

**Nursing Management of the Neonatal Period**  
**Chapters 23-26**

**Chapter 23**

Respiratory Adaptations

- Intrauterine factors
  - Fetal lung development
    - Ongoing development
    - Surfactant – peaks ~ 35 weeks & remains high
  - Fetal breathing movements
    - Occur ~ 11 weeks gestation
    - Fluid filled lungs
    - Develop chest wall muscles & diaphragm

Respiratory Adaptations

- Initiation of breathing
  - Mechanical events
    - Removal of fluid from lungs
  - Chemical stimuli
    - Transitory asphyxia
    - $\uparrow$ PCO<sub>2</sub> &  $\downarrow$ pH & PO<sub>2</sub>
  - Thermal stimuli
    - $\downarrow$  temperature
  - Sensory stimuli
    - Tactile, auditory, visual stimuli
- Factors opposing the 1<sup>st</sup> breath
  - Alveolar surface tension
  - Viscosity of lung fluid
  - Degree of lung compliance
- Cardiopulmonary physiology
  - Change from fetal to newborn blood flow
- Oxygen transport
  - Hgb F – high affinity for O<sub>2</sub>
- Maintaining respiratory function
  - Difficult b/c
    - Large heart
    - Weak intercostal muscles
    - Rigid rib cage (horizontal)
    - Large abdomen
- Characteristics of newborn respirations
  - RR 30-60 breaths/min

- 60-70 breaths/min first 2 hours after birth
- Diaphragmatic, shallow, irregular
- Periodic breathing– 5 to 15 second pause
- Nose breather
- Report: RR <30 or >60 at rest, retractions, cyanosis, nasal flaring, grunting

### Cardiovascular Adaptations

- Fetal-newborn transitional physiology
  - ↑ aortic pressure & ↓ venous pressure
  - ↑ systemic pressure & ↓ pulmonary artery pressure
  - Closure of foremen ovale
    - 1-2 hours after birth essentially closed
    - By 6 months, permanent closure
  - Closure of ductus arteriosus
    - 15 hours after birth
    - By 3 weeks, permanent fibrosis
  - Closure of ductus venosus
    - Within 2 months
- Characteristics of cardiac function
  - Heart rate
    - 120-160 (avg 125-130 at rest)
    - Apical pulse full minute
  - Blood pressure
    - High after birth, low 3 hours later (varies with wt)
    - Average 72/47 full term at rest (↑20 with crying)
  - Heart murmurs
    - 90% transient
  - Cardiac workload
    - Shift from right side to left side

### Hematopoietic System

- Physiologic anemia of infancy
- Leukocytosis
- Blood volume varies (80-85 mL/kg)

### Temperature Regulation

- Need higher environmental temp to maintain core temp.
- Factors affecting temp:
  - Newborn has decreased SQ fat & thin skin
  - Blood vessels closer to skin
  - Flexed position

- Size & age
- Heat loss
  - Convection – A/C; O2 mask; removal from incubator
  - Radiation – walls of incubator
  - Evaporation – when wet; bath time
  - Conduction – cold hands; cold scale
- Heat production
  - Brown adipose tissue (brown fat)
    - Begins at 26-30 weeks
  - Increase basal metabolic rate & O2 consumption
- Response to heat
  - Sweating; peripheral vasodilation
  - Increase basal metabolic rate & O2 consumption

#### Hepatic Adaptation

- Iron storage & RBC production
  - Iron storage should last ~ 5 months, then need supplement
- CHO metabolism
  - Glucose 70-80% of mom's
  - Increase glucose needs immediately after birth
  - Accucheck may be ordered
- Coagulation
  - Sterile gut
  - Vitamin K dependent clotting factors
  - Vitamin K (Aqua MEPHYTON)

#### Conjugation of Bilirubin

- Conjugation – convert bili to excretable form
- Unconjugated bili
  - Byproduct of destroyed RBCs
  - Not excretable
- Total bili
  - <3 mg/dL at birth
  - Liver must begin to conjugate, so increase bili levels first few days

