

An Introduction to the Nursery



Photograph: Anne Geddes



**Newborn Nursery Faculty:
Division of General Pediatrics**

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Pertinent Maternal History

- Everyone involved in the care of the infant should have knowledge of the relevant maternal history
 - Pre-partum
 - Antenatal
 - Perinatal

Maternal History

- Family History

- Inherited diseases (cystic fibrosis, sickle cell disease, metabolic disease, polycystic kidneys, hemophilia, and history of perinatal death)

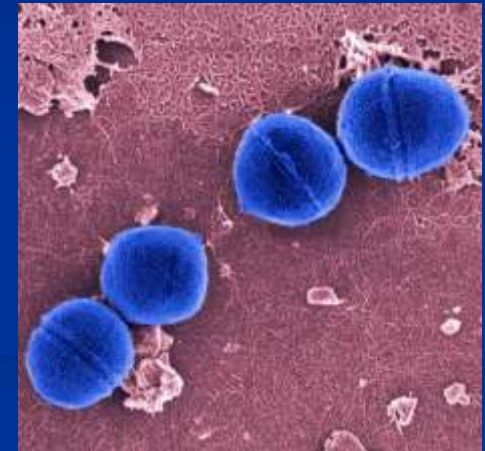
- Maternal History

- Age, blood type, chronic diseases, diabetes, hypertension, renal disease, cardiac disease, bleeding disorders, infertility, recent infections/exposures, rubella status, GBS status, and STD's

Maternal History

- Sexually transmitted diseases (STD's)

- HIV
- Syphilis (RPR or VDRL)
- Hepatitis B (HepBsAg)
- Gonorrhea (GC DNA)
- Chlamydia (Cz DNA)



Group B Strep

- Group B Streptococcus “GBS”

- (*streptococcus agalactiae*)
- Rectal/vaginal swab results at 35-37 weeks gestation

****all maternal results must be verified/confirmed by visualizing a lab report****

Maternal History

- Previous pregnancies
 - Abortions, fetal demise, neonatal death, premature births, postdate births, malformations, respiratory distress syndrome, jaundice, apnea

- Drug history
 - Medications, drugs of abuse, ETOH, tobacco usage during pregnancy

Maternal History

- Current Pregnancy
 - Gestational age, quickening, FHT, results of fetal testing, pre-eclampsia, bleeding, trauma, infection, surgery, polyhydramnios, oligohydramnios, glucocorticoids, labor suppressants, antibiotics

- Important factors during labor.....

Onset of labor:
spontaneous vs. induced

Rupture of membranes

Placental exam

Presentation

Analgesia

Maternal fever

Labor and Delivery: Important Factors

Anesthesia

Fetal monitoring

Apgar scores

Resuscitation

Method of delivery

Duration of labor

Sample Note: A/P

- A: Term infant, DOL #1, with sepsis risk factors and breastfeeding concerns.
- Plan:
 - ID: GBS + mother, but adequate treatment. No other risk factors and infant clinically well. Will monitor for 24-48 hours.
 - FEN: Breastfeeding concerns per mother. Infant tolerating formula and urine/stool output appropriate. Will obtain a lactation consult to facilitate feeding.
 - Hematology: Infant blood type A+ with mother O+, but Coombs negative. Infant breastfeeding. TcBm 4.2. Will follow clinically for jaundice.
 - Social: F/U at CMS Clinic with Dr. Feelgood

Newborn Examination

- A child's first exam should be one of the most thorough the child ever receives.
- The newborn assessment is different from an adult exam!!!
 - If you start at the head and plan to go to toes, a quiet child may no longer be quiet!
- **Look**, listen, feel
 - Listen to heart, lungs, and abdomen while the infant is quiet, then attempt to work "head to toe".
 - May have to continuously adjust your exam and examine what becomes available

Cardiopulmonary Exam

- Look at the chest
 - Color, symmetry, work of breathing, and respiratory rate
 - Observe for retractions, nasal flaring, malformations, abnormal pulsations, and parasternal heave.
- Heart examination
 - Rate, rhythm, murmurs, gallops, clicks, loudest on right side or left side, location and strength of PMI (point of maximal impulse)
 - PDA murmur sound link:
<http://www.merck.com/mrkshared/mmanual/audio/197au23.jsp>
 - Check femoral pulses and compare with brachial pulses
- Listen to the lungs
 - Bilateral breath sounds, crackles, wheezes, or rhonchi

Abdominal Exam

- Inspect first
- Listen for bowel sounds
 - Present or absent
- Feel the tummy!
 - Palpate for liver, spleen, kidneys, and presence of masses

Genitourinary Exam: Male

- Penis: Phimosis is normal!!!
 - Do not attempt to retract the foreskin over the glans
 - Look for epi- or hypospadias
- Testes: Feel both testes, look for hydroceles, hernias, or other abnormalities
- Ambiguous genitalia
- Anus: Check for patency and placement

Genitourinary Exam: Female

- Labia:
 - Large labia major is common due to maternal hormones
 - Examine for fusion and clitoral hypertrophy
- Vagina:
 - Vaginal discharge is common; white & mucoid to pseudomenses
 - May have hymenal tags
- Ambiguous genitalia
- Anus: check for patency and placement

