12 mo, quadruple at 24 mo.*
  - *birth height is double at 5 yr.*
- **rate of growth** decreases rapidly during 1<sup>st</sup> year of life → decreases more gradually until beginning of adolescent growth spurt (peak height velocity is reached at 12.1 ± 0.9 yr in girls and at 14.1 ± 0.9 yr in boys; gain of > 10 cm can be expected in year of peak velocity).
- **proportion of fat** increases rapidly (from 13% at birth to 20 to 25% by 12 mo) accounting for *chubby appearance* of most infants → slow fall (at preadolescence, body fat returns to ≈ 13%).
- **body water percentage** - 70% at birth, dropping\* to 61% at 12 mo (≈ adult percentage).  
\*due to ECF decrease 45% → 28%; ICF stays relatively constant.
- extremities grow faster than trunk.
- at 18 yrs, 2.54 cm of growth remains for boys and slightly less for girls, for whom growth is 99% complete.
- **sexual maturity** begins earlier today than century ago (improvements in nutrition, general health, and living conditions).

**Head circumference** (reflects brain size) is routinely measured up to 2 yr.

- at birth, brain is 25% of adult size, and head circumference ≈ 35 cm.
- head circumference increases ≈ 1 cm/mo during 1<sup>st</sup> year (by 12 mo, brain has completed 1/2 its postnatal growth and is 75% of adult size).
- head circumference increases 3.5 cm over next 2 yr (by 3 yr, brain is 80% of adult size; 90% by age 7 yr).

## SAFETY

**Crib** - bars should be no further than 2.38 inches apart.

- bumpers – to prevent injury from head banging.
- to avoid suffocation – objects (pacifiers and mobiles) should not be hung within crib.
- to prevent SIDS – sleep supine; mattress, pad, and sheet should fit tightly; no soft objects or pillows underneath infant. see p. Ped1 >>
- set **water-heater temperature** below 120°F (49°C) helps to prevent accidental scalding.
- approved **car seat** to transport infants in automobiles:
  - birth ÷ 6 mo → use of **rear-facing car seat**.
  - when infant reaches 9 kg (20 pounds) and 1 yr of age → may\* use **forward-facing toddler car seat**.  
\*rear-facing is still safest position
- **toys** should be soft and washable, without sharp edges or removable parts, and should be too large to fit within infant's mouth.
- parents must be alerted to danger of infant *rolling off elevated surfaces*.
- never leave infants *unsupervised with young children or pets*.
- environment should be **free of tobacco and drugs**.
- protection from **sun exposure** - protective clothing and hats; beginning at 6 months, approved sunscreen product.
- *potential dangers with increasing mobility* - stairways, open windows, electric sockets, hanging tablecloths, electric cords.
- use of *infant walkers* is highly discouraged; walkers should never be used in area with stairs!!!
- parents should have on hand **syrup of ipecac** and **telephone number of poison control center**.
- **infant "swim" programs** should not be encouraged - may expose infants to variety of risks (water intoxication, giardiasis) + extremely unlikely that infant can become "safe" in water.
- from ≥ 5 yr - use bicycle helmet, protective sports gear; instruct about safe street crossing; close supervision ± use of life jackets when swimming.

## SLEEPING

- infants adapt to day-night sleep schedule between 4 and 6 mo.
- most infants **sleep through night** by 4 months of age.
- in cultures where children sleep separately from parents in same house, sleep problems are among most common that parents and children face.
- *inborn biologic patterns* are central to infant's sleep patterns, whereas *emotional factors and established habits* become more important in toddler and older child.
- sleep disturbances are common at **9 mo** and again around **18 mo** (separation anxiety, increasing ability of child to move independently and control his environment, long late-afternoon naps, overstimulating play before bedtime, nightmares tend to become more common).
- infants are often comforted by **swaddling**, **ambient noise**, and **movement**; consistent bedtime and fixed ritual is helpful for young children!
  - N.B. *always rocking infant to sleep* does not allow infant to learn how to fall asleep on his own (important developmental task!)
    - as substitute for rocking, parent can sit quietly by crib until infant falls asleep → infant eventually learns to be comforted and to fall asleep without being held!

