

Post Intensive and Home Care for Prior Premature Infant



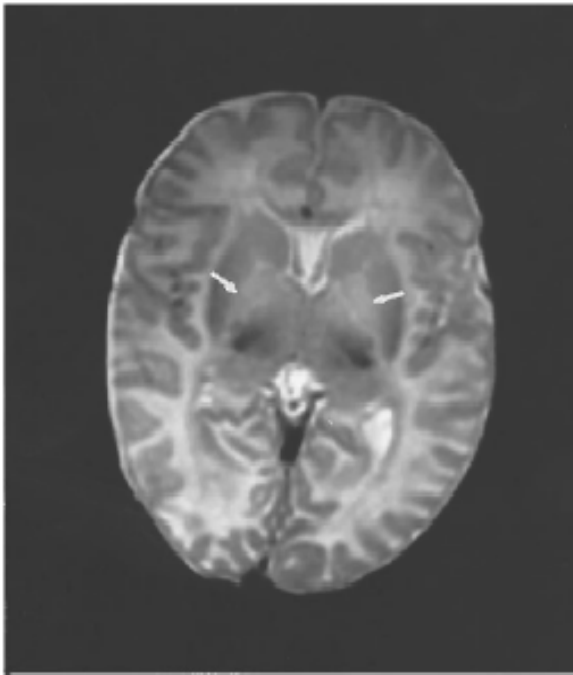
Edward Lawson

Problems of Late Pre-term Infant

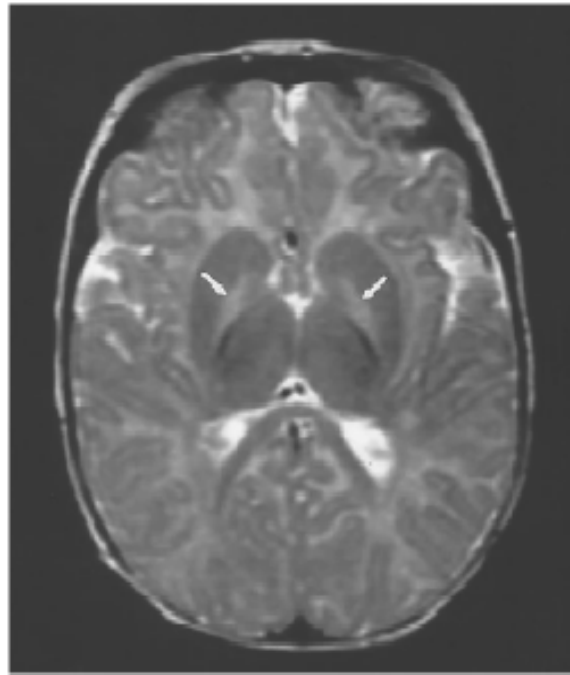
- 34-37 week LBW infants
- Issues often overlooked
 - Sepsis
 - Cold stress
 - Hypoglycemia and undernutrition
 - Apnea and bradycardia
 - Jaundice
- Care given in non-intensive units, early discharge
- Underappreciated, at risk population