Genitourinary Abnormalities: Male



Normal neonatal phimosis

www.vghtpe.gov.tw



Hypospadias

www.meddean.luc.edu

Genitourinary Abnormalities: Male



Left hydrocele

www1.medizin.uni-halle.de



Left inguinal hernia

www.pediatriconcall.com

Genitourinary Abnormalities



Imperforate anus

www.bms.brown.edu



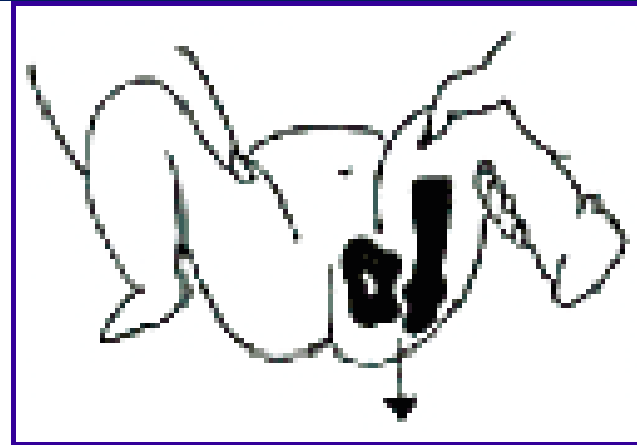
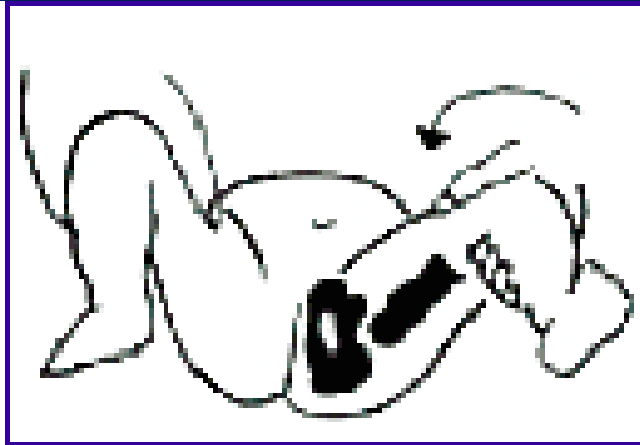
Ambiguous genitalia

www.thefetus.net

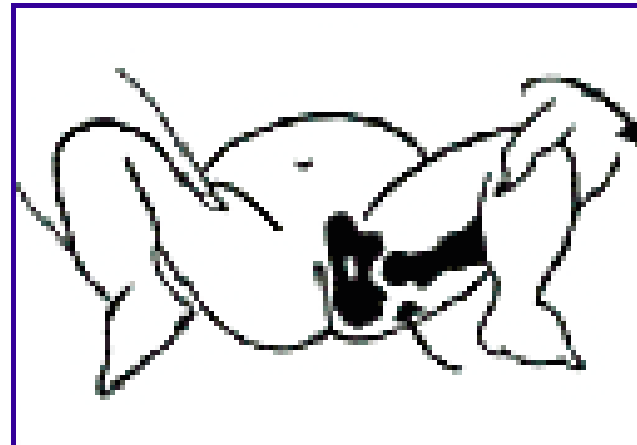
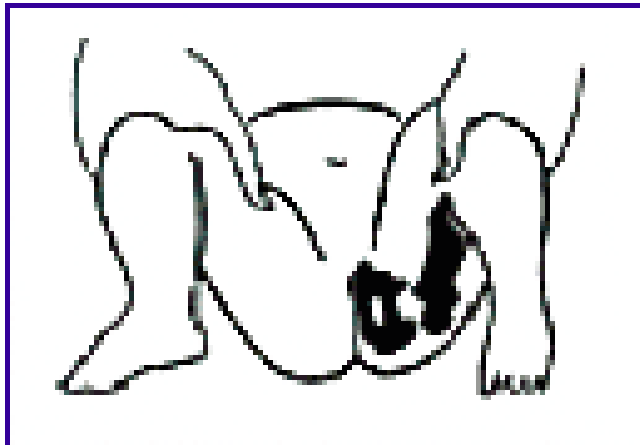
Extremities

- Digits: number and abnormalities
 - Examples: polydactyly, syndactyly, clinodactyly, simian creases
- Arms/Legs:
 - Examine range of motion, tone, asymmetry
- Clavicles
 - Feel for fractures!!!
- Hips:
 - Barlow and Ortoloni exam
 - Clicks are common and benign due to estrogenic effect
 - Clunks are indicative of hip dislocation/relocation and can represent developmental dysplasia of the hip

