

Neonatal Jaundice

Making sense of Bilitool

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The Basics

- Jaundice= yellowing of skin. Due to increased level of bilirubin in the body.
- Bilirubin= comes from the breakdown of heme
- Why do babies have more breakdown? Babies are polycythemic, so they breakdown RBCs faster than adults, and there is impaired secretion

Causes of Indirect Hyperbilirubinemia

Pathologic:

1. Increased production of bilirubin (bcs of hemolysis)
 - a. ABO/Rh incompatibility
 - b. RBC membrane defects
 - c. RBC enzyme defects (G6PD)
2. Decreased clearance of bilirubin
 - a. Crigler Najjar
 - b. Gilbert

Non-pathologic:

1. Increased production of bilirubin
 - a. Cephalohematoma
 - b. Polycythemia (DM)
2. Decreased clearance
 - a. Breastfeeding jaundice- difficulties w/ lactation, weight loss is seen, happens in 1st week of life
 - b. Breast milk jaundice- peaks later in life about 1-2 weeks, resolves by 12 wks of life

The whole point of measuring Bili is to
PREVENT kernicterus

So the question we are trying to answer is:
Does this baby need phototherapy?

Case 1

39 week old baby boy, born via vaginal delivery, now 72hr of life with TSB 16.5 and direct bili 0.2.

Weight at 72hr is 3.15kg, which is down 10% birth weight. Mom's blood type is O+, antibody negative; baby's blood type is O+ DAT negative. Baby's Apgars 9/9, and did not have a cephalohematoma

Go to bilitool.org

And plug in the numbers!

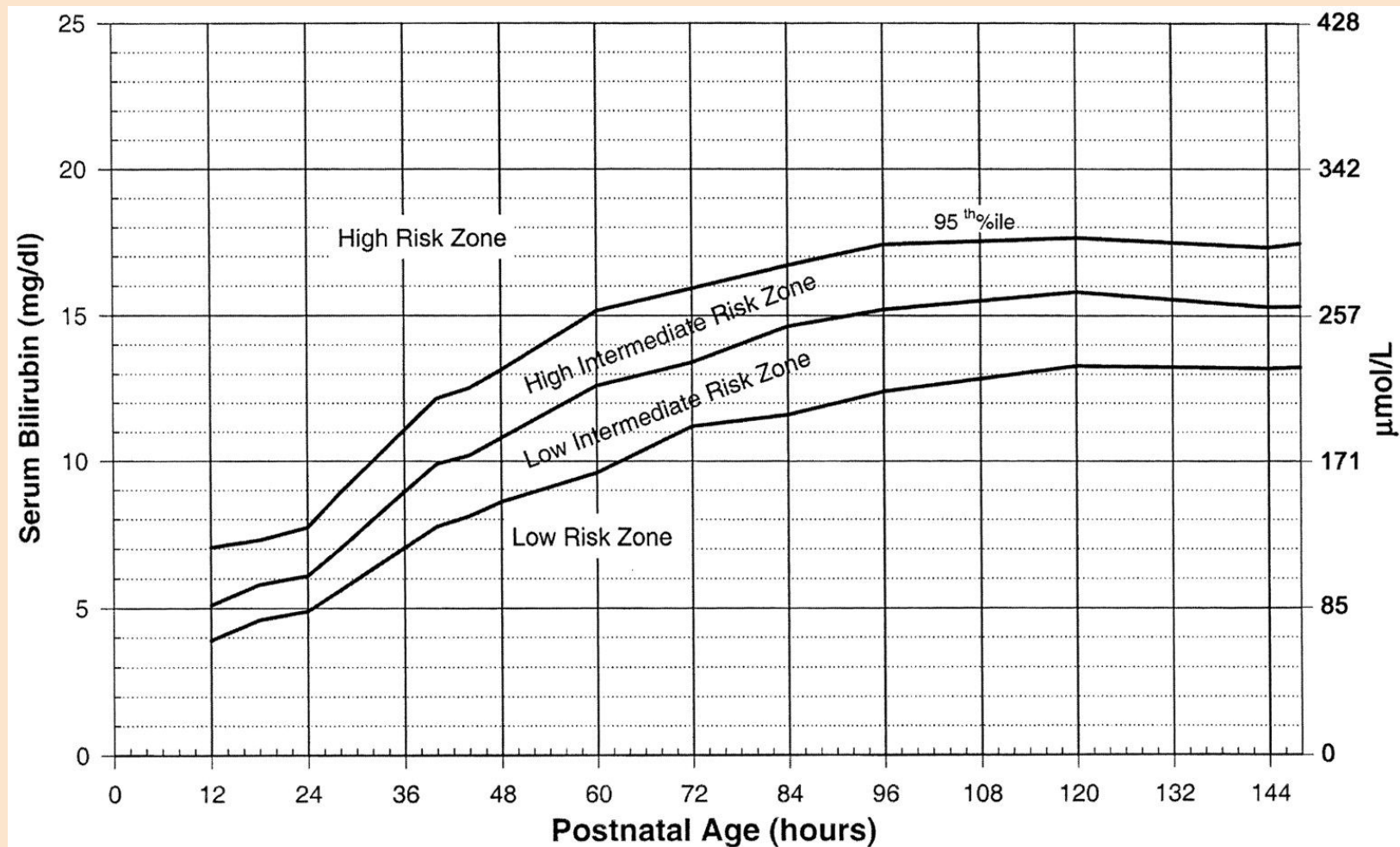
What do you see? The word “risk” is mentioned everywhere, but it’s important to know that **there are 3 different “risks”**

