THE NOT SO NORMAL NEWBORN

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DISCLOSURES

- **This speaker has no financial disclosures**

LEARNING OBJECTIVES

- **Identify the specialized needs of higher risk infants in the newborn nursery and their transition from the nursery to their primary care office**
- **Describe the standards of care for infants presenting with higher risk factors that will impact the growth, development and health of the infant**
- **Describe the critical components to consider when evaluating the needs of a family with a newborn.**

COMMON PROBLEMS WITH NEWBORNS

- Late Preterm
- Small Gestational Age (SGA)
- Large Gestational Age (LGA), Diabetic Mom
- Hypoglycemia
- Hypothermia
- Sepsis Evaluation
- Hyperbilirubinemia
- Neonatal Abstinence Syndrome
- Follow up care

LATE PRETERM

- **Born between 34-36 6/7 weeks gestation**
- **May be the size of full term babies**
- **Higher risk of morbidity and mortality**
- **Higher rate of hospital readmissions**

LATE PRETERM PROBLEMS

- **Respiratory/apnea**
- **Hypothermia**
- **Poor feeders**
- **Hypoglycemia**
- **Hyperbilirubinemia**
- **Neurodevelopmental immaturity/delay**

SMALL FOR GESTATIONAL AGE (SGA)

- SGA defined as infant whose weight at birth is lower than 10th% for gestational age
- IUGR is a deviation from an expected fetal growth pattern; any process that inhibits growth of fetus
- IUGR and SGA not mutually exclusive
- All *IUGR* infants not SGA-*deceleration in growth in utero, but weight may be within a normal range*
- Factors affecting growth: hormone regulation, genetic, congenital disorders, multiples, nutrition, maternal chronic disease/uterine abnormalities, drug use, socioeconomic status, placental insufficiency
- History and physical informs your evaluation: plot on appropriate growth curve
    - Symmetric: weight, height and HC all < 10th% with no head sparing. Growth restriction usually early in pregnancy, need to consider congenital infections
    - Asymmetric: weight, height < 10th%, HC > 10th%, head sparing. Growth restriction later in pregnancy secondary to utero-placental insufficiency

SGA CONSIDERATIONS

- Hypoglycemia
- Hypothermia
- Feedings (sleepier, suck/swallow coordination)
- Growth & developmental problems
- Labs to consider: CBC with diff, glucose, toxicology, urine CMV, toxo titer
- May need to consider specialty consults

LATE PRETERM/SGA INTERVENTIONS

- Pre warmed radiant warmer for avoidance of heat loss
- Skin-Skin contact with mom
- Bundled with warm blankets/hat/shirt on top & bottom
- Frequent vital signs and BGs-follow hospital standard of care
- Early feeds if clinically stable-breastfeeding support
- Daily weights; if >3% weight loss in first 24h or >7% by day 3 consider other interventions
- Close observation for early jaundice; especially with a set up (late peak of 5-7d in preterm)

LATE PRETERM/SGA DISCHARGE CRITERIA

- Babies should be kept for a minimum of 48 hours
- Vital signs must be normal for at least 12h prior to discharge:
  - Respiratory rate <60/m
  - HR 100-160/m
  - Temp 36.5-37.4 in open crib
- Feeds demonstrate appropriate suck/swallow/breathe; BF consult
- Weight loss of <7%
- State screen genetic tests, bilirubin, NBI, car seat trial, hearing screen
- Family risk factors have been assessed; appropriate interventions in place

LATE PRETERM/SGA FOLLOW UP CARE

- Appointment with PCP within 24-48h; consider CHN
- Plan for potential jaundice identified
- All specialty follow up appts set up
- Detailed, written instructions for feeds, elimination, cord care, circumcision care, skin care, sleeping positions/patterns, when to call PCP for concerns/illness

LARGE FOR GESTATIONAL AGE (LGA)

- **Newborns whose weight is above the 90th% plotted**
- **LGA may be preterm, term, or post term**
- **HC & length often at upper limits**
- **LGA babies may be secondary to maternal diabetes-hypoglycemia is most common in macrosomic infants**
- **Related to persistent hyperinsulinemia in the newborn after interruption of the intrauterine glucose supply from the mother; strict glycemic control during pregnancy decreases risk**

LGA INFANTS

- At risk for hypoglycemia, polycythemia, bruising, hyperbilirubinemia, hypothermia, fractured clavicle, brachial plexus injury, facial paralysis, cephalohematoma, caput succedaneum, depressed skull fracture
- Classification system utilized in DR for maternal diabetes; scoring for maternal age, last BG, baby's weight and initial BG