Hip Exam



Barlow Test



Ortolani Test

Extremity Abnormalities



Simian crease

www.emedicine.com



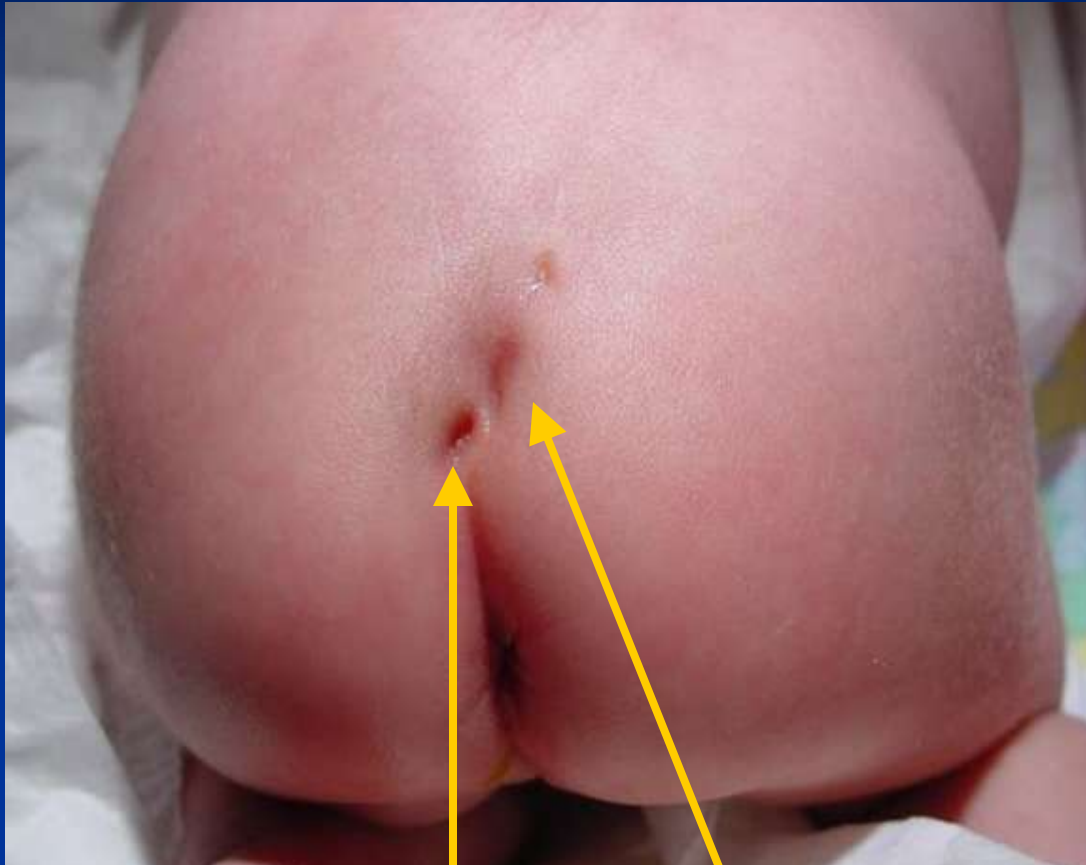
Polydactyly

www.mrcophth.com

Spine

- Flip infant onto your forearm and look at entire spine
- Feel the vertebral column for bony defects
- Examine sacral area closely
 - Clefts, hairy tufts, change in pigmentation
- Look for gross defects
 - Meningomyelocele, teratomas, sinus tracts

Vertebral Abnormalities



Sacral Sinus and Dimple

www.adhb.govt.nz



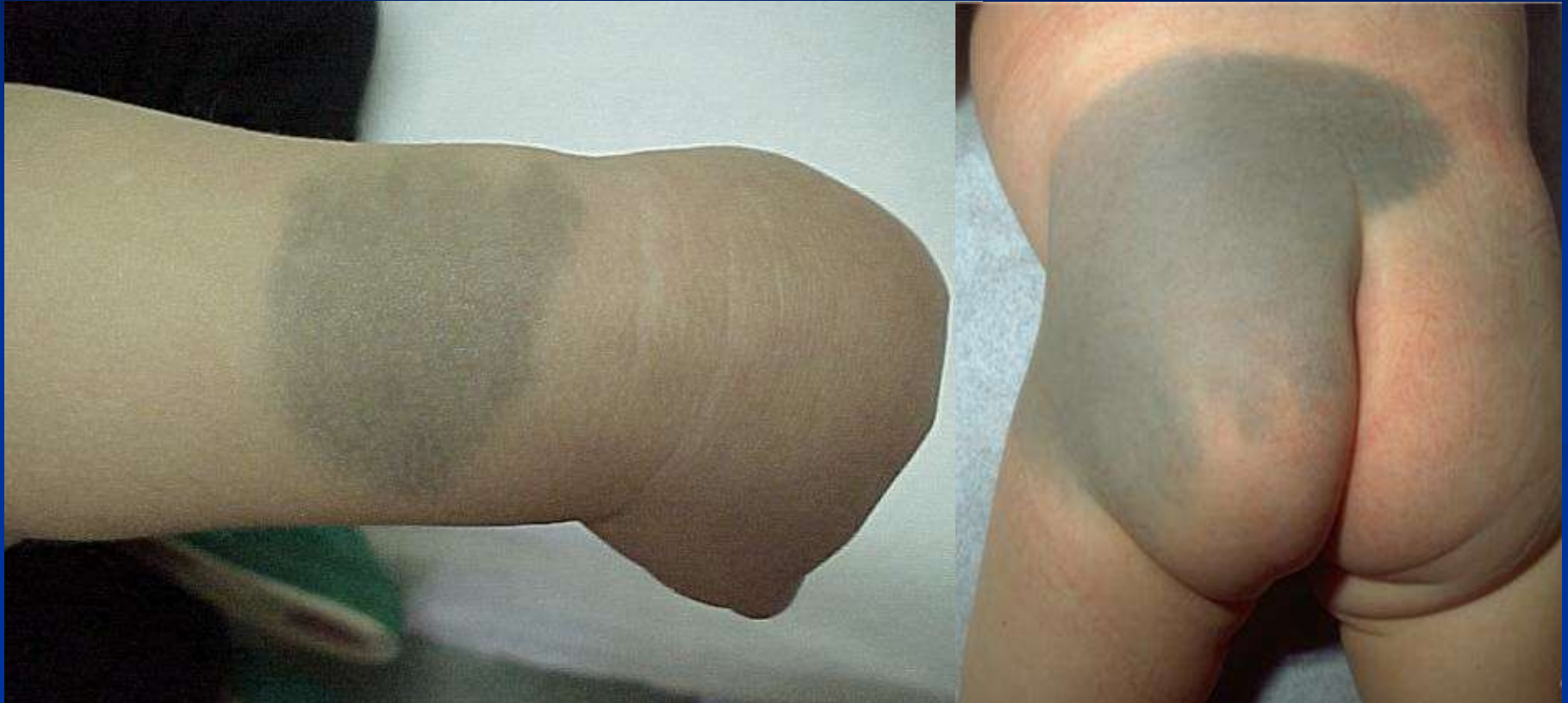
Hair tuft

www.fammed.washington.edu

Skin

- Look at the skin during the entire exam
 - Jaundice
 - Mongolian spots (Important to document!!!)
 - Rashes
 - HSV lesions
 - Transient pustular melanosis
 - Neonatal Acne
 - Erythema toxicum neonatorum
 - Milia
 - Cradle cap
 - Stork bites