Jaundice / Kernicterus

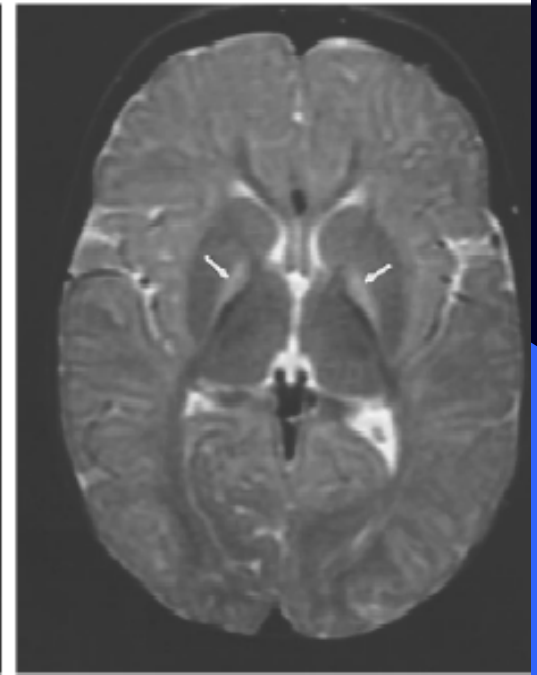
MRI of Kernicterus



A



B



C

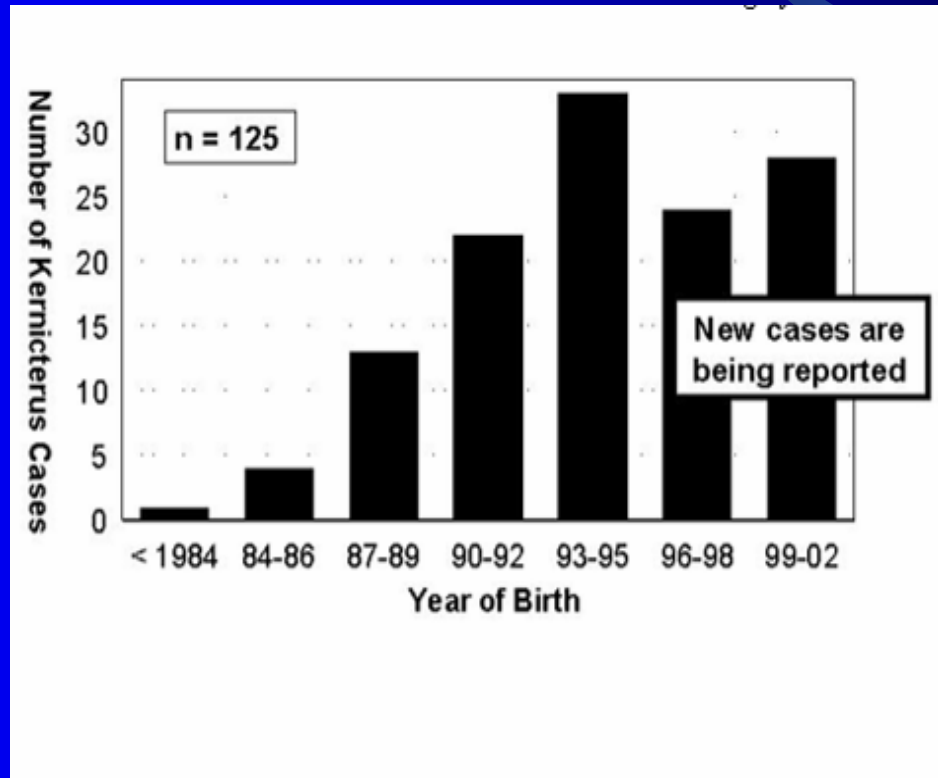
18 Days

6 months

1 year

Report of kernicterus

Buthani et al, Neoreviews



Kernicterus: Sentinel Event



Joint Commission

on Accreditation of Healthcare Organizations

Sentinel Event Alert • Issue 18 - April 2001

Sentinel Event **ALERT**

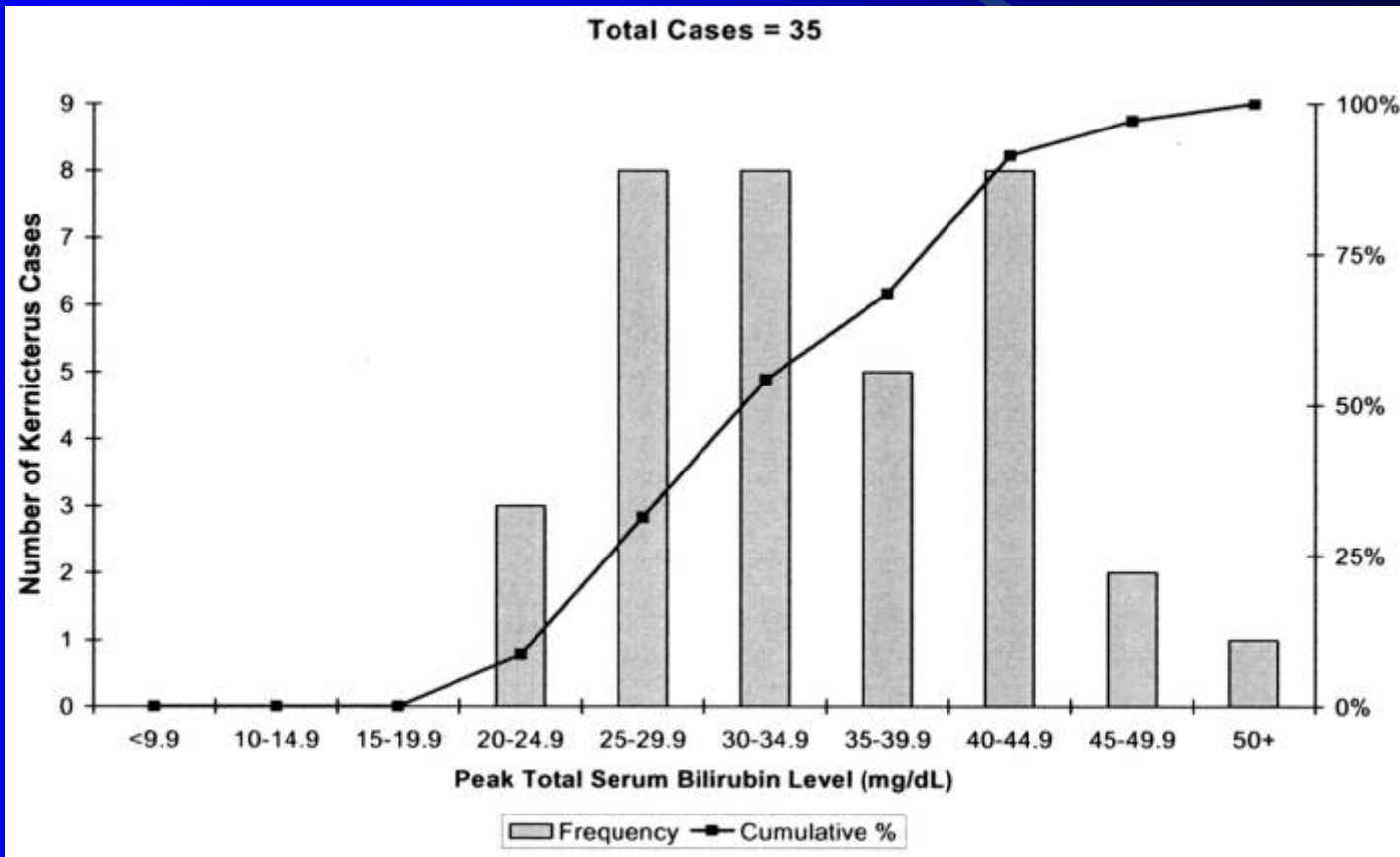
Kernicterus threatens healthy newborns

Kernicterus is a condition of newborns that leads to severely disabling brain damage or death. It results from hyperbilirubinemia that can be caused by a number of factors. Kernicterus is preventable with techniques currently available. Nevertheless, in recent years cases of kernicterus have continued to be reported. One registry includes 90 cases in the United States from 1984 to the present in which three of the newborns died and all others sustained brain damage.