

Decreasing the Risk for Severe Hyperbilirubinemia in Newborns

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SCHOOL OF NURSING



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School of Nursing

Learning Objectives

- 1. Discuss interventions to decrease hyperbilirubinemia in newborns
 - 2. Identify outcomes to measure effectiveness of interventions to decrease hyperbilirubinemia in newborns
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Objectives of this Project

- To determine if the use of educational interventions with medical providers, in combination with a management tool for using clinical guidelines would:
 - 1) increase compliance with published guidelines
 - 2) decrease hospital readmissions secondary to hyperbilirubinemia in the first week of life.
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Background Hyperbilirubinemia

- ~20% of newborns will exhibit hyperbilirubinemia (SB > 12 mgDL or higher)
 - True incidence of kernicterus is unknown
 - Estimates using 2010 birthrates
 - > 20 - 84,954
 - > 25 - 6,372
 - > 30 - 425
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Background

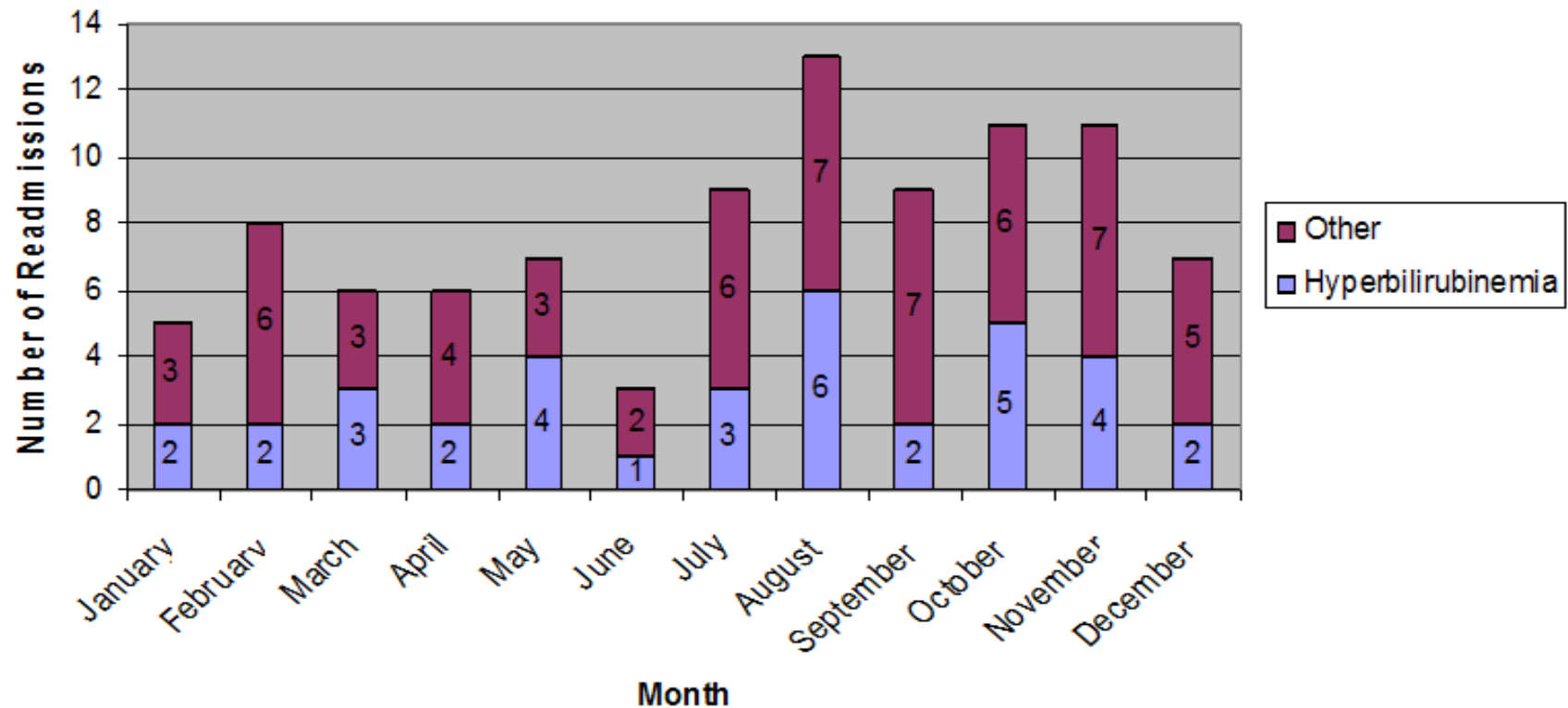
- Increased risk
 - “early” discharge
 - Late pre-term birth rate
 - Increase in breastfeeding in the U.S.
 - Bed space
 - USPTF (2010) Insufficient evidence for screening and treatment prevents bilirubin encephalopathy
 - AAP Guidelines (2004)
 - treatment prevents bilirubin levels from rising
 - Phototherapy (hospital and home)
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Background

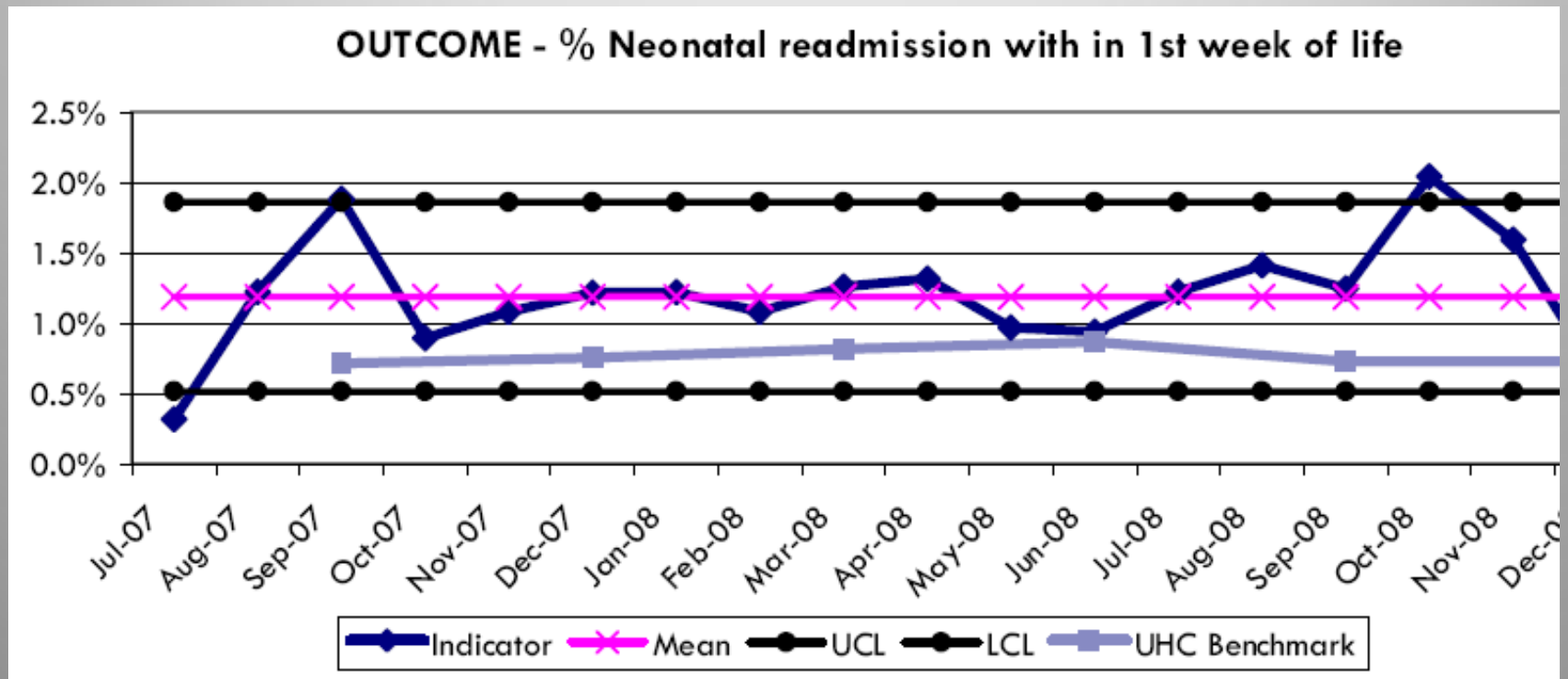
- Bilirubin screening before discharge
 - Studies have demonstrated decreased readmissions for hyperbilirubinemia
 - Eggert et al., 2006; Aklalay et al. 2010; Mah et al., 2010
-

