Jaundice: Decoding the Data & Frontline Management

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Disclosures … Conflicts of Interest

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AAP.org

AMERICAN ACADEMY OF PEDIATRICS

CLINICAL PRACTICE GUIDELINE

Management of Hyperbilirubinemia in the Newborn Infant 35 or More Weeks of Gestation

Bhutani et al … from AAP Hyperbilirubinemia Guidelines

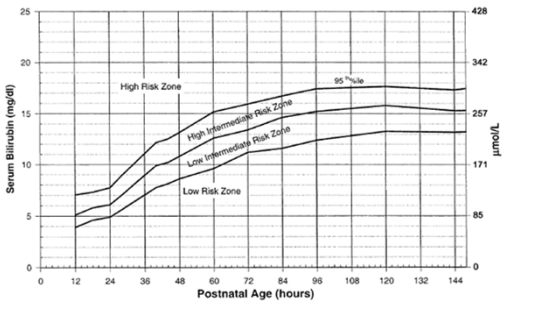


Fig 2. Nomogram for designation of risk in 2840 well newborns at 36 or more weeks' gestational age with birth weight of 2000 g or more or 35 or more weeks' gestational age and birth weight of 2500 g or more based on the hour-specific serum bilirubin values. The serum bilirubin level was obtained before discharge, and the zone in which the value fell predicted the likelihood of a subsequent bilirubin level exceeding the 95th percentile (high-risk zone) as shown in Appendix 1, Table 4. Used with permission from Bhutani et al.[73] See Appendix 1 for additional information about this nomogram, which should not be used to represent the natural history of neonatal hyperbilirubinemia.

Newborns …

- ALL babies are born with **EXTRA Red blood cells**
- It's how they get Oxygen when in momma

Rh Factor and Blood Group Incompatibility

- Rh Factor: Mom
  - Postive +
  - Negative –
    - Rhogam ~ 26 weeks
    - All Rh- Moms = 2nd dose of Rhogam
- Blood Types
  - A, B, AB, O
- ABO incompatibility
  - Common, generally mild type of hemolytic disease
  - Term hemolytic disease means: RBC's (red blood cells) broken down more quickly than usual
- Test Cord blood of all moms
  - blood group O and/or Rh -
  - Father either type A or B
  - If baby is type A or B
    - They will test positive in direct antiglobulin tests (DAT
    - Extra – Extra Red Blood Cells

AMERICAN ACADEMY OF PEDIATRICS CLINICAL PRACTICE GUIDELINE
Subcommittee on Hyperbilirubinemia ... Page 301
Management of Hyperbilirubinemia in the Newborn Infant 35 or More Weeks of Gestation

bilirubinemia in 19 of 61 (31.2%) infants who developed kernicterus.[5] (See Appendix 1 for additional information on G6PD deficiency.)

Risk Assessment Before Discharge

RECOMMENDATION 5.1: Before discharge, every newborn should be assessed for the risk of developing severe hyperbilirubinemia, and all nurseries should establish protocols for assessing this risk. Such assessment is particularly important in infants who are discharged before the age of 72 hours (evidence quality C: benefits exceed harms).

RECOMMENDATION 5.1.1: The AAP recommends 2 clinical options used individually or in combination for the systematic assessment of risk: predischarge measurement of the bilirubin level using TSB or TcB and/or assessment of clinical risk factors. Whether either or both options are used, appropriate follow-up after discharge is essential (evidence quality C: benefits exceed harms).

The best documented method for assessing the risk of subsequent hyperbilirubinemia is to measure the TSB or TcB level[25,31,35–38] and plot the results on a nomogram (Fig 2). A TSB level can be obtained at the time of the routine metabolic screen, thus obviating the need for an additional blood sample. Some authors have suggested that a TSB measurement should be part of the routine screening of all newborns.[5,31] An infant whose predischarge TSB is in the

TABLE 2. Risk Factors for Development of Severe Hyperbilirubinemia in Infants of 35 or More Weeks' Gestation (in Approximate Order of Importance)

Major risk factors
- Predischarge TSB or TcB level in the high-risk zone (Fig 2)[25,31]
- Jaundice observed in the first 24 h[35]
- Blood group incompatibility with positive direct antiglobulin test, other known hemolytic disease (eg, G6PD deficiency), elevated $ETCO_2$
- Gestational age 35–36 wk[36,40]
- Previous sibling received phototherapy[40,41]
- Cephalohematoma or significant bruising[39]
- Exclusive breastfeeding, particularly if nursing is not going well and weight loss is excessive[36,40]
- East Asian race[204]

Minor risk factors
- Predischarge TSB or TcB level in the high intermediate-risk zone[25,31]
- Gestational age 37–38 wk[36,40]
- Jaundice observed before discharge[40]
- Previous sibling with jaundice[40,41]
- Macrosomic infant of a diabetic mother[42,43]
- Maternal age ≥25 y[39]
- Male gender[36,40]

Decreased risk (these factors are associated with decreased risk of significant jaundice, listed in order of decreasing importance)
- TSB or TcB level in the low-risk zone (Fig 2)[25,31]
- Gestational age ≥41 wk[39]
- Exclusive bottle feeding[36,40]
- Black race[204]
- Discharge from hospital after 72 h[43,44]

* Race as defined by mother's description.