LGA INTERVENTION

- **Monitor blood glucose per hospital standard of care-usually first in the DR then every 30 minutes until BG > 40 mg/dl x 2; if <40 mg/dl then may require fluids in the NICU**
- **Close glucose monitoring; hypoglycemia may persist 2-4 days**
- **Early feeds**

HYPOGLYCEMIA

- Blood sugar > 40 mg/dl-80 mg/dl is the normal range
- Most predominantly in SGA, late pre-terms, & infants of diabetic mothers
- Other risk factors include multiples, prematurity, sepsis, delayed feeding, hypothermia, respiratory distress, metabolic, endocrine disorders
- Wide range of clinical manifestations including jitteriness, cyanosis, apnea, tachypnea, lethargy, decreased tone, seizures

HYPOGLYCEMIA INTERVENTIONS

- **If initial BG is <40 mg/dl or > 25mg/dl, feed formula 15cc and recheck in 30; if breastfeeding, put newborn to breast but may need to feed the 15 cc by cup/bottle/syringe, recheck in 30m**
- **Stepwise approach; continue to feed and recheck blood sugars until > 40 mg/dl x 2, then ac x 2, then q 12h-follow your hospital standard of care guidelines**
- **If initial BG < 25 mg/dl then feed, recheck in 30 m; if still below 40 then anticipate transfer to NICU for fluids**
- **Any baby who has experienced persistent low blood sugar will require close monitoring until stable**
- **By > 24 hours old, infant should have a stable blood glucose >50 mg/dl**

HYPOTHERMIA

- Normal baby range is 36.5 C – 37.4 C
- Risk factors include SGA, LGA, low birthweight, late-preterm, hypoglycemia, hypoxic, septic, prolonged resuscitation
- Baby has a larger surface area to body mass ratio; thin skin, little insulating body fat
- Response to cold stress include constriction, increased muscle flexion and metabolism of brown fat; this increased metabolic rate increases utilization of oxygen & glucose
- An infant already hypoglycemic and/or hypoxic will be unable to metabolize the brown fat
- Blood stays in core of body, preventing blood from reaching skin surface; prolonged vasoconstriction may impair perfusion/tissue oxygenation

THERMOREGULATION INTERVENTIONS

- Baby placed on radiant warmer
- Skin-skin warming
- If stable, bundle in warm blankets, hat
- Monitor temp per standard of care; may need incubator/radiant warming if bundling not enough
- Monitor other vitals, BG
- No bath!
- Babies in mother's rooms need to be monitored; often unwrapped
- Persistent hypothermia; despite interventions will require a septic workup

SEPSIS EVALUATION

- Evaluation/treatment based on assessment of maternal risk factors, infant's clinical course & test results
- There is now a newborn sepsis risk score calculated at birth for any infant born greater than or equal to 36 weeks gestation
- Maternal Group B test performed 35-37 weeks for all pregnant women
- Maternal prophylaxis indicated if GPS +, + GBS bacteriuria during current pregnancy, previous infant with GPS, GBS status unknown, <37 weeks gestation, ROM > 18h, intrapartum temp > 100.4
- Prophylaxis must be done at least 4h prior to delivery; not necessary if planned CS in the absence of labor, ROM, negative culture
- Antibiotics considered adequate treatment are Pen VK, Ampicillin, Cefazolin; Clindamycin is acceptable if sensitivities are positive; vancomycin only 80% effective

EVALUATION FOR EARLY ONSET SEPSIS

- **Indicated if suspected/positive maternal chorioamnionitis**
- **Clinical signs of sepsis: hypothermia, hypoglycemia, tachycardia, tachypnea, cap refill < 2 sec, acidosis, hypovolemic**
- **Newborn sepsis risk score calculation**

CLINICAL WORKUP SEPSIS

- CBC & diff
- Blood culture
- CRP at 12h and 36h; single CRP low sensitivity; recommended 24h apart
- Lumbar puncture if indicated
- Antibiotics: Ampicillin & Gentamicin if indicated
- Fluids if indicated

MANAGEMENT OF SEPSIS EVALUATION

- Monitor clinical symptoms in infant
- Monitor blood work
- May rule out in 36 hours/discontinue antibiotics if blood cultures no growth, CRP <5 mg/L; MUST STILL MONITOR FOR 48 HOURS-this applies to blood/urine cultures, not cerebrospinal fluid cultures
- If requiring a full course of antibiotics, early discharge with IM Ceftriaxone may be considered if infant had 4 doses of gent, 12 doses of amp; bili is <8
- Early discharges