### Hepatic Adaptation: Physiologic Jaundice

- Related to
  - Accelerated destruction of fetal RBCs
  - Impaired conjugation of bili
  - Increased bili reabsorption from GI
- Occurs in 50% term & 80% preemies
- 2-3 days after birth; peak 3-5 days in term & peak 5-7 days in preemie
- Bili 4-6 mg/dL = yellow skin & sclera
- Should not exceed 13 mg/dL
  
- Nursing interventions to help decrease risk of jaundice:
  - Maintain temp  $\geq 97.8$
  - Monitor stools
  - Encourage early feedings

### Hepatic Adaptation: Breastfeeding Jaundice

- Occurs in 1-5% breastfed newborns
- Bili levels peak at 2-3 weeks
- May reach 20-25 mg/dL
- Rarely should breastfeeding be interrupted

### Gastrointestinal Adaptation

- Can digest simple CHO, protein, fat (not as well)
- In utero – swallowing & gastric emptying
- Stomach capacity at birth = 50-60 mL
- Relaxed cardiac sphincter = regurg
- Gain 30g/day & 1.2 cm
- Meconium passage in 8-24 hours

### Urinary Adaptation

- Less able to concentrate urine until 3 mos
- 93% void within 24 hours; 100% void by 48 hours
- Few voids until increased PO intake
- 1<sup>st</sup> two days, expect 2-6 voids; then increases to 5-25 voids/day
- Blood-tinged diapers- pseudomenstruation, circumcision

## Immunologic Adaptation

- Decreased immune function
- Hypothermia = possible infection
- IgG antibodies cross placenta in 3<sup>rd</sup> trimester

## Neurologic & Sensory-Perceptual Functioning

- Intrauterine factors
  - Maternal nutrition; physical environment; drug/alcohol use
- Characteristics
  - Flexed extremities
  - Able to fixate on faces & shapes/patterns
  - + blinking reflex with light
  - Lusty, vigorous cry
  - Cephalocaudal growth pattern
  - Hypertonia
  - + reflexes
- Periods of reactivity
  - 1<sup>st</sup> period of reactivity
    - Lasts 30 mins after birth
    - Awake & active
  - Period of inactivity to sleep phase
    - Usually lasts several hours
    - RR & HR return to baseline
  - Second period of reactivity
    - Lasts 4-6 hours
- Behavioral states of newborn
  - Sleep states
    - Deep or quiet sleep
    - Active REM
  - Alert states
    - Drowsy or semidozing
    - Wide awake
    - Active awake
    - Crying
- Behavioral-sensory capacities of newborn
  - Habituation
  - Orientation
  - Self-quieting
  - Auditory capacity
  - Olfactory capacity

- Taste & sucking
- Tactile capacity

## **Nursing Assessment of the Newborn**

### **Chapter 24** Assessment Timing

- 1<sup>st</sup> assessment – in birthing area
- 2<sup>nd</sup> assessment – 1<sup>st</sup> 4 hours
- 3<sup>rd</sup> assessment – prior to discharge

#### 1. Estimation of Gestational Age

- Assessment of physical characteristics
  - Resting posture
  - Skin
  - Lanugo
  - Plantar creases
  - Areola
  - Ear form & cartilage distribution
  - Male & female genitals
- Vernix
- Hair
- Skull firmness
- Nails
- Assessment of neuromuscular maturity
  - Square window sign
  - Recoil
  - Popliteal angle
  - Scarf sign
  - Heel-to-ear extension
  - Ankle dorsiflexion
  - Head lag
  - Ventral suspension
  - Major reflexes