AMERICAN ACADEMY OF PEDIATRICS 301

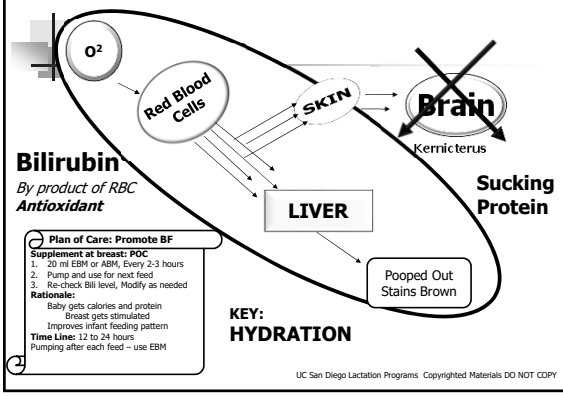
Jaundice

From Abnormal
Pathological Jaundice
To NORMAL
Physiologic Jaundice
To Abnormal
Starvation – Not Breastfeeding Enough Jaundice
To NORMAL
Breast Milk Jaundice

Jaundice in the Breastfed Infant

	Physiologic Jaundice (NORMAL)	Not Breastfeeding Enough or Non-Breastfeeding Jaundice Starvation	Breast Milk Jaundice	Pathologic Jaundice
Bilirubin Concentration	6.5-7.0 mg/dl by DOL 3 <1.5mg/dl by DOL 10	> 7.0 mg/dl DOL 3	May exceed 20mg/dl Usually diagnosed after 2 weeks	Visible Jaundice within 24 -36 hours > 12.5 mg/dl any time
Onset	DOL: 2-5	DOL: 3-6	DOL: 3-4 Diagnosis of Exclusion	Within first 36 hours of delivery
Etiology	Normal increased destruction of RBC	Not enough suckling for peristalsis Not enough colostrum (Protein) Decreased conjugation Decreased albumin binding Reabsorption of bilirubin from gut	May be normal Uncertain ? Excessive lipase at liver	Excessive production bilirubin Blood incompatibilities Hemolytic Disease Metabolic Disorder Birth Injury Premie
Treatment	Frequent feeding to promote peristalsis and elimination	Supplementation at breast Correct BF problems Phototherapy protocols	?? DC breastfeeding for 12-24 hours Occasional: Photo therapy	May need: Blood transfusion Phototherapy Medications

Traffic Jam at Liver



Plan of Care: Promote BF

Supplement at breast: POC
1. 20 ml EBM or ABM, Every 2-3 hours
2. Pump and use for next feed
3. Re-check Bili level, Modify as needed

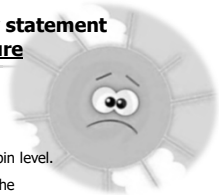
Rationale:
Baby gets calories and protein
Breast gets stimulated
Improves infant feeding pattern

Time Line: 12 to 24 hours
Pumping after each feed – use EBM

Key Questions: Review of process for clients

- **When baby was inside of mom – how did they get oxygen?**
  - Infant in-utero: oxygen carried by EXTRA red blood cells
- **After delivery how does baby get oxygen: infant converts to room air**
  - EXTRA red blood cells are sent to liver for breakdown (conjugation) and excretion
  - By-product of red blood cell destruction is "Bilirubin" (Antioxidant)
  - Bilirubin stains the "poop" brown as excreted
  - Suckling causes peristalsis of lower intestines and assists with excretion
  - Colostrum is high in protein which aids the liver breakdown of red blood cells
  - Without enough sucking (peristalsis) and protein (Colostrum) bilirubin reabsorbed by blood
    - Looks for another escape route
    - Goes to skin and then to brain
  - **NEED: POC – Rationale – Timeline**

AAP : Page 315 of Policy statement
Sunlight Exposure



"In their original description of phototherapy, Cremer et al demonstrated that exposure of newborns to sunlight would lower the serum bilirubin level.

Although sunlight provides sufficient irradiance in the 425- to 475-nm band to provide phototherapy, the practical difficulties involved in safely exposing a naked newborn to the sun either inside or outside (and avoiding sunburn) preclude the use of sunlight as a reliable therapeutic tool, and ***it therefore is not recommended."***

Cremer RJ, Perryman PW, Richards DH. Influence of light on the hyperbilirubinemia of infants ... ***Lancet. 1958;1(7030):1094–1097***

http://www.med.stanford.edu/news/all-news/2015/09/filtered-sunlight-a-safe-low-tech-treatment-for-jaundice.html

2015

First Question ?

How old is the baby?