¹ "This is probably happening more than clinicians know about," says **Sue Sheridan**, spokesperson for the advocacy, educational and support group **PICK**, Parents of Infants and Children with Kernicterus. "With these recent cases, risk assessments were inadequate and unreliable, and bilirubin levels were not measured--or measured in time." PICK has been instrumental in drawing attention to the reemergence of kernicterus and its prevention.

Major Risk Factors for Kernicterus

- Idiopathic hyperbilirubinemia represented a major risk factor ~30%.
- The additional 19 cases of G6PD deficiency falls also in the idiopathic group (total 60%) because of absence of universal neonatal screening in the US.

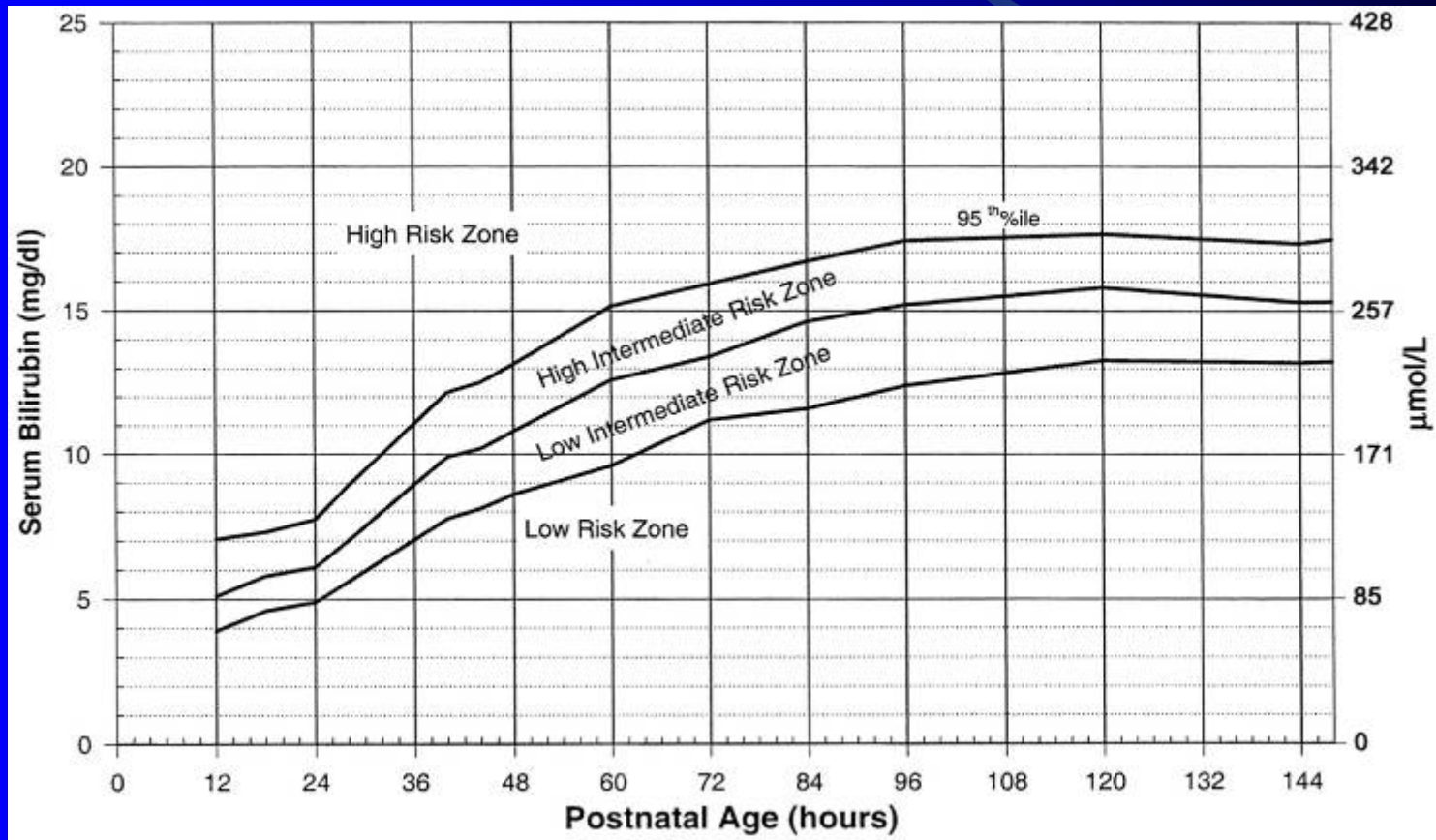
Bilirubin Levels with Idiopathic Kernicterus



