

Simplifying Hyperbilirubinemia Risk Estimation

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Jaundice impacts more than half of term and late preterm newborns in the first week of life. Although in most cases, jaundice is benign, the consequences of severe hyperbilirubinemia are debilitating; thus, identification of newborns likely to exceed bilirubin treatment thresholds is needed. The American Academy of Pediatrics (AAP) recommends stratification of pre-discharge total serum bilirubin (TSB) levels by using the Bhutani Nomogram to help determine the appropriate timing of newborn follow-up. A separate nomogram is then used to determine if an infant meets criteria for phototherapy.¹

Kuzniewicz et al² aim to simplify the process and more precisely determine when a newborn requires outpatient follow-up for jaundice with a simple equation. Starting with a retrospective cohort study of a diverse sample of 148 162 newborns born at ≥ 35 weeks' gestation at 11 Kaiser Permanente Northern California facilities from 2012 to 2017, the researchers identified newborns whose TSB measurements did not exceed phototherapy levels and did not receive phototherapy during the birth hospitalization. Using the newborn's last TSB value before hospital discharge (pre-discharge TSB), the authors calculated the difference between the pre-discharge total serum bilirubin and the corresponding American Academy of Pediatrics phototherapy threshold (in milligrams/deciliter) (Δ -TSB). Newborns who required phototherapy after discharge were identified. The authors compared

the ability of the Δ -TSB model to predict postdischarge TSB above phototherapy thresholds to the Bhutani Nomogram. Examining additional variables, they also compared a more complicated Δ -TSB-Plus model. Although all 3 models performed well for those at highest and lowest risk of subsequent severe hyperbilirubinemia, both Δ -TSB and Δ -TSB-Plus models differentiated newborns in the intermediate zones better than the Bhutani Nomogram. Forty-four percent of newborns in Bhutani's high-intermediate risk zone (who would have follow-up recommended within 48 hours) had a Δ -TSB between -4 and -5 mg/dL. In these newborns, the risk of ever having a subsequent TSB measurement greater than the AAP threshold was only 1.6%, suggesting follow-up within 48 hours might not be indicated.

The Δ -TSB measurements used in this study relied on clinician discretion in follow-up; therefore, the predictive accuracy of the Δ -TSB models may be inflated because of differential verification bias as the authors mention. Only TSB measurements were included, but many hospitals and clinics use transcutaneous bilirubinometry.³ Although one can extrapolate the Δ -TSB for low bilirubin levels, the additional uncertainty involved when transcutaneous bilirubin measurements are used to approximate TSB levels has the potential to impact effective implementation of the Δ -TSB risk prediction approach.⁴ The 2004 AAP bilirubin thresholds were used in this study, but some clinicians caring



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for the patients studied may have followed other recommendations. For example, if the Northern California Neonatal Consortium criteria were used,⁵ some newborns may not have received a TSB assessment. Because nearly half of treated newborns were provided home phototherapy, we suspect their bilirubin levels were close to AAP thresholds. Clinicians may want to understand which newborns returned with bilirubin levels nearing or exceeding exchange thresholds and if they were predictable⁶; these data were not provided. Given the wide range of gestational ages in the AAP phototherapy risk strata (35–38 weeks; >38 weeks), a more delineated approach by gestational age and sex would be helpful because we know lower gestational age and male sex contribute to a higher risk of hyperbilirubinemia.^{7,8} An implementation study across different health systems will improve the generalizability of the Δ -TSB strategy.

Despite any limitations, this study could have significant impact on the experience of care for new families and curb health care overuse. Currently, the AAP Bright Futures Guidelines recommend timing the initial newborn posthospitalization continuing care visit within 3 to 5 days after birth and 48 to 72 hours after discharge. This recommendation is based primarily on concern for jaundice and feeding problems leading to excessive weight loss.⁹ Implementation of a Δ -TSB approach has the potential to simplify postdischarge phototherapy risk estimation and might decrease unnecessary health care visits and extra hospital days for newborns previously stratified to the high-intermediate and low-intermediate risk zones on the Bhutani Nomogram.

Select newborns could be discharged at 24 hours rather than 48 hours given this new evidence supporting an enhanced understanding of bilirubin trajectories. Some newborns with intermediate risk could safely defer in-person follow-up through weekends, holidays, and inclement weather days, whereas others may avoid daily outpatient bilirubin sampling with more optimally timed follow-up. This research also highlights, with large numbers, how truly low risk some newborns are for developing significant hyperbilirubinemia. With increasing adoption of telemedicine,¹⁰ those newborns who are also at low risk of feeding problems could be safely cared for in their homes.

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ABBREVIATIONS

AAP: American Academy of Pediatrics
 TSB: total serum bilirubin
 Δ -TSB: difference between the pre-discharge total serum bilirubin and the corresponding AAP phototherapy threshold (in milligrams/deciliter)

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