## 2. Physical Assessment

- General appearance
  - Head large for body
  - Body appears long & extremities short
- Weight
  - Avg 3405 gm (7 lb 8 oz)
    - Affected by race, parents age/size, health of mother, interval b/t pregnancies
  - Increases 198 g weekly 1<sup>st</sup> 6 months
  - 5-10% wt loss 1<sup>st</sup> 3-4 days
- Length
  - Avg 50 cm (20 in)
  - Increase 1 in monthly 1<sup>st</sup> 6 months
- Head circumference
  - 32-37 cm (12.5-14.5 in)
  - Place tape over most prominent part of occiput & above eyebrows
  - 2 cm > chest circumference
- Chest circumference
  - Avg 32 cm (12.5 in)
  - Place tape measure at lower edge of scapulas & directly over nipple line
- Temperature
  - Skin thermal sensor 96.8-97.7
  - Axillary 97.7 – 98.6
- Skin characteristics
  - Acrocyanosis
  - Mottling
  - Harlequin sign
  - Jaundice
  - Erythema toxicum
  - Milia
  - Skin turgor
  - Forceps marks
- Birthmarks
  - Telangiectatic nevi (stork bites)
  - Mongolian spots
  - Nevus flammeus (portwine stain)
  - Nevus vasulosus (strawberry mark)

- Head
  - General appearance
    - ¼ of body size
    - Molding = overriding cranial bones
    - Fontanelles
      - Anterior – diamond shaped, 3-4 cm X 2-3 cm; closes in 18 months
      - Posterior – triangular, 0.5 cm X 1 cm; closes in 8-12 weeks
  - Cephalhematoma
    - Blood; reabsorb over weeks/months
  - Caput succedaneum
    - Soft, swollen area of scalp; reabsorbs over weeks/days
  
- Face
  - Designed to facilitate sucking
- Eyes
  - Blue-gray or slate-blue-gray color; sclera bluish white
  - PERRL
  - Blink reflex
  - Eyelids edematous
  - Chemical conjunctivitis – r/t silver nitrate
  - Subconjunctival hemorrhages
    - Disappear in weeks
- Eyes
  - Strabismus
  - Dolls eyes
  - No tears
- Nose
  - Nose breathers – ensure patency
  - Can smell
- Mouth
  - Pink lips
  - Cleft lip/palate w/ or w/o lip
  - Epstein's pearls
  - Thrush
- Ears
  - Soft, pliable, easily recoil
  - Pinna parallel to outer/inner canthus of eye
  - Hearing screen

- Neck
  - Short, creased with skin folds
  - Poor muscle tone
  - Head lag
  - Clavicle fracture – lump, creptius, neg. Moro reflex
  
- Chest
  - Breasts/nipples
- Cry
- Respiration
  - 30-60 breaths/min
  - Diaphragmatic
  - Assess s/s distress
  - Breath sounds
- Heart
  - Rate/rhythm
  - Position of apical impulse
  - Heart sounds
  - Peripheral pulses
- Abdomen
- Umbilical cord
- Genitals
  - Female
  - Male
- Anus
- Extremities
  - Arms & hands
    - Polydactyly= extra digits
    - Syndactyly = webbing of fingers or toes
    - Inspect creases
    - Brachial palsy
  - Legs & feet
    - Ortolani's/Barlow's maneuver
- Back
  - Straight & flat
  - Assess sacral dimple

### 3. Neurological Assessment

- Neuro status
  - State of alertness
  - Resting posture
  - Cry
  - Quality of muscle tone
  - Motor activity
- Neuro status (cont.)
  - Tonic neck reflex
  - Moro reflex
  - Grasping reflex
  - Rooting reflex
  - Sucking reflex
  - Babinski reflex
  - Trunk incurvation (Galant reflex)

### Behavioral Assessment

- Newborn behavior
  - Habituation
  - Orientation to stimuli
  - Motor activity
  - Variations
  - Self-quieting activity
  - Cuddliness or social behaviors

### Normal Newborn: Needs & Care

#### Chapter 25

#### Nursing Assessment & Diagnosis: 1<sup>st</sup> 4 Hours of Life

- Ineffective airway clearance
- Risk for altered body temperature
- Pain
- Admission
  - Condition of newborn
  - Labor & birth record
  - Antepartal history
  - Parent-newborn interaction