Readmissions for Hyperbilirubinemia

- 11 infants over 4 years in population of 111,000 infants (Newman, Pediatrics)
- All less than 40 weeks, 4 less than 37 weeks
- 7/11 breastfed
- 2 with hemolytic disease
- 3 cases of inadequate follow up
- 5 infants required exchange transfusion

Prediction of Risk of Hyperbilirubinemia: “Bhutani”



Prediction of Risk of Severe Hyperbilirubinemia

- Bhutani Pediatrics 103(1)1999: 13000 term infants with direct Coombs negative. Measurement of bilirubin at time of metabolic screen, then within 24-48 hours post discharge and as needed thereafter.
- 6% had TSB >95th percentile. 40% stayed in that zone.
- 32% had TSB in the intermediary zone. 6.4% moved in the high risk zone.
- 62% were in the low risk zone less than 40th percentile. 0% moved in the high risk zone.

Visual Estimate of Jaundice

Engle Pediatrics 110 2002

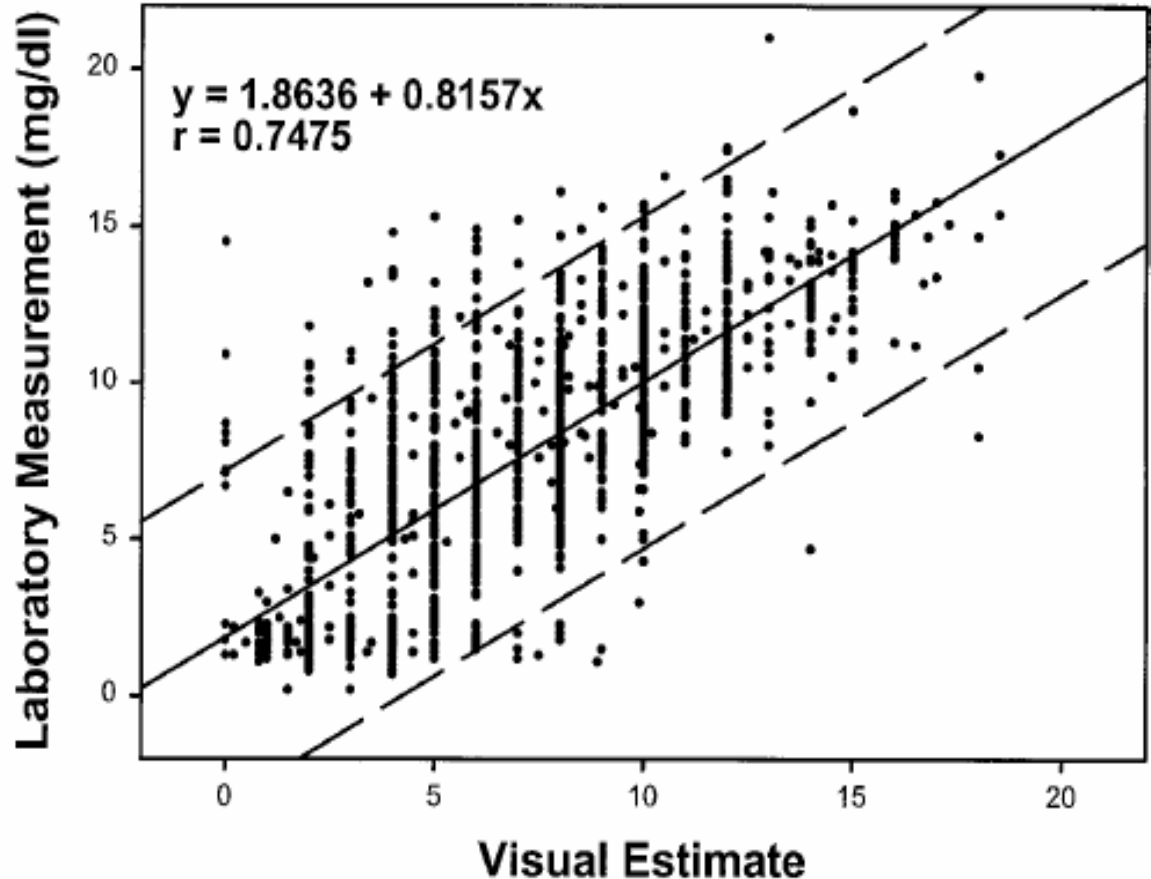
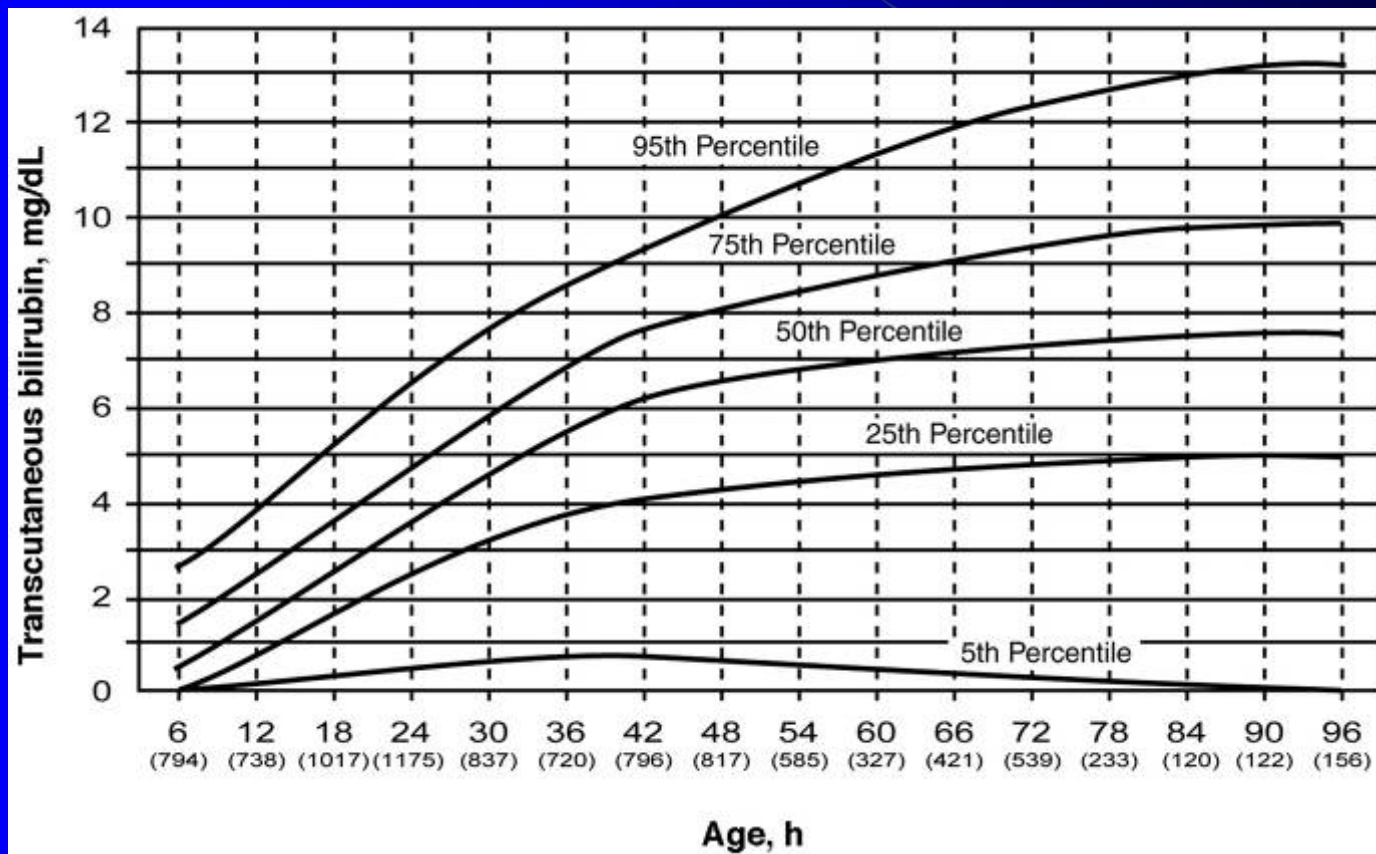