**Resistance to going to bed** - common problem that peaks at 1-2 yr.

- child cries when left alone in crib or climbs out and seeks parents.
- **causes**: **separation anxiety**; attempts by child to **control his environment**; **long naps** late in afternoon; rough, **overstimulating play** before bedtime; **disturbed parent-child relationship**; **tension** in home.
- **ineffective measures**: letting child stay up, staying in room and comforting him at length, spanking and scolding.
- **management**: settling child with brief story, offering favorite doll or blanket, using night-light, watching quietly from hallway to ensure that child stays in bed.
  - nighttime bottle risks *milk-bottle caries*!
  - child who learns futility of getting out of bed or enticing parent into room for more stories or play will settle down and go to sleep.

**Awakening during night** - occurs in 50% infants aged 6-12 mo, related to **separation anxiety**.

All children awaken during night, but children who have been taught to fall asleep by themselves will usually settle themselves back to sleep!

- older children - episodes follow **stressful event**; H: period of "winding down" with quiet activities such as reading; *allowing child to sleep in parents' bed* almost always prolongs rather than resolves problem.
- **ineffective measures**: allowing child to sleep with parents, playing, feeding, spanking and scolding.
- **management**: return child to bed with simple reassurance, sit outside open bedroom door until child settles down.
  - routinely place baby in bed sleepy but awake, thus encouraging habit of self-soothing at bedtime.
  - some 3-yr-olds wander around without waking parents; H: instal hook-and-eye lock on outside of child's bedroom door.

## DIAPER RASH

- varieties of diaper dermatitis:

- generic (ammonia) diaper rash** - erythematous dry, wrinkled skin; spares skin folds.
- candidal rash** - bright red erosions (with satellite lesions), involve deep skin folds.
- infantile seborrheic dermatitis** - starts as erythema and satellite lesions in diaper area → spreads to face, scalp, flexural areas.
- staphylococcal diaper rash** - superficial erythematous pustules and bullae.

**Intertrigo** - poorly understood dermatitis with white / yellow exudate involving deep skin folds.

## PACIFIER

- use is recommended after 1<sup>st</sup> month to reduce risk of SIDS; use throughout 1<sup>st</sup> year but not beyond.
  - pacifier can increase risk of **ear infections** (but they are less common during first year of life when SIDS risk is highest).
  - pacifier in older children may increase risks for **teeth misalignment**, but using them in infancy is not a problem.

## TEETHING

- may begin by 6 months of age.
- excessive **drooling**, **rhinorrhea**, mild **diarrhea**, **irritability**, **decreased appetite** may be associated with teething.
- **high fevers** should not be attributed to teething!!!
- teeth should be cleaned with gauze / soft cloth → soft brush during 2<sup>nd</sup> year of life.
- if local water supply contains fluoride < 0.3 ppm → for all children from age 6 months until age 3 years, use 0.25 mg of **fluoride** daily.

## CRYING

Crying is only means infant has to signify distress!

- often there is no obvious cause.
- crying outside normal range – if > 3 h/day in 6-wk-old infant.
- crying almost always improves by 4-6 mo; when it does not → suspect physical pain or tension within family.
- differentiate from colic.
- examination focuses on growth parameters and any signs of illness.
- management (if parents and physician are convinced that there is no serious cause for crying):
  - 1) infants are often comforted by **swaddling**, **ambient noise**, and **movement** (rocking or swinging); infants and older children often respond to **ride in car**.
  - 2) allow infant to **cry for short period** (“5-minute rule”), then parents comfort infant and re-start clock; often parents are relieved to know that they can let infant cry, and often infant will stop spontaneously before prescribed period is over.

## TELEVISION

- observing violence on TV → children more willing to harm others and play more aggressively.
- prolonged TV viewing diminishes time available for physical activity.
- TV commercials promote eating foods high in sugar and saturated fat.

Limit amount of TV time to **≤ 1-2 hours per day** maximum + **monitor content** of programs watched.

## SPORTS

- exercise maintain good physical and emotional health - children must develop good habits early in life.
  - **outdoor play** should be encouraged from infancy.

Pediatric screening before sports (to identify rare, apparently healthy, young patient at high risk of life-threatening cardiac events):

- 1) thorough history
  - 2) physical examination (incl. BP, supine and standing cardiac auscultation).
- ask about illicit and performance-enhancing drugs.
  - seek for **FEMALE ATHLETE TRIAD** (eating disorders, amenorrhea / other menstrual dysfunction, osteoporosis).