Skin Findings



Mongolian Spot (Congenital dermal melanocytosis)

www.koori-childrens-clinic.com

dermis.multimedica.de

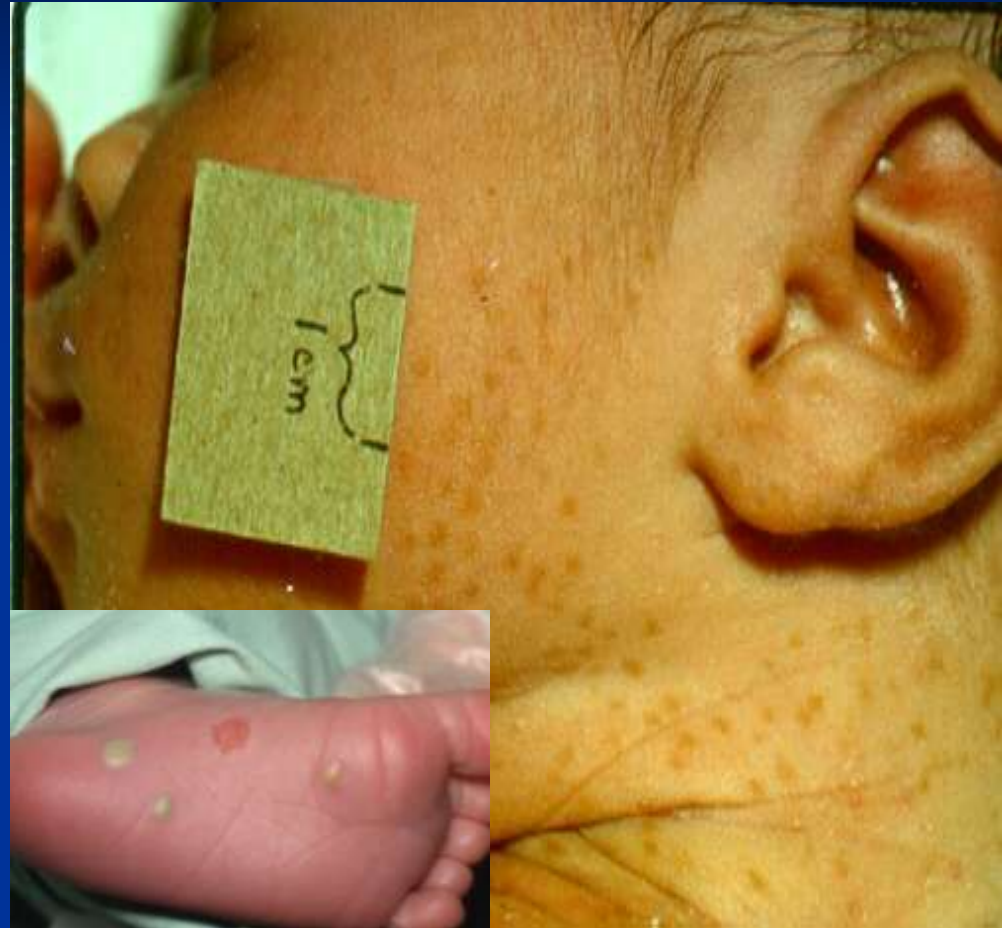
Skin Findings



Erythema toxicum neonatorum

www.dermis.net

www.nursing.duq.edu



Transient pustular melanosis

www.ahsl.co.nz

ethnomed.org

Skin Findings



Sebaceous Gland Hyperplasia

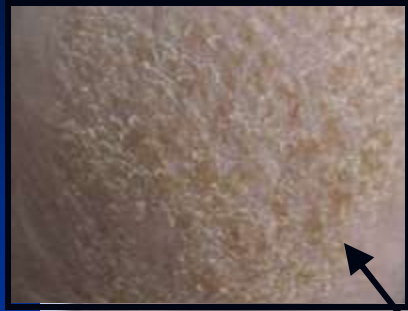
www.ahsl.co.nz



Neonatal Acne

www.derm101.com

Skin Findings



Cradle Cap (Seborrheic dermatitis)

en.wikipedia.org



Stork bite (Salmon patch hemangioma)

www.ritari.org

HEENT

- Head
 - Head circumference (average 34-35cm)
 - Look and feel scalp
 - Caput succedaneum, cephalohematoma, abrasions, sutures, fontanelles (anterior and posterior)
- Ears
 - Formed, pits, tags, rotation, position, size
- Nose
 - Nares patent bilaterally

Head Findings



Caput succedaneum

www.fammed.washington.edu



Cephalohematoma

www.emedicine.com

HEENT

- Mouth

- Check for clefts (lip and palate), arched palate, neonatal teeth, Epstein pearls

- Eyes

- Scleral hemorrhages, icterus, discharge, pupil size, extra-ocular movements, red reflex, clear cornea