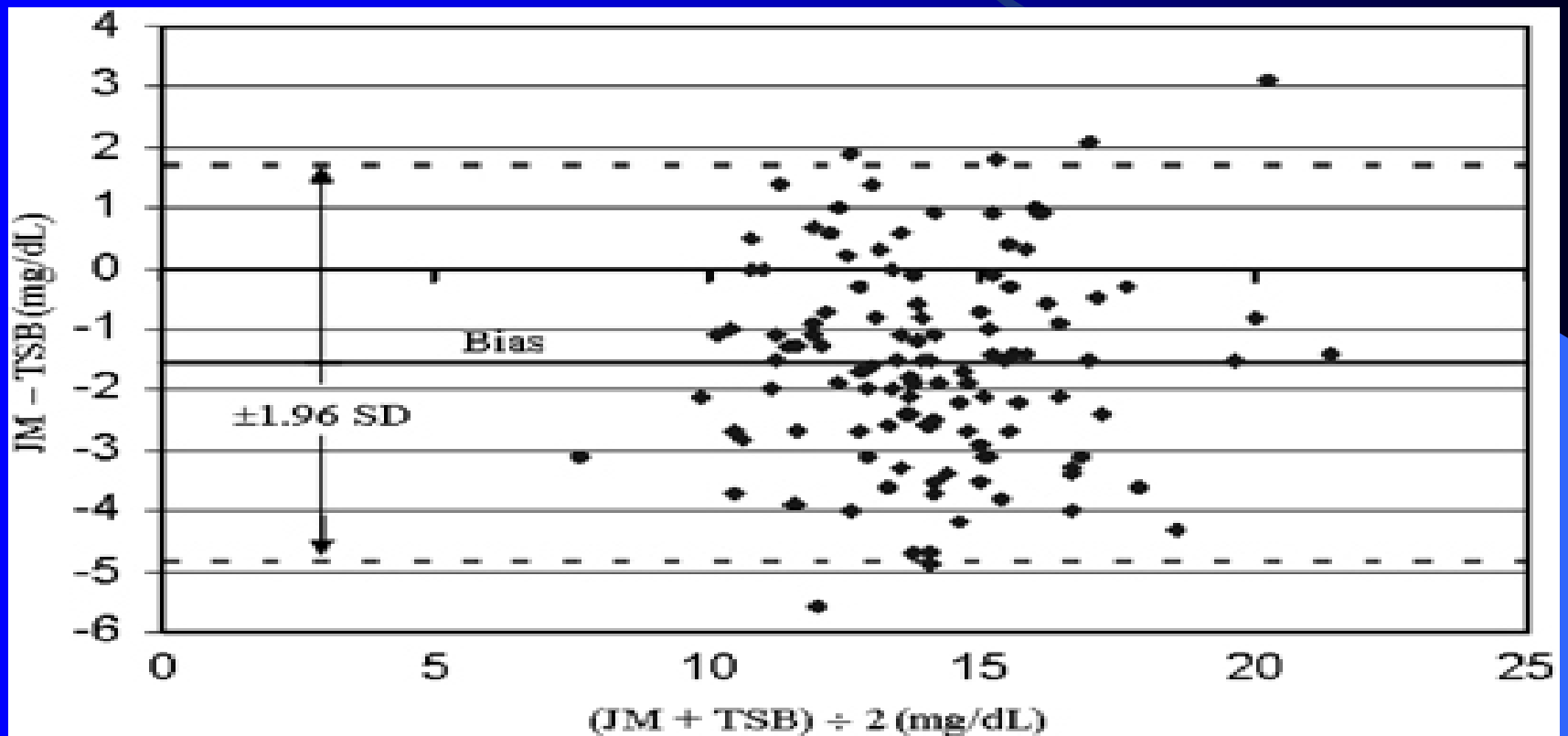
Fig 2. The relationship of the visual estimate of bilirubin ("how jaundiced?") to the laboratory analysis of total bilirubin. The 95% confidence bands for predicting a single observation are represented by the broken lines around the regression line. $N = 1470$ separate measurements in 851 patients.