HYPERBILIRUBINEMIA RISK FACTORS

- **Hemolytic Disease**
- **Prematurity/SGA**
- **Previous sibling with jaundice**
- **Birth Trauma-bruising, cephalhematoma**
- **Asian Ethnicity**
- **Infection**
- **Maternal diabetes**
- **Breastfeeding**
- **Metabolic/Enzyme/Biliary Disorders**

EVALUATION

- Bilirubin level peaks 3-5 days; 5-7 days for premature infants
- Should begin prenatally-screen for blood type and isoimmune antibodies
- Cord blood sent for Coombs test, blood type, Rh determination
- Visual evaluations at least every 8 hours-best done at window in daylight
- Depending on risk factors may need to measure a Total Serum Bilirubin (TSB) level as early as 12 hours old, but always prior to discharge
- Transcutaneous Bilirubin gaining popularity and correlates closely with TSB
- Further lab evaluations include Hct, Retic; consider CBC & diff
- Repeat TSB in 4-24 hours depending on level, rate of rise, and risk factors
- Bilitool.org

option one

Date and time of **birth** to closest hour:

2016 | January | 23 | 12 am - midnight

Date and time of **blood sampling** to closest hour:

2016 | January | 24 | 12 am - midnight

Total Bilirubin*: mg/dl (US) Submit

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option two

Age (hours): (12-146 hours)

Total Bilirubin*: mg/dl (US) Submit

Use

BiliTool is designed to help clinicians assess the risks toward the development of hyperbilirubinemia or "jaundice" in newborns over 35 weeks gestational age.

Required values include the age of the child in **hours** (between 12-146 hours) and the **total bilirubin** in either US (mg/dl) or SI (µmol/L) units.

Two entry options are available.

Hour-Specific Nomogram for Risk Stratification

Infant age	70 hours	
Total bilirubin	14.5 mg/dl	
Risk zone	High Intermediate Risk	

Risk zone is one of several risk factors for developing severe hyperbilirubinemia.

Recommended Follow-up

Hyperbili Risk Level	Interval
Lower Risk (>= 38 weeks and well)	Follow-up within 48 hours and consider TcB/TSB at follow-up
Medium Risk (>=38 weeks + hyperbili risk factors OR 35 to 37 6/7 weeks and well)	Evaluate for phototherapy and check TcB/TSB within 24 hours
Higher Risk (35 to 37 6/7 weeks and hyperbili risk factors)	Evaluate for phototherapy and check TcB/TSB in 4-24 hours

AAP Phototherapy Guidelines (2004)

Neurotoxicity Risk Level	Start phototherapy?	Approximate threshold at 70 hours of age
Lower Risk (>= 38 weeks and well)	No	17.5 mg/dl
Medium Risk (>=38 weeks + neurotoxicity risk factors OR 35 to 37 6/7 weeks and well)	No	15.4 mg/dl
Higher Risk (35 to 37 6/7 weeks and neurotoxicity risk factors)	Yes	13.4 mg/dl

Hour-specific nomogram
Phototherapy nomogram
Exchange nomogram

Hyperbilirubinemia Risk Factors

- TSB/TcB in high-risk zone
- Jaundice in first 24 hours
- ABO incompatibility with positive direct Coombs, known hemolytic disease, or elevated ETCO
- Gestational age 35-36 weeks
- Prior sibling had phototherapy
- Cephalohematoma or bruising
- Exclusive breastfeeding, esp. with poor feeding or weight loss
- East Asian Race

Neurotoxicity Risk Factors

- Isoimmune Hemolytic Disease
- G6PD deficiency
- Asphyxia
- Significant lethargy
- Temperature instability
- Sepsis
- Acidosis
- Albumin < 3.0 g/dL

MANAGEMENT JAUNDICE

- Follow guidelines to recheck TSB; follow rate of rise- >0.2/hour worrisome
- Encourage frequent feeds, providing breastfeeding support is essential
- If reaches Phototherapy (Light) Level-Bili tool or Bhutani Nomogram utilized to guide management
- Often start with 2 banks and a Wallaby but may need more banks depending on level, rate of rise, risk factors
- Discontinuation of lights not standardized; use clinical judgement based on risk factors, rate of TSB dropping, feeds, stools