- Neck

- Range of motion, goiter, cysts, clefts,

HEENT Findings



Cleft lip and palate

www.thefetus.net



Absent red reflex

www.stjude.org



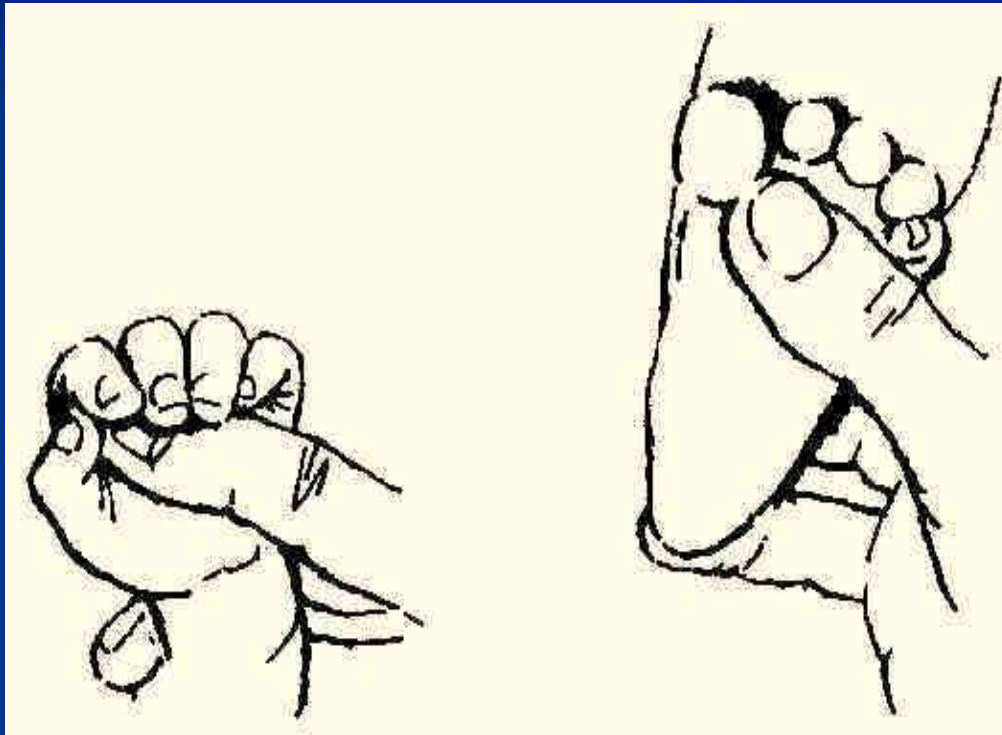
Epstein's pearls

www.dentistry.bham.ac.uk

Neurologic Exam

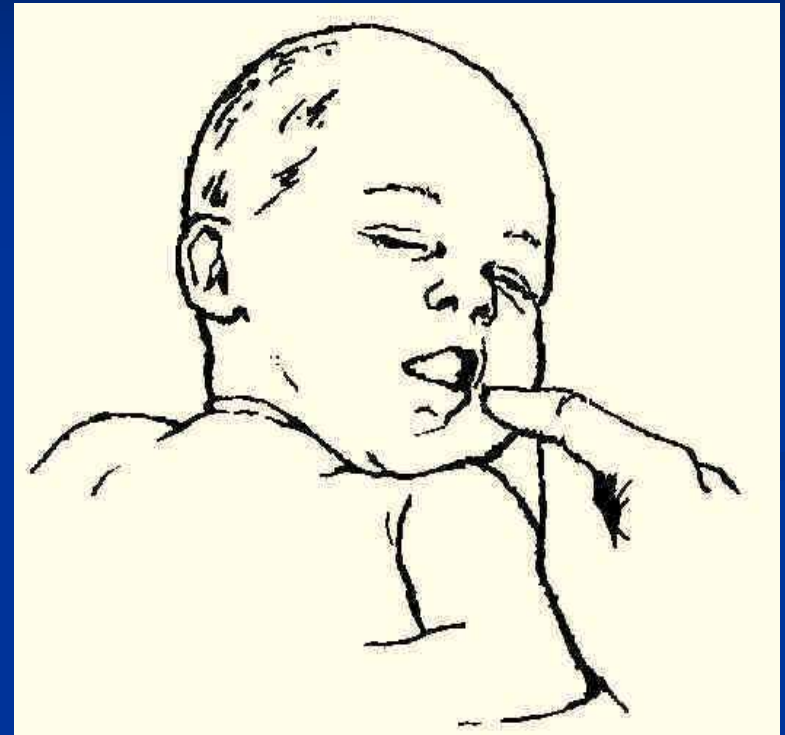
- Look carefully and evaluate neurologic status during exam of other systems
 - Symmetry of motion, tone, bulk, response to stimulation, pitch of cry, repetitive motions, palsies
 - Primitive Reflexes: Moro, suck, rooting, palmar/plantar grasp, stepping

Newborn Reflexes



Palmar and plantar grasp

www.winfssi.com



Rooting reflex

www.winfssi.com

Newborn Reflexes



Moro reflex

www.nlm.nih.gov



Stepping reflex

www.imi.org.uk

Newborn Exam Pointers

- Listen first, a crying baby doesn't promote a good listening environment
- Take your time, develop a system, and use it every single time
- Look at every square inch of the baby!
- Follow-up any abnormalities
- Don't forget gestational age assessment

Gestational Age Assessment

- Dates estimation
 - Calculated from 1st day of last menstrual period
- Early OB ultrasound is best
 - Accurate within approximately 3 days
- Later OB ultrasound
 - Accurate within approximately 2 weeks
- Ballard Gestational Age Assessment accurate within about +/- 2 weeks.