Hour-Specific Nomogram for Risk Stratification

Risk #1: Risk for developing severe hyperbilirubinemia (ie- needing phototherapy)

-Risk zone: **High Risk**

That bili level at that time of life, places the baby at a **high risk** zone for **developing severe hyperbilirubinemia and future phototherapy**



Are there other risk factors that place a baby at risk for developing severe hyperbilirubinemia?

YES, that's **risk #2**

Jaundice in first 24hr, +DAT (hemolytic disease), GA 35-36wk, prior sibling with phototherapy, cephalohematoma, exclusive BF with poor weight loss, East Asian Race

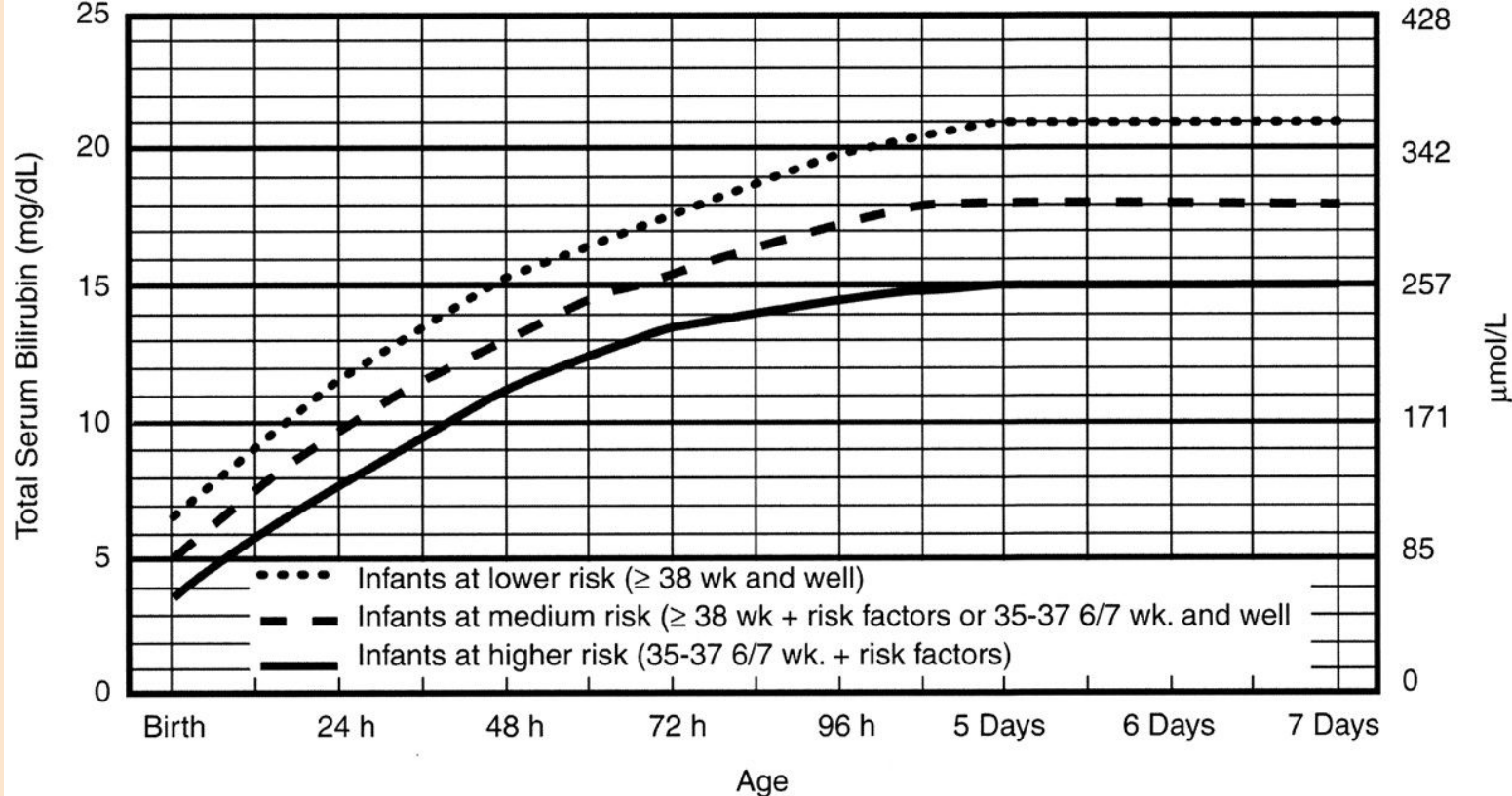
Neurotoxicity Risk Level

Risk #3: Risk of Neurotoxicity

-This depends on how mature BBB is.

-Low risk: 38wk GA and well, will have a HIGHER Bili threshold for when to start phototherapy

-Higher risk: <38wks and has neurotoxicity risk factors: sepsis, asphyxia, lethargy, temp instability, acidosis, G6PD deficiency



- Use total bilirubin. Do not subtract direct reacting or conjugated bilirubin.
- Risk factors = isoimmune hemolytic disease, G6PD deficiency, asphyxia, significant lethargy, temperature instability, sepsis, acidosis, or albumin $< 3.0\text{g/dL}$ (if measured)
- For well infants 35-37 6/7 wk can adjust TSB levels for intervention around the medium risk line. It is an option to intervene at lower TSB levels for infants closer to 35 wks and at higher TSB levels for those closer to 37 6/7 wk.
- It is an option to provide conventional phototherapy in hospital or at home at TSB levels 2-3 mg/dL (35-50mmol/L) below those shown but home phototherapy should not be used in any infant with risk factors.

Case 2

Same 72hr Tbili 16.5