The Problem

Readmissions in the First Week of Life of Patients Discharged from the NBN in 2008



Reportable Quality Issue



Defining the Priorities

- The Model of Performance Improvement
 - Stakeholders
 - pediatricians, a nurse practitioner (*Newborn Nursery Medical Director, opinion leader and champion*), Newborn Nursery (NN) staff nurses and the North Carolina Children's Hospital (NCCH) pediatric residents, quality improvement professionals and lactation consultants
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Safe and Healthy Beginnings Project (SHB)

- 1) Assessment of risk for severe hyperbilirubinemia prior to discharge
- 2) breastfeeding support
- 3) coordination with primary care



http://www.aap.org/qualityimprovement/quiin/SHB_EvaluationProject.html

Newborn Nursery Chart Review Tool

- Priority Problems

- 70-75% of newborns discharged before 72 hours of age had a documented plan for follow up within 2 days

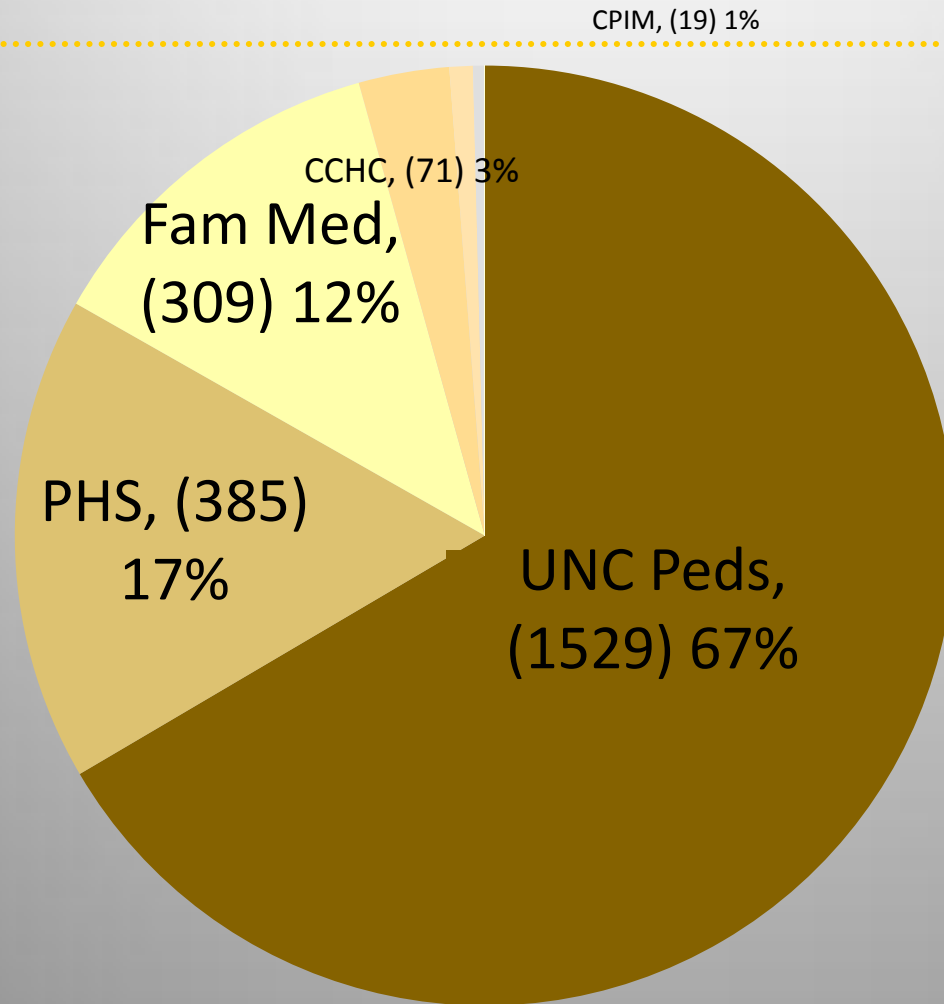
Chart review of all infants hospitalized with dx hyperbilirubinemia in 2008

- 36 percent of hospitalized infants had follow up appointments documented in the medical record upon initial discharge from the nursery
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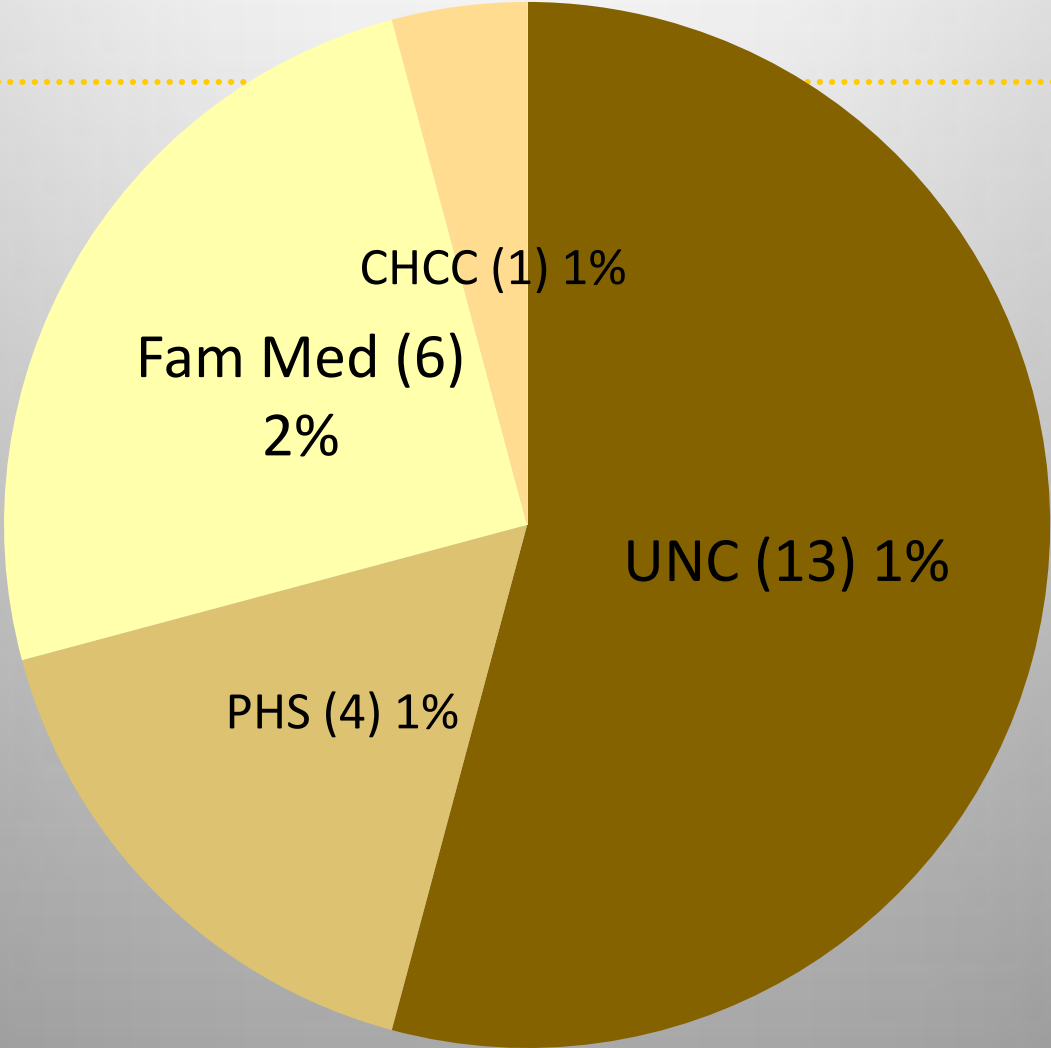
Design