Prediction of Risk of Hyperbilirubinemia: "TcB"



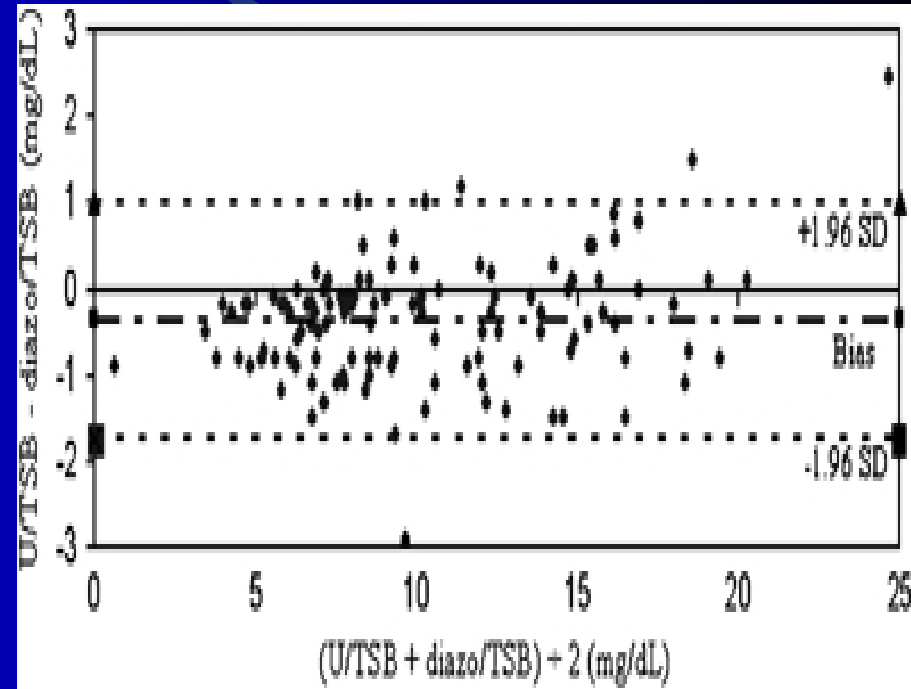
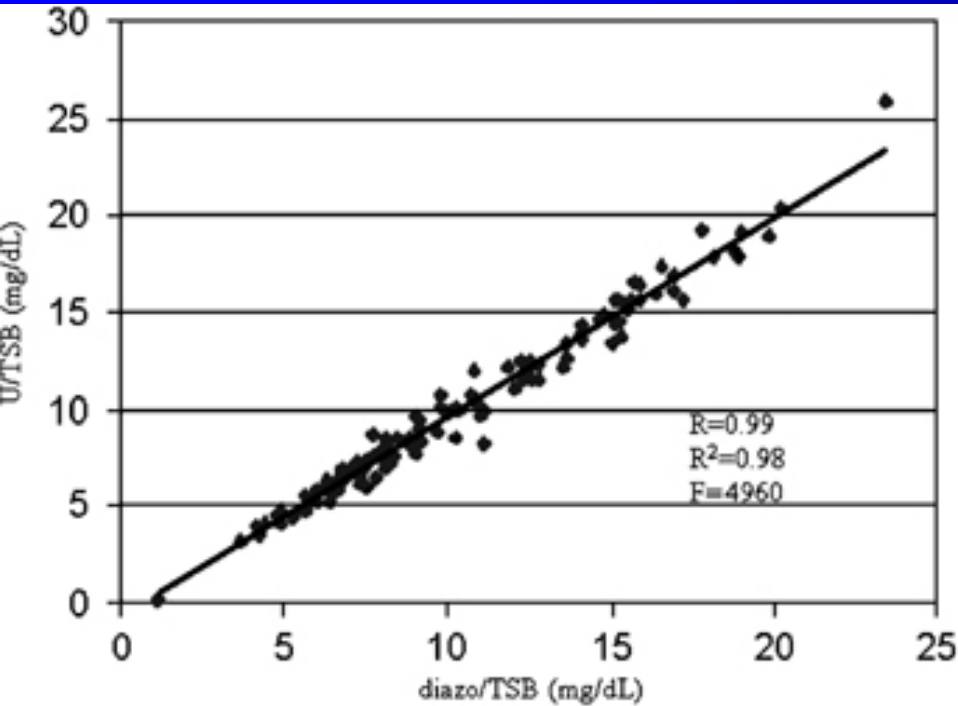
Maisels, M. J. et al. Pediatrics 2006;117:1169-1173