Two at-risk populations:

1. **Boys who physically mature late** → greater risk of injury in contact sports with larger and stronger children.
2. **Obese people** in sports that require **high agility** (sudden stops and starts) → greater risk of injury (because of excess body weight).

Adult screening before sports:

- 1) coronary artery disease (incl. family history), arrhythmia, elevated serum cholesterol, hypertension.
- 2) arthritic disorders (particularly involving major weight-bearing joints).
- 3) obesity

Relative contraindications and preventive recommendations:

- 1) **myocarditis** → sudden cardiac death.
- 2) **acute splenic enlargement** → splenic rupture.
- 3) **fever** → heat-related disorders, decreased exercise tolerance, may be sign of serious illness
- 4) **diarrhea** → dehydration.
- 5) **angina pectoris** and **recent (< 6 wk) MI**.
- 6) history of **multiple concussions** → participate in noncollision sports.
- 7) **single testis** → wear protective cup for most contact sports.
- 8) people at risk of **heat intolerance and dehydration** (e.g. diabetes, cystic fibrosis) → hydrate frequently during activity.
- 9) **suboptimal seizure control** → avoid swimming, weight lifting, archery and riflery.

## RECURRENT PAIN SYNDROMES

- pains occur at least monthly for 3-month period; no organic pathology is found; between episodes, child is well.

- *purely organic* or *purely emotional* etiologic explanations account for only minor percentage of recurrent pains, i.e. pain may result neither from pathophysiology nor obvious psychopathology, but may be result of **mild individual differences in physiology** (make child vulnerable to pain and stress-induced exacerbations).

*e.g. in recurrent abdominal pain, there may be slower transit time that results in constipation*

1. **Recurrent abdominal pain syndrome** - occurs in 10-15% school-age children (peak incidence at age 9 years)  
N.B. further pain is from umbilicus, more likely it is to be organic (rectal examination is imperative)
  2. **Headache** - occurs in 15-20% school-age children (peak incidence at age 12 years).
  3. **Limb pain ("growing pains")** - occurs in 15% school-age children (peak incidence at age 11 years).
- **localized** pain, **continuous** pain, pain that **awakens** from sleep, pain associated with **other symptoms** (e.g. vomiting, fever, changes in stool color) suggest organic disease!
  - evidence of *obvious psychopathology* must be sought in both parents and child!
  - laboratory screening: CBC, ESR, urinalysis.
  - management:
    - 1) **normal activity** (do not allow pain to restrict child significantly!).
    - 2) **symptom diary** should be kept by parents and child + scheduled **follow-up visits**.
    - 3) **symptomatic relief** - mild analgesics (such as **IBUPROFEN**) during acute pain episodes.
  - prognosis – self-limiting.

**PEDIATRIC MORTALITY**

**Mortality rate** - deaths per 1000 population

**Birth rate** - live births per 1000 population

**Fertility rate** - live births per 1000 women 15–44 years of age

**Maternal mortality** - deaths during pregnancy ÷ 90 days postpartum per 100,000 live births

Mortality	20 <sup>th</sup> wk - birth	birth - 28 d	28 d – 1 yr
Fetal			
Neonatal		Early - before 7 d Late - at 7-28 d	
Perinatal			
Postneonatal			
Infant			

Rate	Age	Per population	
Fetal mortality	Stillbirths (i.e. gestational age > 20 weeks)	1000 total births of gestational age > 20 weeks	
Infant mortality	Infants < 1 yr	1000 live births	i.e. neonatal + postneonatal mortality
Neonatal mortality	Infants < 28 days	1000 live births	Causes: prematurity, birth weight↓, congenital anomalies, birth injuries
Postneonatal mortality	Infants > 28 days but < 1 yr	1000 live births	Causes: infections, SIDS, injuries (esp. motor vehicle)
Perinatal mortality	Stillbirths + infants < 7 days* or < 28 days**	1000 total births of gestational age > 20 weeks	* <b>standard</b> perinatal mortality ** <b>extended</b> perinatal mortality

- mortality in infants is higher than in any group of individuals < 55 yrs.
- mortality is increasing for adolescents (vs. other age groups – mortality is decreasing).

BIBLIOGRAPHY for ch. "Pediatrics" → follow this [LINK >>](#)