- Weight & measurements
- Physical exam
- Labs as appropriate
- Maintenance of clear airway
  - Position on back or side
  - Suction available
- Stable vital signs
  - Temperature: 97.7-98.6
  - Pulse: 120-160
  - Respirations: 30-60
  - Blood pressure 80-60/45-40
- **Maintenance of neutral thermal environment**
  - Prewarm radiant warmer
  - Wipe off blood & excessive vernix
  - May give to mom after wrapping for skin to skin contact
  - Place under radiant warmer
    - Skin probe nothing except diaper and hat
- **Maintenance of neutral thermal environment**
  - Dress & wrap in blanket
  - Cap on head
  - Avoid chilling
- **Prevention of complications of hemorrhagic disease of newborn**
  - Vitamin K (AquaMEPHYTON)
    - 0.5 – 1 mg IM in vastus lateralis
    - 25 g 5/8 in needle
    - Within 1 hour of birth
    - S.E.: pain & edema at injection site; allergic reaction possible
    - NSG: protect from light. Give before invasive procedure; observe for jaundice & hemolytic anemia; observe for bleeding
- Prevention of eye infection
  - Prophylaxis – N gonorrhoeae
  - Topical meds such as 0.5% erythromycin
    - ¼ inch along lower conjunctiva of each eye
    - 1<sup>st</sup> hour after birth
    - S.E.: local edema, inflammation, drainage (should clear in 24-48 hours)
    - NSG: clean eyes before administration; massage eyelids gently to distribute med; may wipe away excess after 1 minute
- **Early assessment of distress**
  - Increased RR labored respirations

- Sternal retractions
- Nasal flaring
- Grunting
- Excessive mucus
- Facial grimacing
- Central cyanosis
- Abdominal distension or mass
  
- Bile-stained vomitus
- No meconium within 24 hours of birth
- No urine within 24 hours of birth
- Jaundice within 24 hours
- Hypo/hyperthermia
- Jitteriness or blood glucose < 40
- First feeding
  - Breastfeeding – encourage early attempts
  - Formula feeding – begin by 5 hours of age
  - Cues to feed – active bowel sounds, rooting, sucking
  
- Promotion of adequate hydration/nutrition
  - Maintain neutral thermal environment
  - Early, frequent feedings (at least q 3 h)
  - Monitor & record void/stool
  - Daily weight – expect 10% wt loss 1<sup>st</sup> week
  - Ensure adequate rest
  - Assess breast/bottle feeding
  
- Altered nutrition: less than body requirements
- Altered urinary elimination
- Risk for infection
- Health-seeking behaviors
- Altered family processes
- Maintenance of cardiopulmonary function
  - VS every 6-8 hours or more
  - Propped, back or side-lying position
  - Bulb syringe in bassinet at all times!!
  - Cardiac/respiratory monitor if at risk

- Promotion of skin integrity
  - Diaper changes – clean with water/cotton wipe
  - Umbilical cord care
    - Assess bleeding, infection such as smell, redness and drainage, heat or tenderness
- Promotion of safety/prevention of complications
  - Safety
    - Compare ID bands!!!!
    - All employees must wear badge
    - Don't leave baby alone in room
    - Code Pink
- Promotion of safety/prevention of complications
  - Prevent complications
    - Infection
      - 2-3 minute hand scrub beginning of shift & continued handwashing
    - Bleeding
      - Assess, monitor
      - Vaseline gauze after circumcision
- Circumcision
- Parent-infant attachment
  - Eye-to-eye contact immediately after birth
  - Holding
  - Feeding
  - Quieting
  - Bathing

### Parent Teaching

- General instructions
  - Handling, positioning, bathing, cord care, taking temp, normal voiding/stooling
- Nasal/oral suctioning
  - Nose breathers!
  - Bulb syringe
- Swaddling
- Sleep & activity
- Car safety
  - Back seat, rear facing

- Newborn Screening Tests
  - NC – PKU, sickle cell, hypothyroid, etc.
  - Must be at least 24 hours old
- Immunizations
  - Hep B