NEONATAL ABSTINENCE SYNDROME

- Scope of the issue
  - 200,000 infants/year exposed in utero to illicit substances
  - 25% of pregnant women smoke
  - 8.3 million children impacted by maternal substance abuse
  - SSRI use is significant; effect on newborn not always recognized

DRUG EXPOSURE EVALUATION

- Maternal history
- Maternal/infant urine toxicology screen; reflects use within past 48-72 hours
- Substance use in pregnancy associated with birth defects, low birth weight, prematurity, NAS, seizures, neurobehavioral disorders/cognitive deficits
- Often multi-substance abuse
- Onset of symptoms can be minutes to weeks; most within 72 hours
- Many hospitals require infants of known maternal drug use to be observed a minimum of 96 hours-maybe longer

MATERNAL RISK FACTORS

- No or limited prenatal care
- Maternal history of drug use
- Precipitous labor
- Abruption
- Previous infant with NAS or fetal demise
- Hypertension/cardiac issues
- Multiple therapeutic terminations
- Infant has urine testing if any above are present

DRUG CATEGORIES

- Opioids
- Synthetic/Semisynthetic Narcotics
- CNS Depressants
- CNS Stimulants
- SSRI
- Hallucinogens
- THC/Nicotine/ETOH

CLINICAL SIGNS OF NAS

Neurologic

- High pitched crying
- Excessive crying
- Increased muscle tone
- Seizures, tremors
- Sneezing/yawning
- Irregular sleep cycles

GI/Autonomic

- Excessive sucking
- Poor, uncoordinated suck/poor weight gain
- Spitting
- Loose stools
- Sweating
- Tachypnea

SCORING TOOLS

- Finnegan Tool-21 point item measuring symptoms
- Modified Finnegan-8 point system widely used
- Lipsitz Tool-11 point item measuring symptoms
- Other tools available; evidence does not support one tool superior to others
- Significant challenge for nurses to score consistently and objectively- inter-observer variability

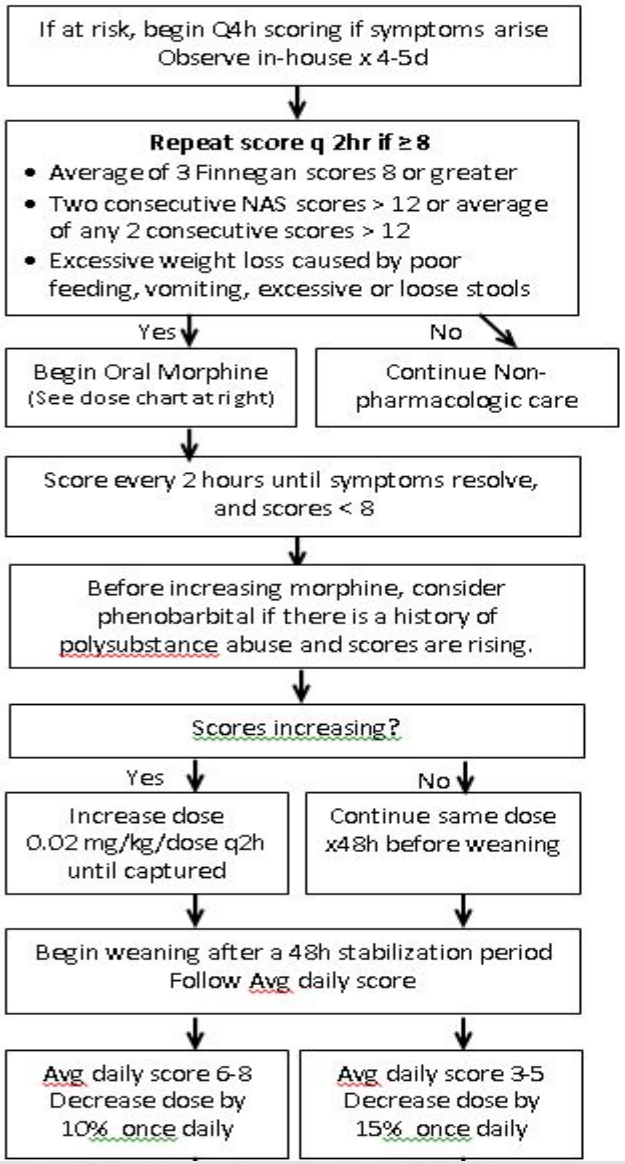
PHARMACOLOGIC TREATMENT

- Indicated when supportive care not effective
- Start 2-4 hours after meets criteria
- AAP recommends oral morphine and methadone as first line
- Clonidine may be considered
- Phenobarbital for sedative withdrawal & adjunct
- Infant may require meds for 2-4 weeks
- Goal is always to control symptoms to allow baby to gain weight and be discharged