TcB v TSB: Post Discharge Term and Near-Term



Engle J Perinatol 2005

TSB: POC v laboratory



Conclusions: 2004 AAP Guidelines

- Promote and support successful breastfeeding.
- Establish nursery protocols for the identification and evaluation of hyperbilirubinemia.
- Measure the total serum bilirubin or transcutaneous bilirubin level on infants jaundiced in the first 24 hours.

Conclusions (Cont)

- Visual estimation of jaundice leads to errors, particularly in pigmented infants.
- Interpret all bilirubin levels according to the infant's age in hours.
- Infants <38 weeks' gestation, particularly breastfed, are at higher risk of developing hyperbilirubinemia and require closer surveillance and monitoring.

Conclusions (Cont)

- Systematic assessment of all infants before discharge for the risk of severe hyperbilirubinemia
- Provide parents with written and verbal information about newborn jaundice.
- Provide appropriate follow-up based on the time of discharge and the risk assessment.
- Treat newborns, when indicated, with phototherapy or exchange transfusion.

Nutrition of the Prior Preterm

Top Ten Reasons Why I'd Rather Breast Feed...



GLASBERGEN

David Letterman, nine months old.

Breastfeeding the Newborn

Top Ten Reasons

- 4 Encourages bonding
- 3 Prevents Infection - NEC, Otitis media
- 2 Nutritional advantages
- 1 **THE MOST IMPORTANT REASON IS -**

Long-term Outcomes

- Length of breast feeding correlates with cognitive outcome (Rogan Early Human Dev 1993)
 - Even high school performance (reading math) may be improved (Horwood Pediatrics 1998)
 - Many factors (SES, Mo. Educ, etc) but meta-analysis HM feeding is most significant - AJCN, 1999
- Mechanism - Fatty acid content of docosahexanoic acid in human milk appears to correlate with improved visual function (Uauy)

Breastfeeding the Premature

Need for Fortification

	Optimal 1.5-2 kg	Human Milk	Enfamil Premature	HM + Sim HMF
Protein (gm)	3	2.2	3	3
Sodium (mg)	2.4	1.8	2.4	2.4
Calcium (mg)	148	42	165	159
Phosphorus (mg)	102	21	83	88