- pre- post-intervention design
 - Educational Intervention
 - Adapted “Assessment of Risk for Severe Hyperbilirubinemia” tool for clinicians (QuINN, 2009)
 - http://practice.aap.org/public/Hyperbilirubinemia_SAMPLE.pdf
-

Total Admissions to UNC Newborn Nursery 2009 (until 9/20/2009)



Admissions 2009 for Hyperbilirubinemia



Educational Intervention

- Each group was provided with information on current management practices based on infants readmitted in first 8 months of 2009
- ARSH tool was retrospectively applied to all infants readmitted so far that year and compared to current AAP guidelines
- Instructed on use of the tool

Educational Intervention

- 64% of the providers received f2f intervention
 - PNP in one group saw 57% of the patients
 - PNP in one group saw 38% of the patients
 - others received it the presentation and tool by email.
 - The tool was laminated and available in the newborn nursery for use by all.
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Adapted SHB PARH tool

Step 1. Identify Risk Factors

Risk Factors for Development of Severe Hyperbilirubinemia^a

Risk Factors	Major Risk	Minor Risk	Decreased Risk
Gestational age	<input type="checkbox"/> 35–36 wk	<input type="checkbox"/> 37–38 wk	<input type="checkbox"/> ≥41 wk
Predischarge TSB/TcB	<input type="checkbox"/> >95th Percentile	<input type="checkbox"/> >75th–95th Percentile	<input type="checkbox"/> <40th Percentile
Visible jaundice	<input type="checkbox"/> First 24 h	<input type="checkbox"/> Before discharge	
Feeding	<input type="checkbox"/> Exclusive breastfeeding (1 risk if poor feeder or 1 weight loss ^b)	<input type="checkbox"/> Breastfed, nursing well	<input type="checkbox"/> Exclusive formula feeding
Previous sibling	<input type="checkbox"/> Received phototherapy	<input type="checkbox"/> Jaundiced, no phototherapy	
Blood groups Hemolytic disease	<input type="checkbox"/> Blood group incompatibility + DAT Other hemolytic disease (eg, G6PD)		
Race	<input type="checkbox"/> East Asian	<input type="checkbox"/> Latina/Latino	<input type="checkbox"/> African American unless G6PD deficiency (12%)
Other factors	<input type="checkbox"/> Cephalohematoma, significant bruising, or vacuum delivery	<input type="checkbox"/> LGA newborn, male, maternal, age ≥25 y, oxytocin in labor	<input type="checkbox"/> Discharged from hospital after 72 h

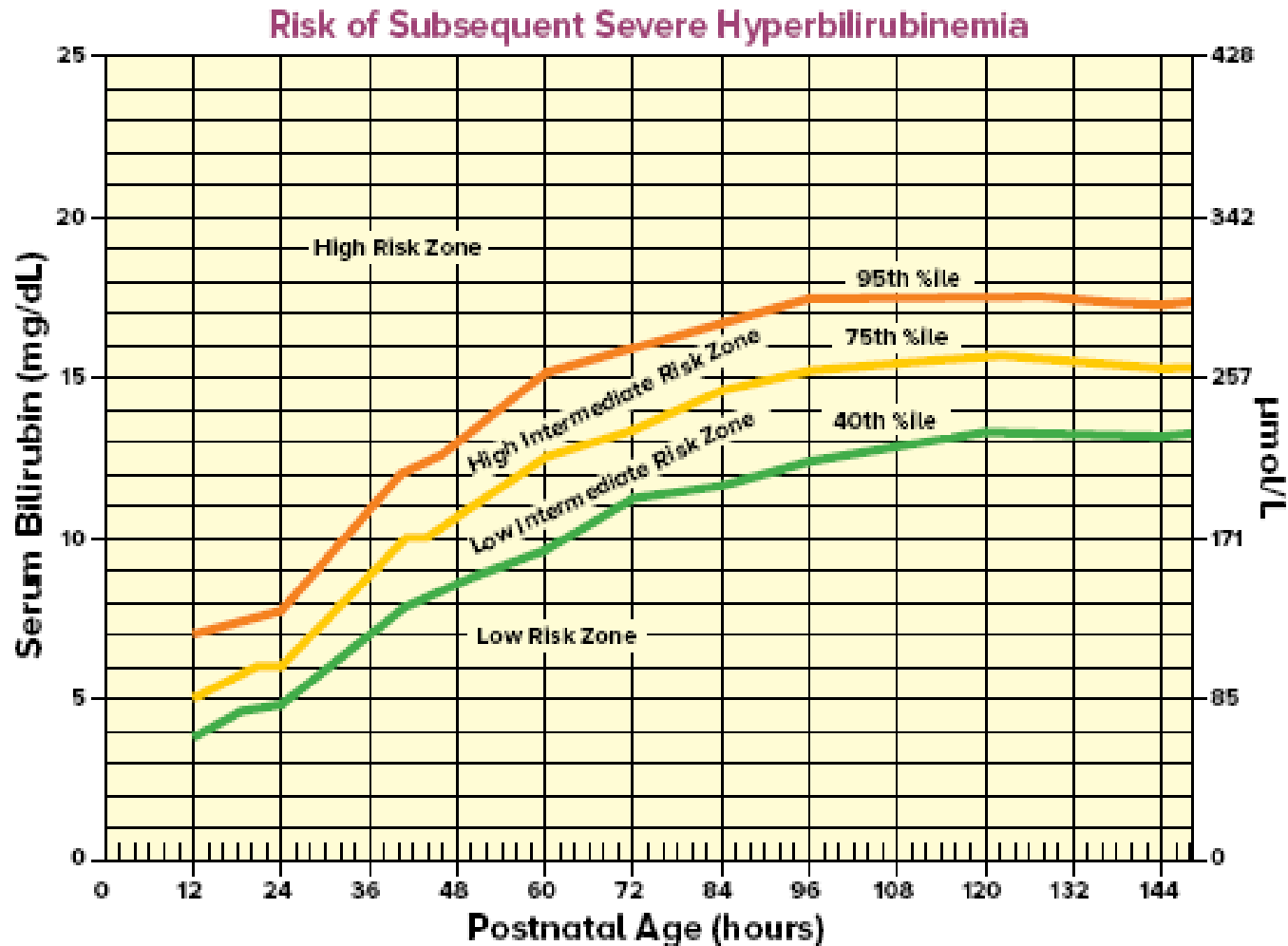
TSB, total serum bilirubin; TcB, transcutaneous bilirubin; DAT, direct antiglobulin test; G6PD, glucose-6-phosphate dehydrogenase; LGA, large for gestational age.