## **Newborn Nutrition**

### **Chapter 26** Nutritional Needs

- Protein – cellular growth
- CHO – energy
- Fat – calories, f/e, brain/neuro system
- 105-108 kcal/kg/day
- 140 – 160 mL/kg/day
- Iron

### **Breast Milk Feeding**

- Colostrum
  - More proteins, vitamins, minerals
  - Immunoglobulins
  - Lasts 2-4 days, then transitional milk
- Transitional milk
  - Lasts until 2 weeks PP
  - More calories than colostrum
- Mature milk
  - 10% solids; 90% water
  - Composition varies
  - 20 kcal/oz
- Immunologic advantages
  - Protection against infection
  - nonallergenic
- Nutritional advantages
  - Brain development
  - Appropriate doses of minerals
  - Iron readily absorbed
  - All natural
- Psychosocial advantages

- Contraindications
  - Mother – HIV/AIDS
  - Certain meds mom's taking
  - Baby – galactosemia
- Disadvantages
  - Must always be present to feed
  - Dad doesn't get to feed

### Formula Feeding

- Numerous types
  - \_ Artificial baby milk
  - \_ Lactose free
    - Soy protein-based
    - Specialized
- Must mix correctly
- Possible allergies

### Formula vs Breast Milk Initial Feeding

- Look for cues infant is ready
- Assess suck, swallow, gag reflexes
- Stimulates peristalsis
- Enhances maternal-infant attachment
- Expect some regurg – position on R side

### Establishing a Feeding Pattern

- On demand
  - Breast
    - may cluster feed at first, then go longer intervals b/t feeds
    - At least q 2 hours at first to establish milk supply
  - Bottle
    - Q 3-4 hours
    - May be able to go all night by 3 months
- Increased feedings with growth spurts

## Promotion of Successful Infant Feeding

- Support
- Get comfortable
  - Positioning
- Make sure baby is ready to eat

### Cultural Considerations

- Breast exposure
- How soon/how often to feed
- How long to continue breast feeding.

### Physiology of Breasts & Lactation

- Prolactin – promotes milk production
- Oxytocin – letdown reflex

- Must empty completely & frequently

### Breastfeeding Education & Self-Care

- Breastfeeding process
  - Adequate nutrition
  - Maternal-infant attachment
  - Prevent trauma to nipples
- Breastfeeding assessment
  - Maternal & infant cues; latch on; position; letdown; nipple condition; infant response; maternal response
  - Lactation consultant may be needed
- Leaking
  - R/t thinking about/hearing/seeing baby
  - Breast pads – change frequently
- Supplemental bottle-feeding
  - Nipple confusion???
  - Avoid bottles until breastfeeding established
  - Is he getting enough?
    - Breasts soften after feeding
    - 6-8 wet diapers/day
    - Gaining weight
    - Hear sucking
- Expression of milk
  - Pump at least q3 hours at first
  - Electric pump
  - Both breasts simultaneously
- Storing breast milk
  - Room temp – 6-10 hours

- Up to 3 days in refrigerator
- Frozen 3-4 mos (side freezer) 6 mos (deep freeze)
- Store in plastic bottles/bags
  
- External supports
  - LaLeche League
  - Lactation consultants
  - Books, videos, etc.
- Drugs & breastfeeding
  - Most drugs pass into breastmilk, but most only appear in small amounts in milk
  - Very few drugs contraindicated
  - Avoid long acting drugs
  - Less drug passes into milk if taken just after feeding
  - Risk vs. benefit

#### Bottle Feeding Education

- Always hold bottles; never prop
- Appropriate nipple size
- Point nipple into mouth
- Burp infant
- Expect reflux
- Avoid overfeeding
- Preparing bottles
  - Bottles dishwasher safe
  - Nipples – warm soapy water
  - May prepare up to 1 day supply formula
  - Discard leftovers
- See “Key Facts To Remember” p 678-679

#### Nutritional Assessment

- Nutritional history from parent
  - Type, amt, frequency of milk, supplemental foods, vitamins/minerals; if formula, how is it mixed
- Weight gain since last visit
- Growth chart %
  - Weight, head, length
- Physical exam