But baby born at 37 weeks...now what does Biltool say? Take a look at the Phototherapy Nomogram

Do we need to start Phototherapy?

-Faster turnover of RBCs, Enzyme for conjugation is not as effective, 37weekers don't feed as well as 38+ weekers

-Also, why was baby born at 37 weeks? Likely baby is sicker, so BBB not as developed

-Labs to send out: for sure fraction the Bili, so that you know elevated Bili is due to indirect (unconjugated), and NOT direct.

→ If direct is high, then you know it is a problem with excretion of Bili from the liver, so something like biliary atresia for instance

Case 3

38 1/7 wk baby girl VSD to 28 year old mom. Mom O+, GDM and HgbA1c was 9.2%. At 48hr of life, baby's weight is down 9% from birth (4500 to 4100grams), and total bili is 14.5 Apgars 7 and 9

Plot in bilitool!

This baby is “high risk” for needing phototherapy in the future

Baby’s neurotoxicity risk level is “lower risk” since >38 and well.

And risk factors contributing to needing phototherapy in the future is *infant of diabetic mother*

So if look at the phototherapy nomogram, threshold to start phototherapy in this baby is 15.3... right now she is at 14.5

Maternal DM → results in more glucose exposure to baby, so baby uses glucose and grows more, is hypermetabolic, and needs more oxygen for growth will need more RBCs= more heme= more bilirubin. So likely this high bili is because of uncontrolled GDM

Case 4

39 wk born VSD, Apgars 9/9, DAT neg, no cephalohematoma, mom healthy, weight loss only 3%

Total bili 14 at 24hr

Plot it!

Way above the threshold for phototherapy right?!

What labs do you want to get?

DAT was negative

CBC: Retic a bit elevated and Hgb 16

So now what are you thinking this is?