The risk factors highlighted in yellow are those most predictive for subsequent hyperbilirubinemia.

^aThe more risk factors present, the greater the risk of developing severe hyperbilirubinemia.

^bWeight loss of more than 7% to 10% in a breastfeeding newborn requires assessment and plan.

Step 2: Assess for jaundice using Tcb by 24 h age



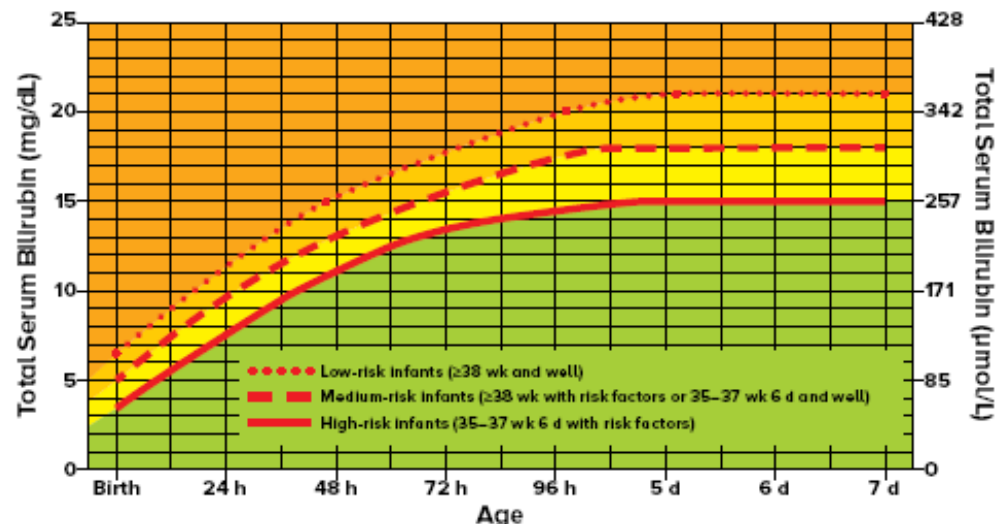
Step 3:

- Follow up appointment with primary care provider in 24 hours if in high risk zone

In 1-2 days if NOT in low risk zone

Step 4: Determine if infant needs phototherapy

Phototherapy Guidelines for Newborns 35 or More Weeks of Gestation



Source: Maisels MJ, McDonagh AF. Phototherapy for neonatal jaundice. *NEngl J Med.* 2008;358:920–928

- These guidelines are based on limited evidence.
- Guidelines refer to use of *intensive* phototherapy, which is the use of high levels of irradiance in the 430- to 490-nm band (usually $30 \mu\text{W}/\text{cm}^2$ per nm or higher) delivered to as much of the newborn's surface area as possible.
- Use *total bilirubin*. Do not subtract direct reacting or conjugated bilirubin.
- Risk factors referred to in the graph key indicate specific risk factors that increase the likelihood of brain damage at different bilirubin levels. These risk factors include isoimmune hemolytic disease, glucose-6-phosphate dehydrogenase deficiency, asphyxia, respiratory distress, significant lethargy, temperature instability, sepsis, acidosis, or albumin less than 3.0 g/dL (if measured).
- For well babies born between 35 and 36 6/7 weeks, you can adjust total serum bilirubin (TSB) levels for intervention around the medium risk line. It is an option to intervene at lower TSB levels for newborns closer to 35 weeks and at higher TSB levels for those closer to 37 6/7 weeks.
- It is an option to provide phototherapy in the hospital or at home at TSB levels 2 to 3 mg/dL below those shown, but *home phototherapy should not be used in any newborn with risk factors listed herein.*

Remember: In healthy term newborns, home phototherapy is an inexpensive option that might prevent an extended newborn stay or readmission in the first week of life

Adapted from:



American Academy
of Pediatrics



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Outcome Measures

- Two separate assessments
- Two separate samples
- Quality Indicators using the SHB Chart review tool
- Compliance with medical management based on the use of the tool

All newborns admitted to and discharged from UNC NN
12 month period
(May 1, 2009-April 31, 2010)
N=3519

10 month period
N = 2931

4 month period
N = 1132

Total infant readmitted with a
diagnosis of hyperbilirubinemia
N = 30
0.85%

Quality Indicator Sample (1)
N = 240
8.2%

Compliance Sample (2)
N = 244
21.6%

Quality Indicator Sample

- SHB Chart Review tool
 - 16 questions/indicators of care supportive of decreasing risk for severe hyperbilirubinemia
 - Examples
 - Jaundice assessment
 - Is there documentation that risk for severe hyperbilirubinemia was assessed?
 - Was infant discharged before 72 hours of life
-

SHB Chart Review tool

– Care Coordination

- For infants discharge < 72 h age
- Is there documentation of a plan for f/u that includes infant being seen by a licensed hcp within 2 days of discharge?

– Breastfeeding support

- That mother was counseled to breastfeed at least 8-12 times/day
 - Infant fed exclusively mother's milk without supplementation
-

Compliance Sample Measures

- Assessment of Risk factors
 - Evaluation of risk (risk zone) based on bilirubin level
 - Appropriateness of follow up based on risk zone
 - Was phototherapy indicated and given or not
-

Readmission Sample

- Any infant readmitted to the NCCH with primary diagnosis of hyperbilirubinemia
 - 12 months (6 before and 6 after the educational intervention)
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Analysis