Types of Jaundice:
Physiologic Jaundice

- **NORMAL**
- Normal breakdown of extra red blood cells needed by fetus
  - Not needed now infant breathing oxygen
- Not an immature liver unless infant is premie or immature
- May have antioxidant effect
- Peaks at about day 2-5
- Excretion facilitated by suckling (peristalsis) and protein (Colostrum)
- ***Prevention*** from becoming "Not BF enough jaundice"
  - Early and continuous access to breast by infant
  - Feeding 10+ times in 24hr
  - Signs of Milk Transfer
  - Assistance to dyad
  - Education of clients
- Role of ethnicity
  - Higher normal levels
    - All ***EXCEPT*** northern European decent

Kernicterus

- Kernicterus: Greek "kern" or kernal plus "icterus" or yellow
- Kernicterus: Form of brain damage caused by excessive jaundice
  - Bilirubin is so high that it moves out of blood into brain tissue
- Symptoms:
  - Excessively lethargic
  - Too sleepy and difficult to arouse
    - Either don't wake up easily like a normal baby, or don't wake up fully, or can't be kept awake
  - High-pitched cry
  - Decreased muscle tone (becoming hypotonic or floppy)
    - Episodes of increased muscle tone (hypertonic) and arching of head and back
  - As damage continues may:
    - Develop fever
    - Arch their heads back into contorted position known as opisthotonus or retrocollis
- Kernicterus is fortunately a very rare occurrence.

Kernicterus

- Clinically, classic kernicterus involves:
  - 1) specific movement disorder
  - 2) hearing loss or deafness
  - 3) impairment of eye movements especially upward gaze
  - 4) abnormal staining of the enamel of baby teeth
- Classic in kernicterus is "Athetoid" form of cerebral palsy
  - Athetosis refers to:
    - Slow, writhing involuntary movements that occur
- Dystonia: abnormal muscle tone and position
- Some are deaf, some have normal hearing, and some with or without deafness have an auditory processing problem now called auditory neuropathy or auditory dys-synchrony.
  - Auditory brainstem response (ABR) testing (BAEP or BAER) is often abnormal
  - Other "hearing" tests, such as otoacoustic emissions (OAEs) and cochlear microphonic responses can be normal

Case: What Type of Jaundice

- **NORMAL** - DOL = 21 days
- Birth weight = 7lb 6oz
- Today Weight = 8lb 15oz
  (25 oz in 7 days)
- Today's Bilirubin = **9**

What else do you want to know?

- **Voids/Stools = 6-8/day & 1-2/day**
- **Eats 10 or more times in 24 hours**
- **Ethnicity: Asian**
- **Skin tone: Excellent Reflexes : Normal**

Case: Physicians Order

- Admit infant to pediatrics
- Place under bili lights
- Do not start IV
- Give ABM for 24 hours
- Have MOB pump and store milk
- Recheck Bili level in 12 hours
- Resume Breastfeeding when bilirubin starts downward trend

Types of Jaundice: Breast Milk Jaundice

- **History**
  - Disease 1962
  - Syndrome 1980
  - **Normal** 1991
- Definition: Probably extension of Physiologic Jaundice
- Onset:
  - Identified about 2 week pediatric visit
  - **"Diagnosis of exclusion"**
- Characteristics
  - ***Normal thriving BF infant***
  - Familiar
  - Prolonged with gradual decline
- **Treatment**
  - **Watchful Waiting!!!**
  - Occasional
    - DC breastfeeding and breast milk for 12 to 24 hours
    - Give ABM (Artificial Baby Milk) for 12 to 24 hours
    - Mom pumps and saves milk
    - Resume breastfeeding
  - "Bili" lights – Photo Therapy
    - May reduce bilirubin level

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Jan 2012

HOW COULD BILIRUBIN BE GOOD FOR YOU?

- **Adults with Gilbert's Syndrome**
  (Chronic Unconjugated Hyperbilirubinemia):
  - **Five-fold reduction in ischemic heart disease**
    - Vitck et al. Atherosclerosis 2002;160:449-456
  - **Reduced risk of coronary artery disease**
    - Schwertner HA et al. Clin Chem 1994;40:18-23
    - Hopkins PN et al. Arterioschl Thromb Vasc Biol 1996;16:250-255
    - Djoussc L et al. Am J Cardiol 200;87:1196-2000
  - **Reduced cancer mortality (Belgium)**
    - Temme EH. Cancer Causes Control 2001;12:887-894

Feeding Practices …

Bilirubin levels correlate inversely with number of feedings over first 3 days

DeCarvalho M, Klaus MH, Merkatz RB, *Frequency of breastfeeding and serum bilirubin concentration*, Am J Dis Child. 1982 Aug;136(8)737-8

Average Number Feeds per Day	Day 3Bilirubin Level
6	11
6.8	9.3 ± 3.5
10.1	6.5 ± 4.0
12	5

AAP Basis for recommendation for feeding 8-12 X in 24 hours
2014 Recommendation is feed 10 or more times in 24 hours

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Onset	DOL: 2-4	DOL: 2-6	DOL: 3-4	≤36 hours of delivery
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