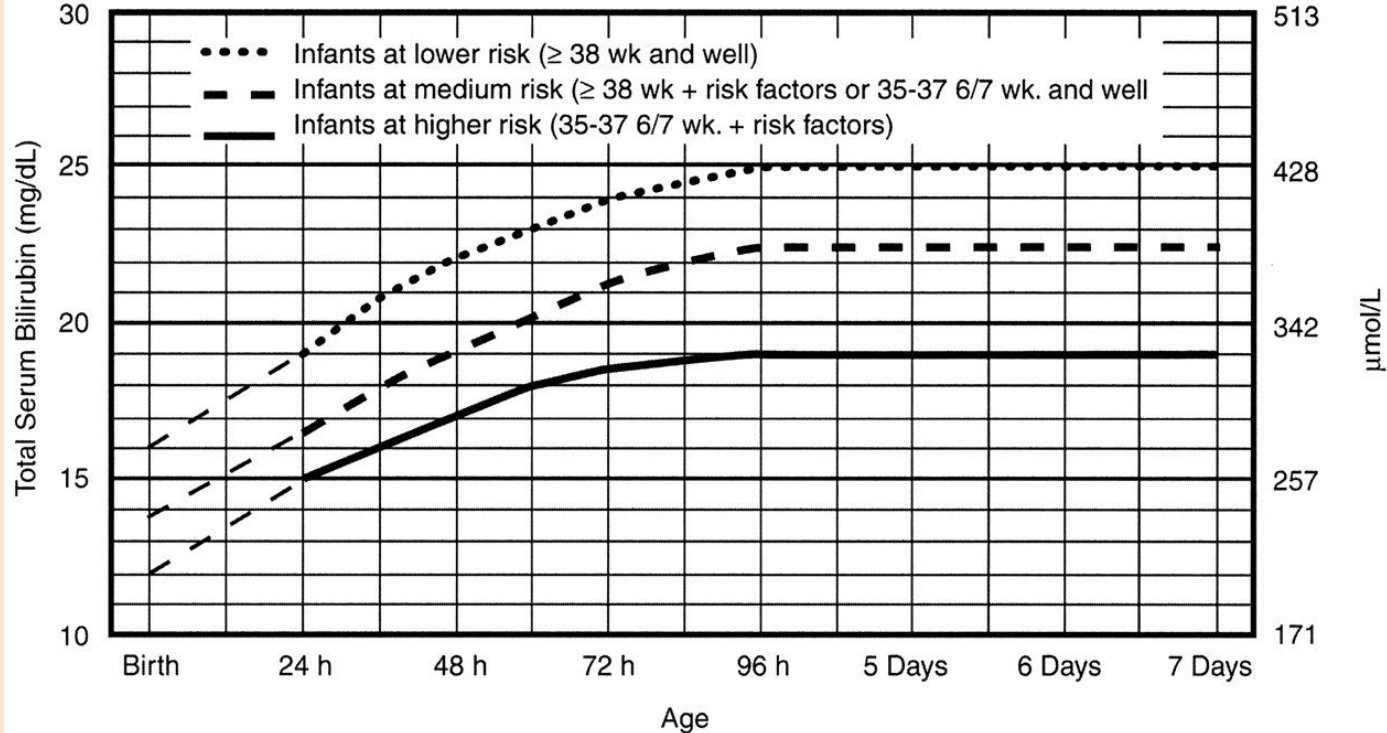
Perhaps baby has enzyme G6PD defect or membrane defect

Baby needs immediate intensive phototherapy

Check Bili every 4-6hr, under lights, make sure Bili is plateauing

Should we do an exchange transfusion?

Look at the exchange nomogram



- The dashed lines for the first 24 hours indicate uncertainty due to a wide range of clinical circumstances and a range of responses to phototherapy.
- Immediate exchange transfusion is recommended if infant shows signs of acute bilirubin encephalopathy (hypertonia, arching, retrocollis, opisthotonos, fever, high pitched cry) or if TSB is ≥ 5 mg/dL (85 $\mu\text{mol/L}$) above these lines.
- Risk factors - isoimmune hemolytic disease, G6PD deficiency, asphyxia, significant lethargy, temperature instability, sepsis, acidosis.
- Measure serum albumin and calculate B/A ratio (See legend)
- Use total bilirubin. Do not subtract direct reacting or conjugated bilirubin
- If infant is well and 35-37 6/7 wk (median risk) can individualize TSB levels for exchange based on actual gestational age.

Questions?