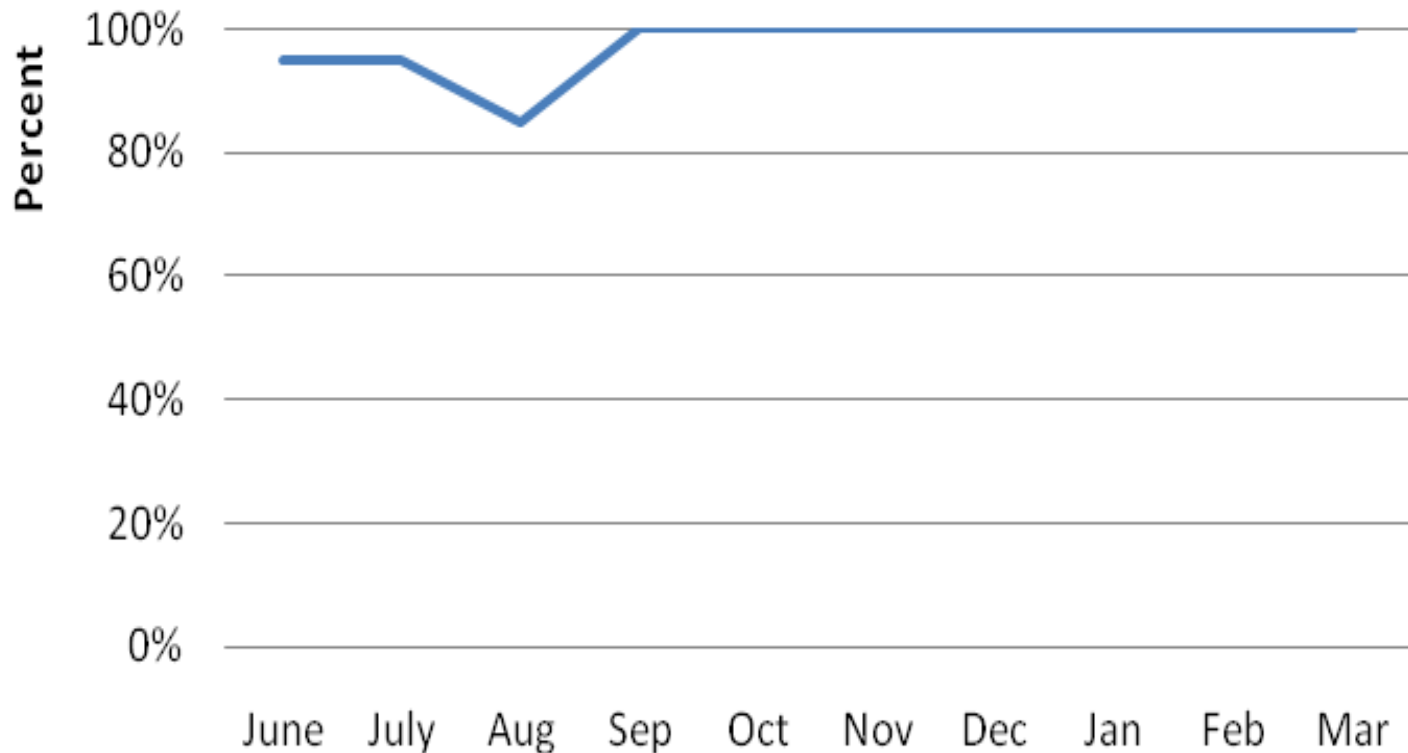
- Significant differences before and after the intervention were determined using t-tests for continuous variables
 - Fisher's exact tests for categorical variables
-