Ballard Exam

- Focuses on physical and neuromuscular characteristics
 - Best done between 12 and 20 hours of life
- Accurate within 2 weeks

****You will get special training on this exam your first day in the nursery****

Ballard Exam

- Neuromuscular Maturity
 - Posture
 - Square window
 - Arm recoil
 - Popliteal angle
 - Scarf sign
 - Heel-to-ear
- Physical Maturity
- Add scores together and compare with estimated gestational age by OB (dates and/or ultrasound)

The Ballard Exam:

- Neuromuscular maturity



- Physical Maturity



MATURATIONAL ASSESSMENT OF GESTATIONAL AGE (New Ballard Score)

NAME _____ SEX _____
 HOSPITAL NO. _____ BIRTH WEIGHT _____
 RACE _____ LENGTH _____
 DATE/TIME OF BIRTH _____ HEAD CIRC. _____
 DATE/TIME OF EXAM _____ EXAMINER _____
 AGE WHEN EXAMINED _____
 APGAR SCORE: 1 MINUTE _____ 5 MINUTES _____ 10 MINUTES _____

NEUROMUSCULAR MATURITY

NEUROMUSCULAR MATURITY SIGN	SCORE							RECORD SCORE HERE
	-1	0	1	2	3	4	5	
POSTURE								
SCAPULAR WINDOW (Rise)								
ARM RECOIL								
POPULTEAL ANGLE								
SCARP SKIN								
HEEL TO EAR								
TOTAL NEUROMUSCULAR MATURITY SCORE								

SCORE
 Neuromuscular _____
 Physical _____
 Total _____

MATURITY RATING

SCORE	weeks
-10	20
-5	22
0	24
5	26
10	28
15	30
20	32
25	34
30	36
35	38
40	40
45	42
50	44

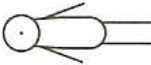

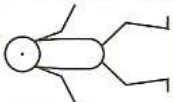
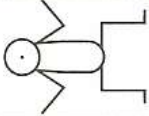
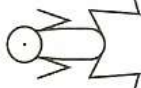









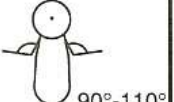

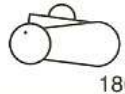
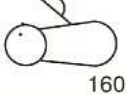
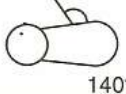
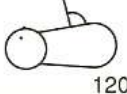
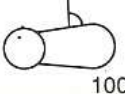
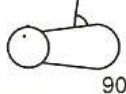
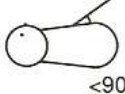

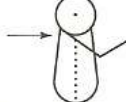
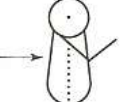
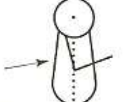
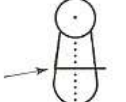
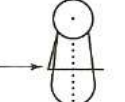
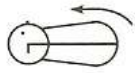
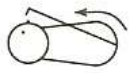
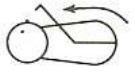


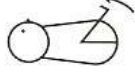
PHYSICAL MATURITY

PHYSICAL MATURITY SIGN	SCORE							RECORD SCORE HERE
	-1	0	1	2	3	4	5	
SKIN	sticky, fragile, transparent	glistening, red, translucent	smooth pink, visible veins	superficial peeling &/or rash, few veins	cracking, pale areas, rare veins	parchment, deep cracking, no vessels	leathery, cracked, wrinkled	
LANUGO	none	sparse	abundant	thinning	bald areas	mostly bald		
PLANTAR SURFACE	heel-fore 40-50 mm-1 =40 mm-2	>50 mm no crease	faint red marks	anterior transverse crease only	crosses ant. 2/5	crosses over entire sole		
BREAST	imperceptible	barely perceptible	flat areola, no bud	stippled areola, 1-2 mm bud	raised areola, 3-4 mm bud	full areola, 5-10 mm bud		
EYELID	lids fused loosely, -1 tightly, -2	lids open, pinna flat, stays folded	sl. curved pinna, soft, slow recoil	well-curved pinna, soft but ready recoil	formed & firm, instant recoil	thick cartilage, ear stiff		
GENITALS (Male)	scrotum flat, smooth	scrotum empty, faint rugae	testes in upper canal, rare rugae	testes descending, few rugae	testes down, good rugae	testes pendulous, deep rugae		
GENITALS (Female)	clitoris prominent & less fat	prominent clitoris & small labia minora	prominent clitoris & enlarging minora	majora & minora equally prominent	majora large, minora small	majora cover clitoris & minora		
TOTAL PHYSICAL MATURITY SCORE								

GESTATIONAL AGE (weeks)
 By date: _____
 By vitals/urinal: _____
 By exam: _____

Reference: Ballard J.L., Kline J.C., Peeling R., et al. New Ballard Score, modified to accurately estimate prematurity. *Obstet. Gynecol.* 1991; 77:103-108. Reprinted by permission of Dr. Ballard and Martin Year Book, Inc.