DOSING

- Morphine starts at 0.05 mg/kg every 4 hours-birthweight is used-score dependent
- Increase by 0.05 mg/kg as needed
- May need to bolus with 0.02 mg/kg
- May add Phenobarbital if symptoms not controlled – 5 mg/kg as a single dose prn; also needs to be weaned
- Once you reach your capture dose; stabilize for 3-5 days and then begin to wean 10% each day-same time each day
- Observe x 48 hours once medication is discontinued

Treatment Algorithm



Pharmacologic treatment

- is indicated when, despite maximal supportive care, the average of three consecutive scores is 8 or greater
- start within 2-4 hours after infant meets criteria
- wean medications at the same time every day.
- scores should be averaged over a 12 to 24 hour period.
- Other factors than score must be considered in dose adjustments such as feeding quality and weight gain
- Use **birth weight** for all calculations.
- OK to breastfeed unless otherwise contraindicated (e.g. cocaine, HIV, etc)
- For term infants, use Gentlease Formula, consider brief use of soy formula if diarrhea is difficult to treat.
- For preterm infants, use appropriate preterm formula

Oral Morphine

- Dosing schedule – all doses on birth weight

Score	4 Hr Dosing (mg/kg/dose)
8-10	0.05
11-13	0.08
14-16	0.11
> 16	0.13

- Monitor closely, and if infant is lethargic or obtunded, withhold dose.
- Concentration of oral morphine for NAS use at SMH: 0.2 mg/ml
- When the infant has received 24 hours of 0.02 mg/kg/dose q 4 hours of opium/morphine, and clinical condition is stable, the medication can be discontinued.
- Due to the short half-life of morphine and opium, it is not necessary to increase (i.e. spread out) the dose interval
- Consider adding Phenobarbital if CNS symptoms cannot be controlled with opiates alone.
- Infant can be observed for at least 24 hours after the medications have been discontinued.

Phenobarbital

- Dose: 5 mg/kg, as a single dose, may repeat 3-5 mg/kg/dose as needed for irritability

Use In narcotic withdrawal and poly or other substance abuse

SUPPORTIVE CARE

- Quiet, soothing environment, soft music
- Organize care to minimize handling
- Swaddle tightly/swings/cuddlers
- Frequent small feeds/pacifiers-hypercaloric formula, Gentlease
- Breastfeeding depends on maternal drug use/utilize lactation consultant
- Skin care
- Consistent caregivers; dedicated multidisciplinary staff
- Support for the mother/infant dyad-guilt feelings
- Transitional care

DISCHARGE PLANNING

- Social work essential
- CPS often involved to determine safety of home
- If infant being discharged on meds; very close monitoring with PCP necessary
- PCP, Early intervention, specialist appointments should be arranged
- PCP needs detailed hospital information

PRIMARY CARE FOLLOW UP

- **Recommend PCP follow up for weight status, feeding adequacy, elimination patterns, jaundice, parenting evaluation :**
  - **Discharge at 48-72h: see by 120 hours of age**
  - **Discharge 24-48h: see by 96 hours of age**
  - **Discharge before 24h: see by 72 hours of age**

PRIMARY CARE FOLLOW UP

- Prior to hospital discharge:
  - Hearing screen with recommended follow up-Check results
  - CCHD screen >24h and <48h
  - Newborn state screen-Check results
  - Car seat trial if necessary
  - Total serum bili and recommended follow up-Note risk factors
  - Clear documentation of maternal history, birth history, infant history, weight loss, feeding choice/pattern, recommended follow up with PCP; other recommended follow ups as ultrasounds, specialist care, documentation of teaching done (safe sleep, shaken baby, routine newborn care, etc.), results of any other blood work, time in NICU, phototherapy, social issues encountered