Results & Discussion



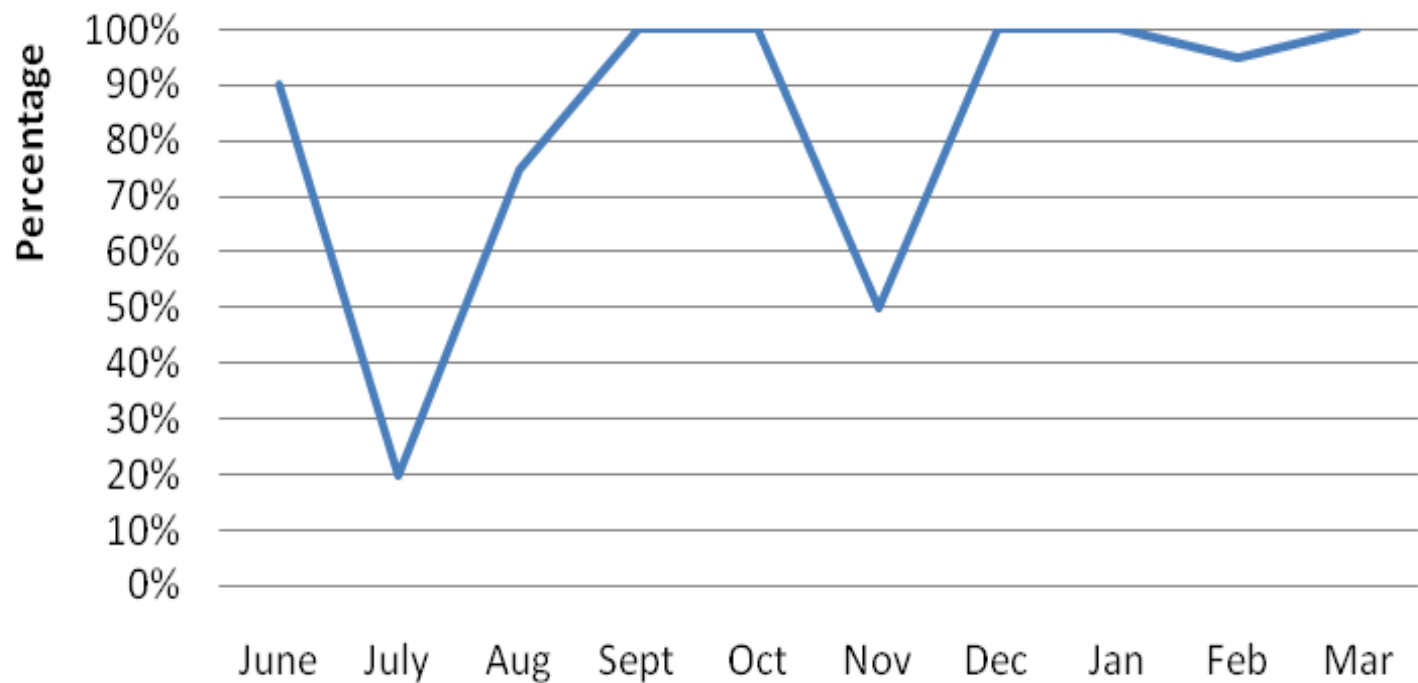
- Care Quality Indicators

Discharge exam noted presence of Jaundice



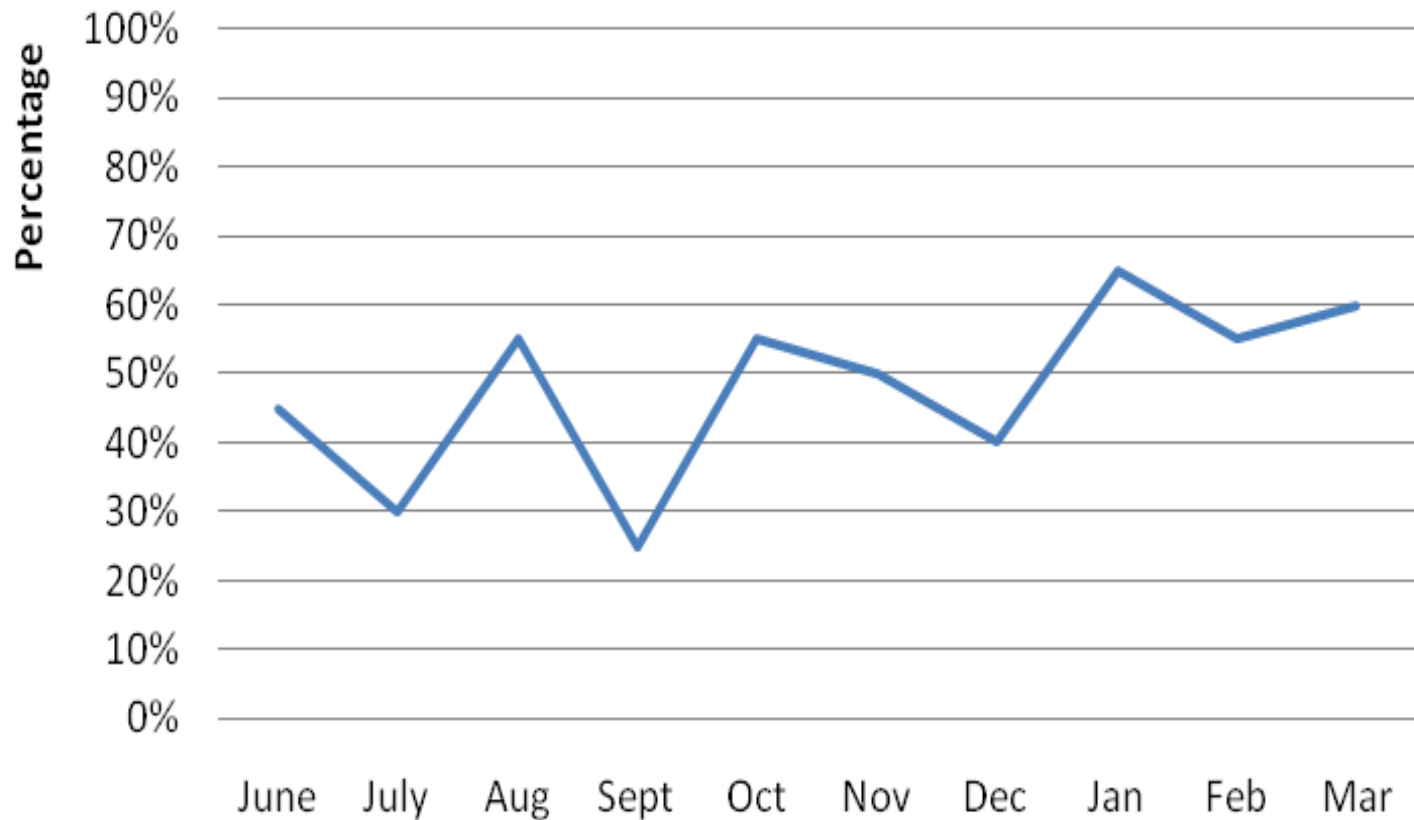
P = 0.033

Documentation of oral and written counseling about jaundice



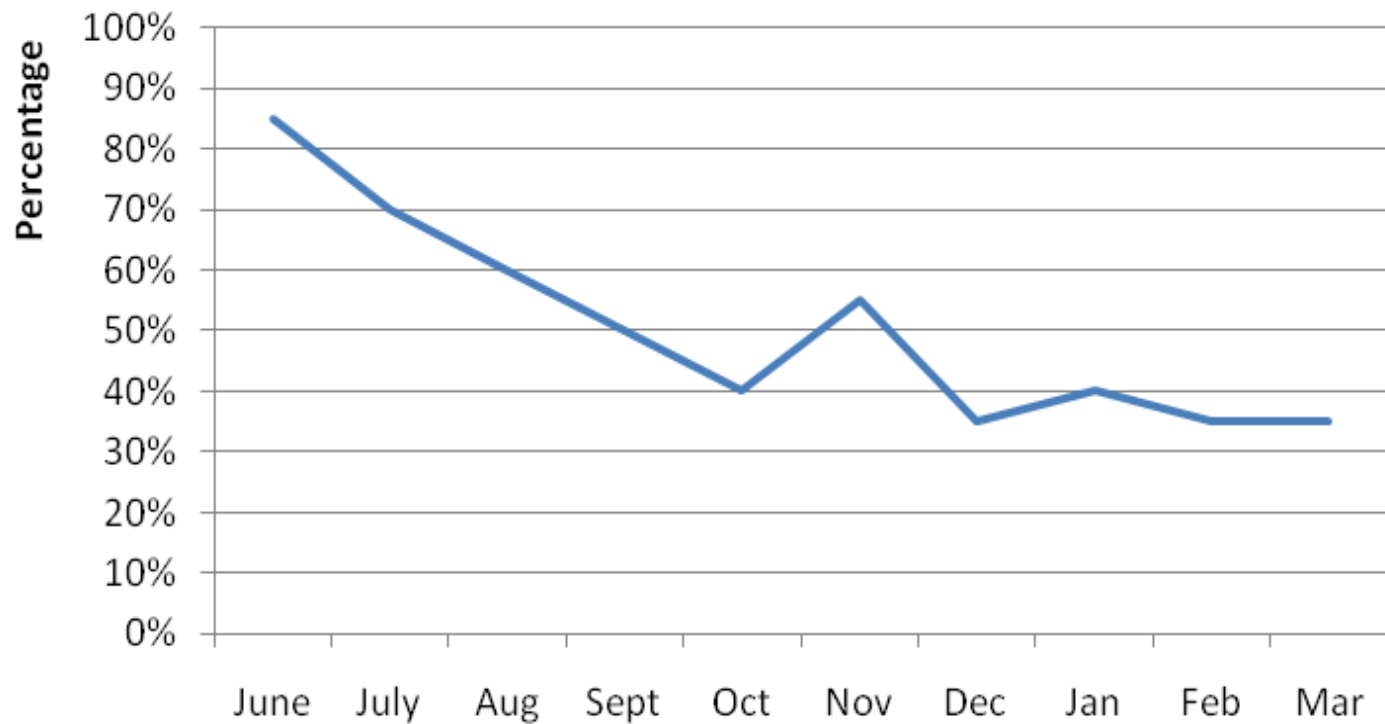
P = 0.008

Exclusively fed breastmilk



P = 0.025

Two observed breastfeedings



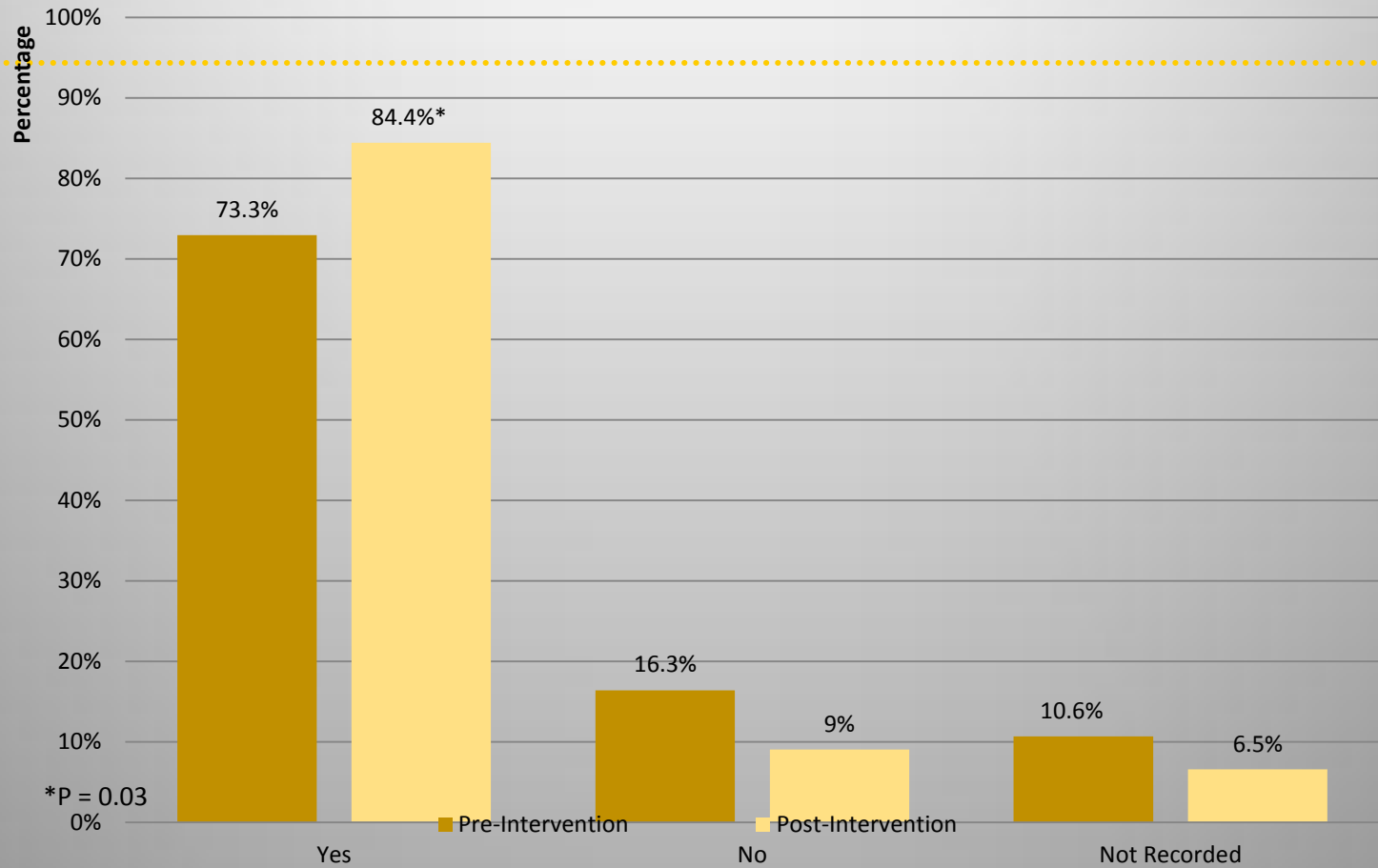
P = 0.006

Results & Discussion



- Compliance Outcomes

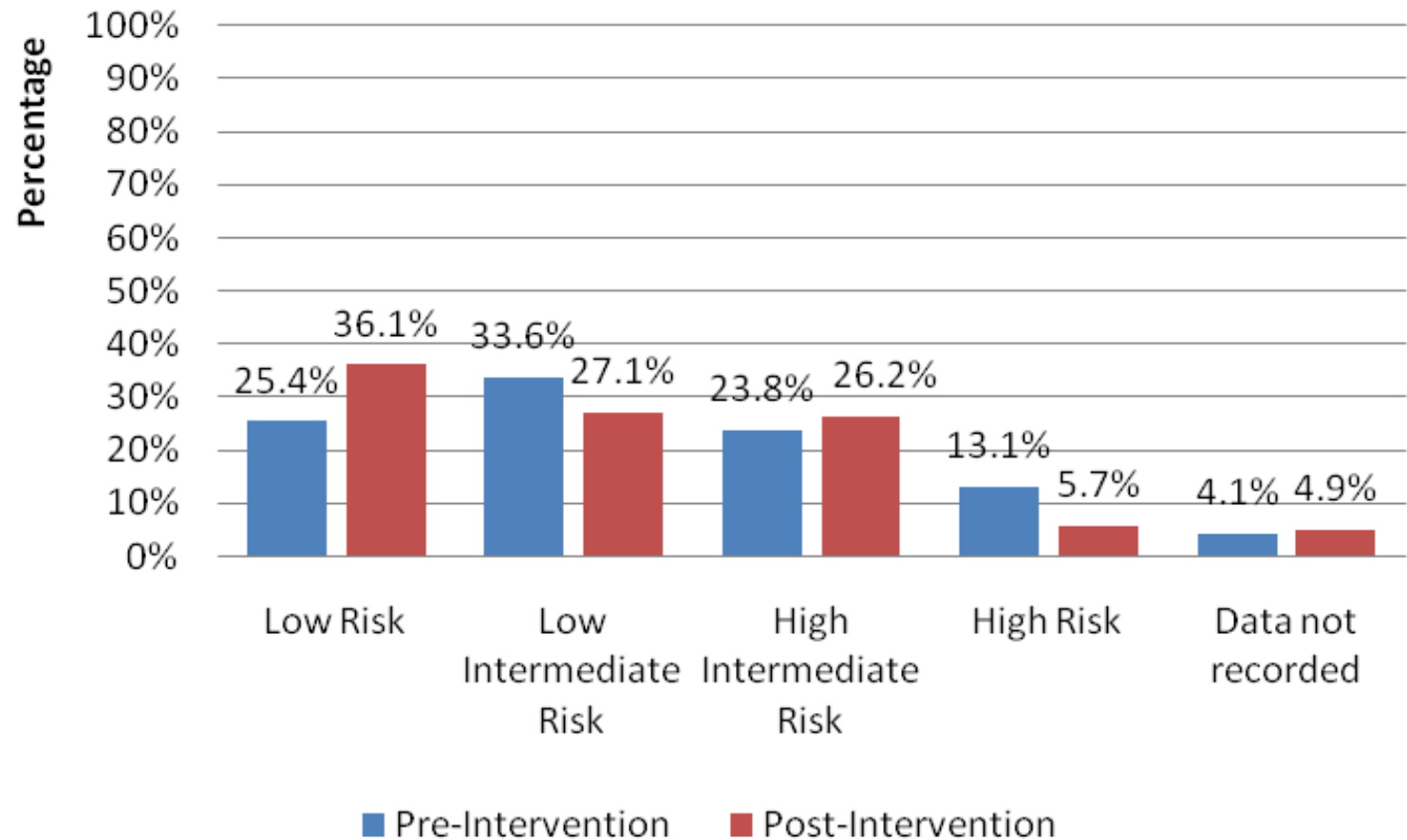
Appropriate follow up