NEUROMUSCULAR MATURITY

NEUROMUSCULAR MATURITY SIGN	SCORE							RECORD SCORE HERE
	-1	0	1	2	3	4	5	
POSTURE								
SQUARE WINDOW (Wrist)	 $>90^\circ$	 90°	 60°	 45°	 30°	 0°		
ARM RECOIL		 180°	 $140^\circ-180^\circ$	 $110^\circ-140^\circ$	 $90^\circ-110^\circ$	 $<90^\circ$		
POPLITEAL ANGLE	 180°	 160°	 140°	 120°	 100°	 90°	 $<90^\circ$	
SCARF SIGN								
HEEL TO EAR								
TOTAL NEUROMUSCULAR MATURITY SCORE								

PHYSICAL MATURITY

PHYSICAL MATURITY SIGN	SCORE							RECORD SCORE HERE
	-1	0	1	2	3	4	5	
SKIN	sticky friable transparent	gelatinous red translucent	smooth pink visible veins	superficial peeling &/or rash, few veins	cracking pale areas rare veins	parchment deep cracking no vessels	leathery cracked wrinkled	
LANUGO	none	sparse	abundant	thinning	bald areas	mostly bald		
PLANTAR SURFACE	heel-toe 40-50 mm:-1 <40 mm:-2	>50 mm no crease	faint red marks	anterior transverse crease only	creases ant. 2/3	creases over entire sole		
BREAST	imperceptible	barely perceptible	flat areola no bud	stippled areola 1-2 mm bud	raised areola 3-4 mm bud	full areola 5-10 mm bud		
EYE/EAR	lids fused loosely: -1 tightly: -2	lids open pinna flat stays folded	sl. curved pinna; soft; slow recoil	well-curved pinna; soft but ready recoil	formed & firm instant recoil	thick cartilage ear stiff		
GENITALS (Male)	scrotum flat, smooth	scrotum empty faint rugae	testes in upper canal rare rugae	testes descending few rugae	testes down good rugae	testes pendulous deep rugae		
GENITALS (Female)	clitoris prominent & labia flat	prominent clitoris & small labia minora	prominent clitoris & enlarging minora	majora & minora equally prominent	majora large minora small	majora cover clitoris & minora		

Reference

Ballard JL, Khoury JC, Wedig K, et al: New Ballard Score, expanded to include extremely premature infants. *J Pediatr* 1991; 119:417-423. Reprinted by permission of Dr Ballard and Mosby-Year Book, Inc.

TOTAL PHYSICAL MATURITY SCORE

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So what's the big deal with gestational age?

- Gestational age can predict problems, morbidity, mortality, and can help you keep alert for certain problems
 - Pre-term infants are at a higher risk for:
 - Respiratory distress syndrome
 - Necrotizing enterocolitis
 - Patent ductus arteriosus
 - apnea
 - Post-term infants are at a higher risk for:
 - Asphyxia
 - Meconium aspiration
 - Trisomies and other syndromes

Gestational Age & Birth Weights

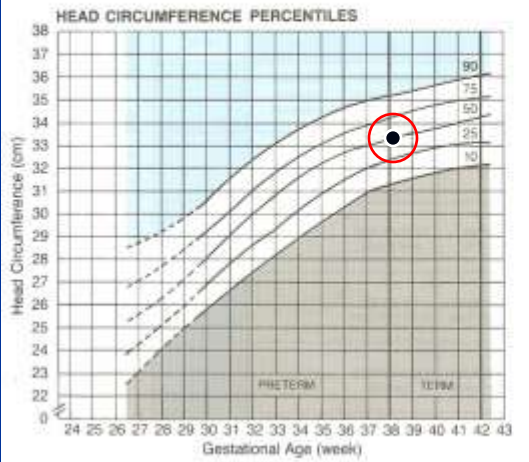
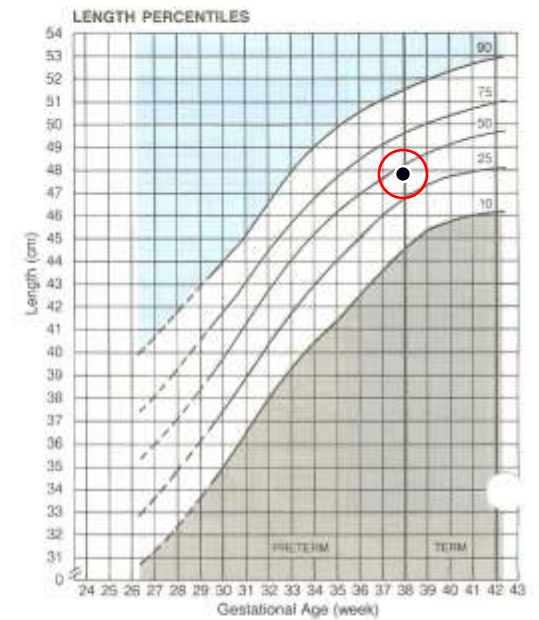
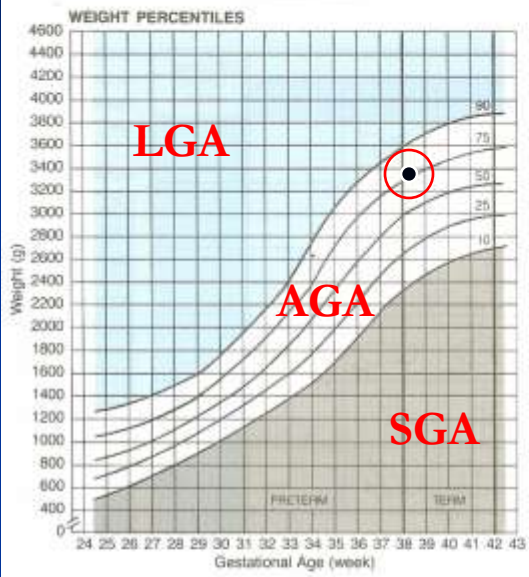
- Gestational Age:
 - Pre-term: < 37 weeks
 - Term: 37-41 6/7 weeks
 - Post-term: 42 or more weeks
- Term Infant (weight classification)
 - LGA: ≥ 4000 g
 - AGA: 2500-3999 g
 - SGA: <2500 g

Gestational Age Classification

- Pre-term, term, and post term infants must all be plotted to determine if they are SGA, AGA, and LGA with regards to weight, length, and head circumference.