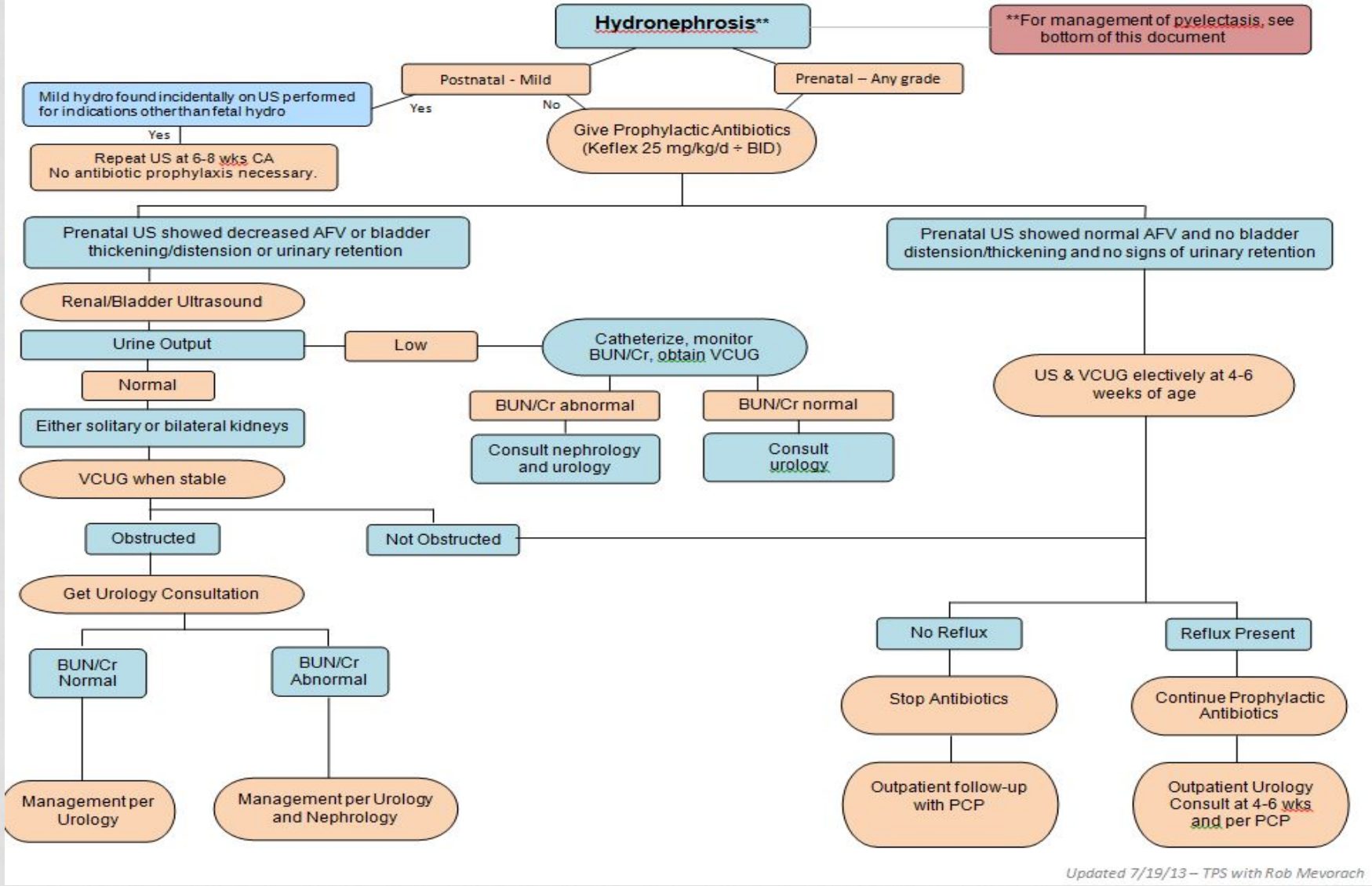
PRIMARY CARE FOLLOW UP

- **Maternal bonding/PP depression-Consider Edinburgh Tool**
- **Weight/Feeding-Multifactorial- need to consider birthweight, gestational age, feeding type, frequent follow up**
- **Specialty appts-Helpful to family to remind them of dates/times; if possible try to arrange on same day**

PRIMARY CARE FOLLOW UP SPECIAL CIRCUMSTANCES

- **Breech babies: Hip US at 6 weeks of age even with normal exam-females & males, check family history**
- **Early Discharge: Follow weight, bilirubin level/jaundice, heart murmurs, feeding patterns closely**
- **Breastfeeding Support:**
  - **Problems may not appear until baby is a few days old**
  - **Lactation consultant helpful**
  - **Breastfeeding jaundice vs breastmilk jaundice**

APPROACH TO EVALUATION OF HYDRONEPHROSIS



Updated 7/19/13 – TPS with Rob Mevorach

PRIMARY CARE FOLLOW UP SPECIAL CIRCUMSTANCES

- Vulnerable Child Syndrome
- High Risk Families
- Community Resources

RESOURCES

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