*P = 0.03

P = 0.03

Risk Zone at Discharge



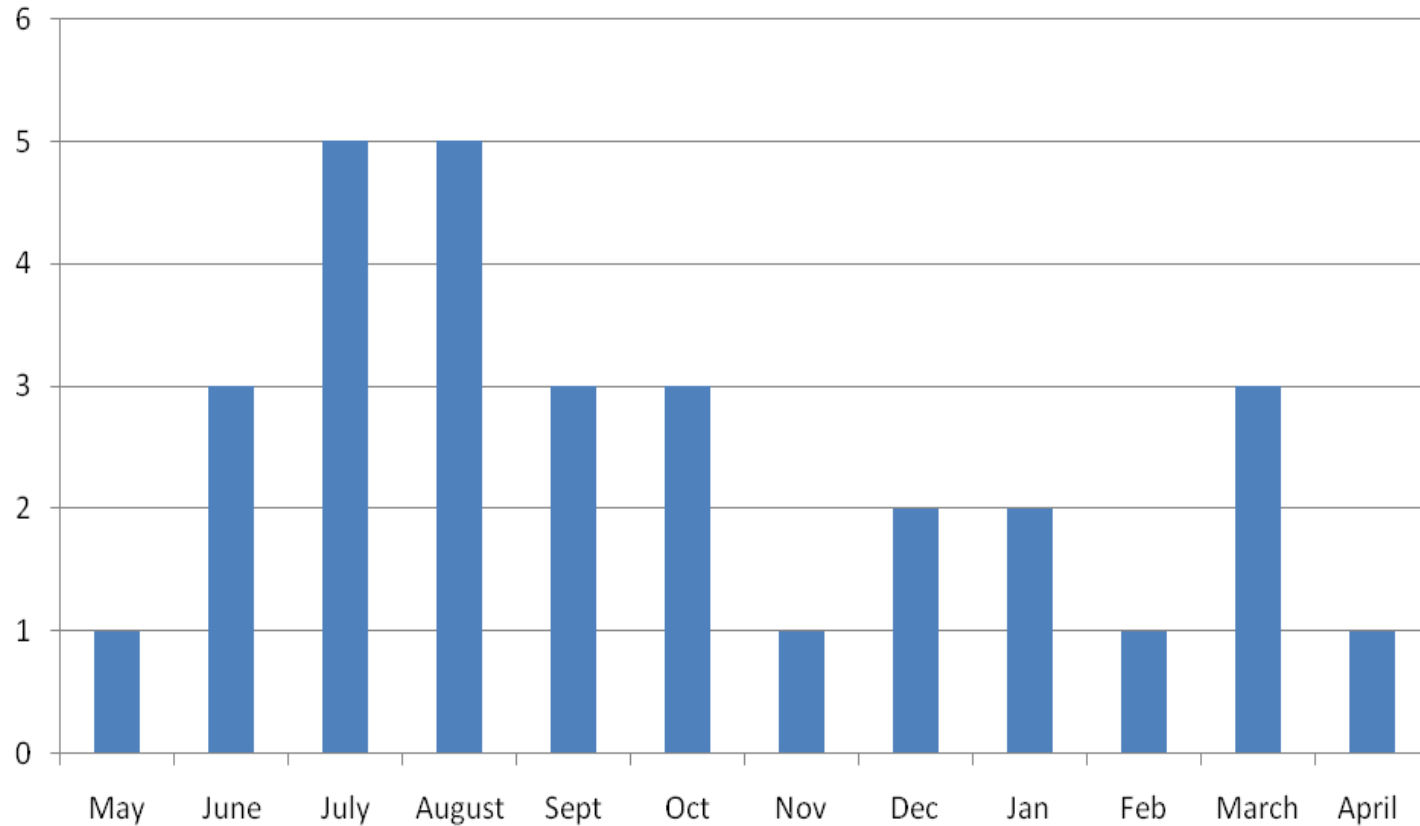
P = 0.06 for high risk

Results & Discussion



- Readmissions

Readmits 5/2009-4/2010

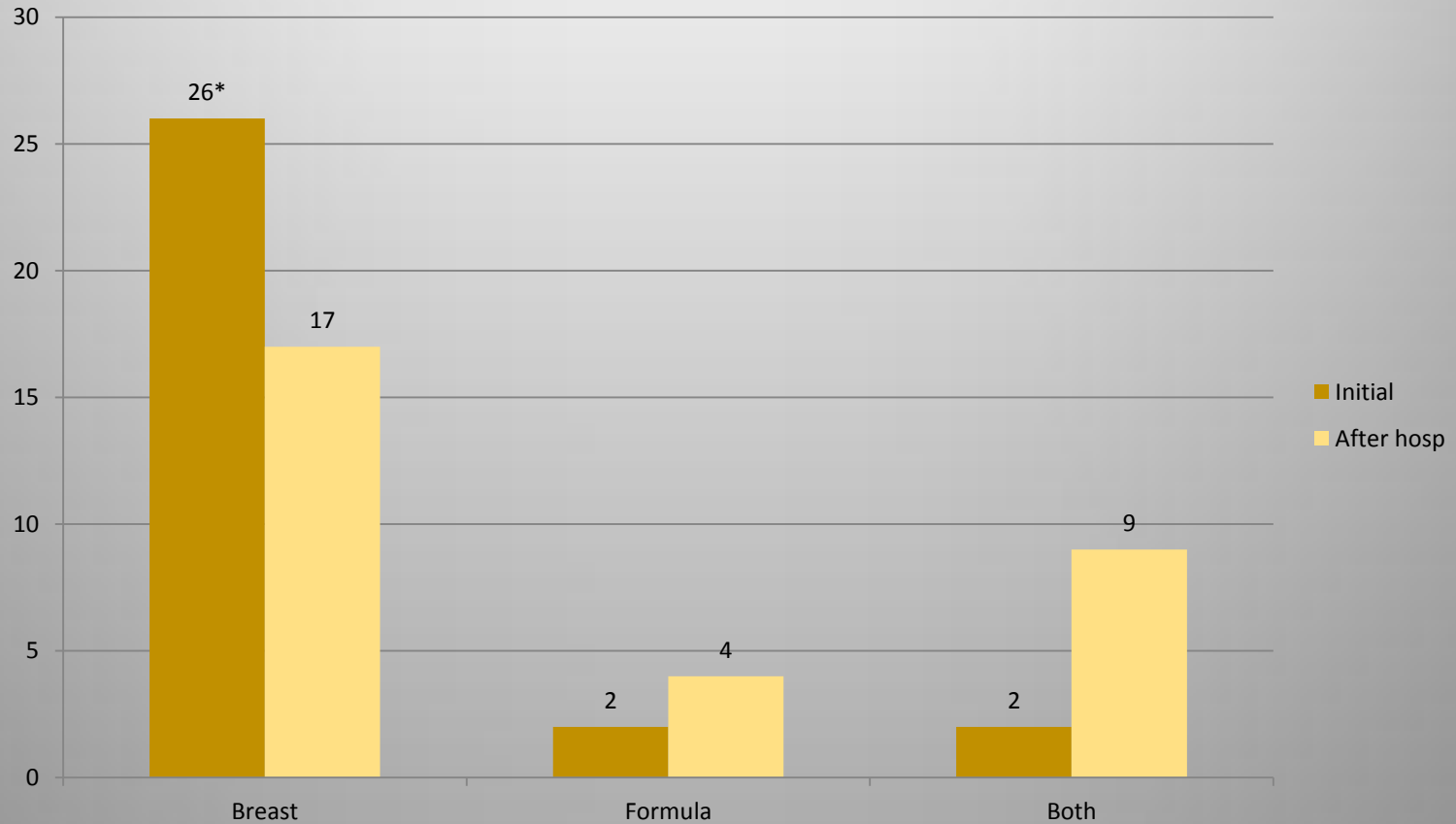


$P = 0.067$, effect size 0.74

Other interesting findings

- No infant readmitted for hyperbilirubinemia was delivered by cesarean section (29% C/S rate)
 - 40% were < 38 weeks gestation
 - 86% were breastfeeding at time of admission
-

Impact on exclusive breastfeeding with readmission



*P = 0.07

Limitation

- Pre/post design
 - Goal: Improve standard of care for all infants
 - Data sampling was randomized to decrease differences between groups
 - Confounding initiatives may have been present
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Conclusions

- An educational intervention with a clinical tool may help change provider practice
 - The intervention strategies were simple but multifaceted
 - Education
 - Tool
 - Opinion leader/champion
 - Could be made more automatic/computer assisted
 - Longer follow up is need to determine if impact is sustainable
-