CLASSIFICATION OF NEWBORNS (BOTH SEXES) BY INTRAUTERINE GROWTH AND GESTATIONAL AGE^{1,2}

NAME _____ DATE OF EXAM _____ LENGTH _____
 HOSPITAL NO. _____ SEX _____ HEAD CIRC. _____
 RACE _____ BIRTH WEIGHT _____ GESTATIONAL AGE _____
 DATE OF BIRTH _____

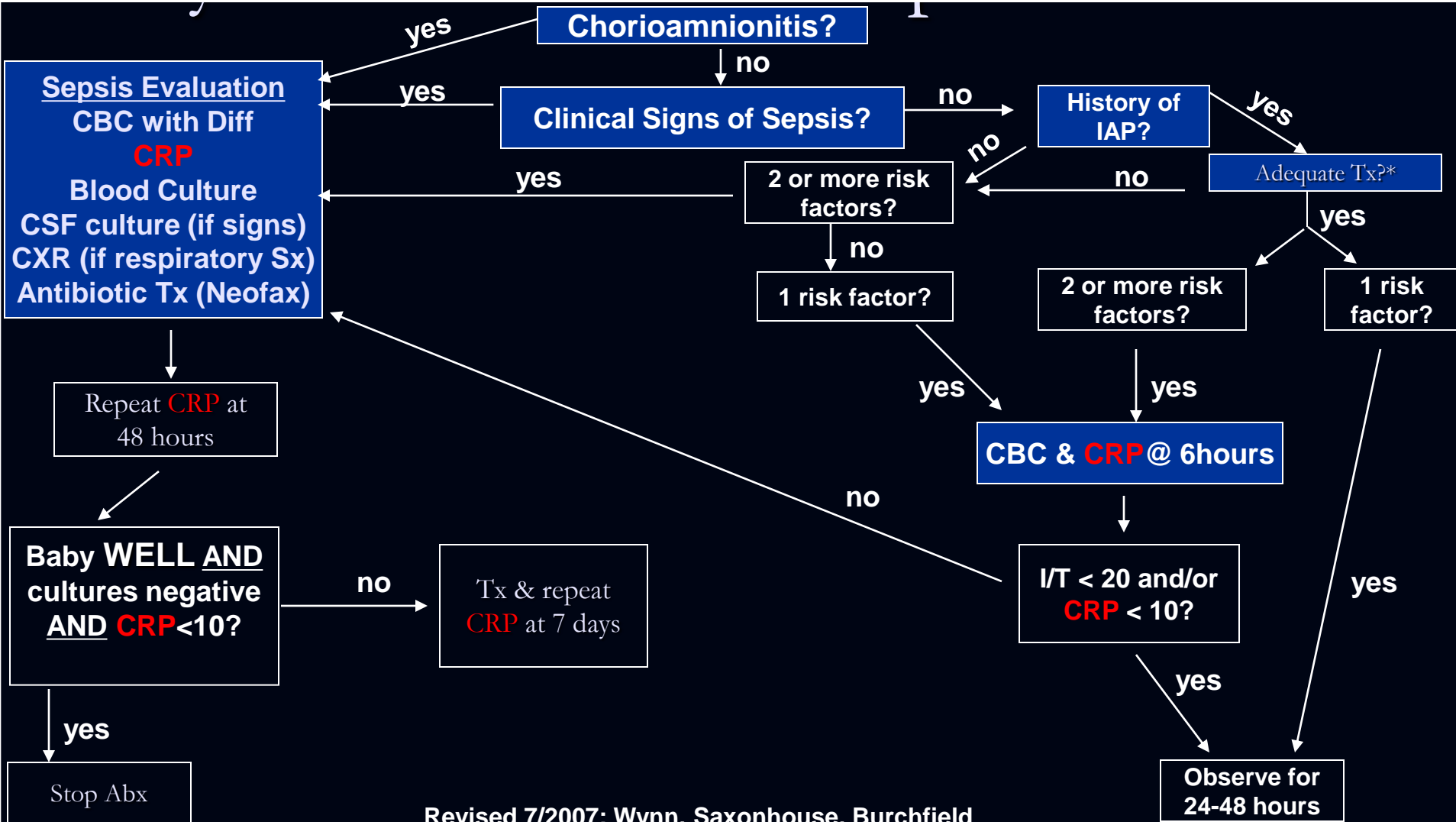


CLASSIFICATION OF INFANT*

	Weight	Length	Head Circ.
Large for Gestational Age (LGA) (>90th percentile)			
Appropriate for Gestational Age (AGA) (10th to 90th percentile)	X	X	X
Small for Gestational Age (SGA) (<10th percentile)			

*Place an "X" in the appropriate box (LGA, AGA or SGA) for weight, for length and for head circumference.

Early-Onset Newborn Sepsis Guidelines



Revised 7/2007: Wynn, Saxonhouse, Burchfield

* Adequate IAP (intrapartum antibiotic prophylaxis) consists of maternal antibiotics at least 4 hours prior to delivery

‡ No 6hr CBC/CRP is necessary in a term infant born by scheduled C-section unless there is ROM and/or signs of PTL

Risk Factors
 <37 weeks
 PROM >18 hours
 GBS positive Cx or unknown with ROM
 Sibling with GBS
 Maternal fever >38 C

Summary

- Be thorough
- Be complete
- Find a system and use it each and every time!!!
- The more infants you examine, the more comfortable you will become with normal variations.

References

- Nelson's Textbook of Pediatrics, 17th ed
- Gomella's Neonatology, 5th ed