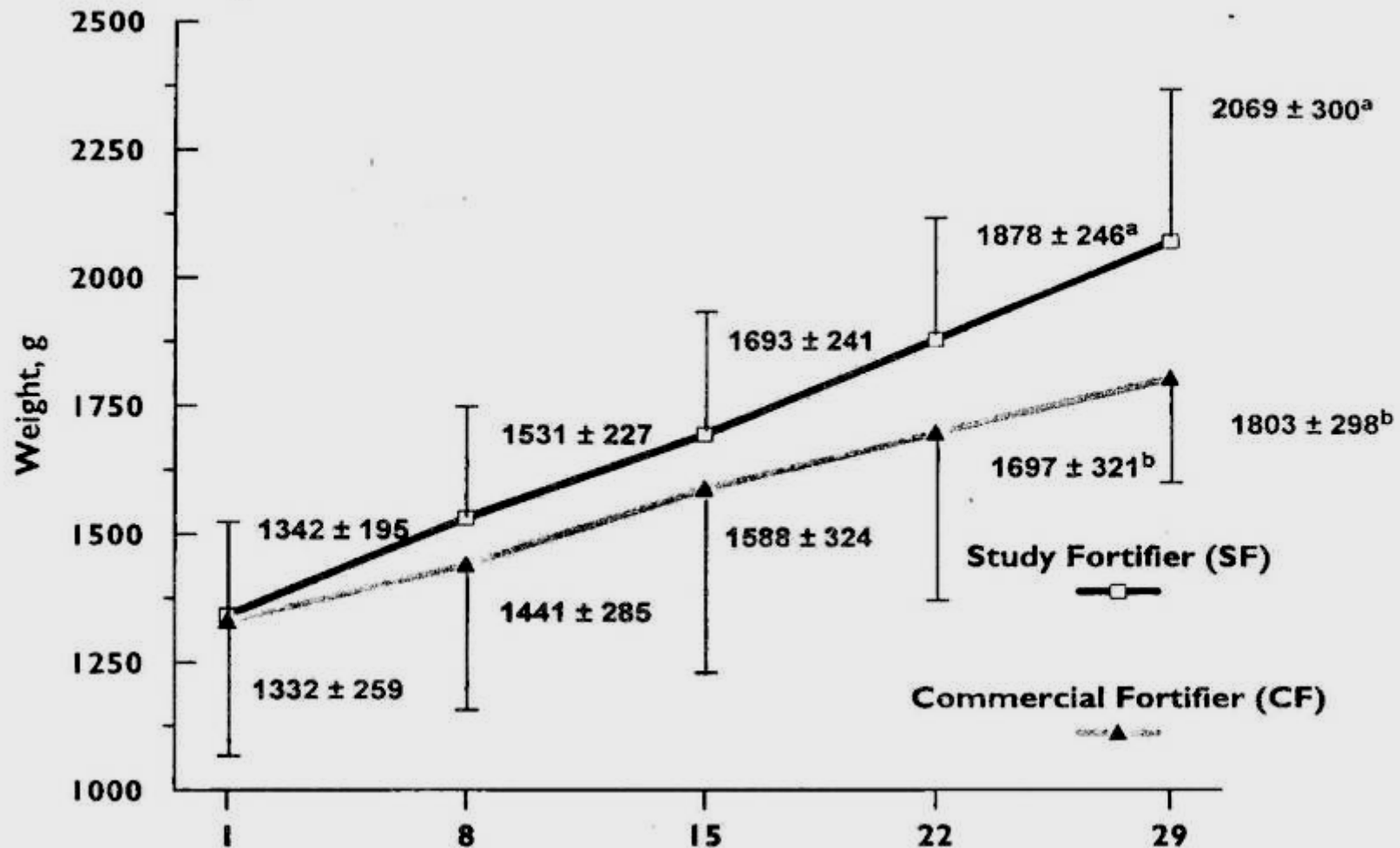
Expressed as per 100 kcal

Breastfeeding the Premature In-Hospital Fortification

- Proven nutrient supplementation needs
 - Increase protein content (relative to energy)
 - Increase Ca, P, Na content
 - Increase other minerals and vitamins
- Results of HMF usage
 - Increased wt gain, length velocity, head circumference, bone mineral content
 - Reduced hospital length of stay

Higher Protein Supplement to HMF

Reis et al Pediatrics 106 (3), 2000



Breastfeeding the Premature In-Hospital Fortification

- Fortification with HMF now AAP Policy
- Pediatric Nutrition Handbook
 - Feed prior preterm infant preterm formulas at discharge rather than full term formulas
 - JHH recommends use of 22 calorie formulas at discharge
- ? What to feed the infant being breast fed
- ? When to terminate

Breastfeeding the Premature Discharge

Hill et al JOGNN 26:189

Mode of Feeding	LBW Full Term	LBW 34-37wk	LBW 30-34 Wk
At Breast	53%	37%	20%
Breast + EMM	10%	5%	15%
EMM (bottle)	0%	7%	20%
Breast + Formula	30%	38%	35%

Breastfeeding the Premature Need for Fortification Discharge

- 180 infants with BW <1250 gm
- Transitional formula (22 cal) supplementing human milk started before discharge results in improved growth after discharge at 3 months (weight) and 18 months (length)

Breastfeeding the Premature Need for Fortification Discharge

	Optimal 2.5 kg	Human Milk	HM + Enfacare 24
Protein (gm)	2.7	2.0	2.7
Calcium (mg)	83	60	90
Phosphorus (mg)	42	30	48

Expressed as per 100 kcal

Breastfeeding the Premature Need for Fortification Discharge

- 24 Calorie supplement
 - 1/2 tsp packed EnfaCare[®] (or Neosure[®]) powder to 45 ml breast milk
 - Could use human milk fortifier (Ross or M-J) but expense is factor (?iron issue)
- Encourage mother >50% BF to increase supplements to 27 calorie (1 tsp / 45 ml)

Breastfeeding the Premature Discharge

- Variability of breast milk
 - fore vs hind milk
 - premature vs term milk
- Three ways to adjust supplements
 - fortify blindly to assure adequacy for all
 - analyze milk periodically and adjust fortification selectively
 - use infant's response as indicator - BUN, weight

Breastfeeding the Premature

Follow-up - Goals

- Nutritional assessment (4 weeks post discharge)
 - Biochemical - BUN, prealbumin (transthyretin), alkaline phosphatase, Ca, PO₄, CBC
 - Physical Growth Action levels
 - Weight gain <25 gm/d
 - Length velocity < 1cm/wk
 - Head Circumference <0.5 cm/wk
- Assessment not okay - explore means to increase

Breastfeeding the Premature Discharge

- Adequacy of feedings - what, how and how much
 - home weighing
 - assess growth in office shortly after discharge
 - early intervention if growth falters
- At one month do nutritional assessment
- Discontinue at 2500 gm (some suggest 9 month)

