

Use of transcutaneous bilirubinometer to improve reliability in newborn jaundice evaluation

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OBJECTIVES

- Standardize evaluation of jaundice for newborns in the St. Vincent PCC Pediatric Clinic (PCC)
- Increase identification of significant hyperbilirubinemia
- Improve care for newborns with jaundice at the PCC

BACKGROUND

- Jaundice is a common newborn diagnosis.
- Jaundice that exceeds safe levels can cause kernicterus (neurological dysfunction).⁷
- Prior to this study, the PCC used clinical judgment based on subjective visual exam of yellowing of the skin.
- Several previous studies have shown visual assessment is unreliable and inadequate.^{1,2}
- Given the range of races/ethnicities seen in this clinic, visual diagnosis may be more challenging and lead to underdiagnosis and missed opportunities for intervention.

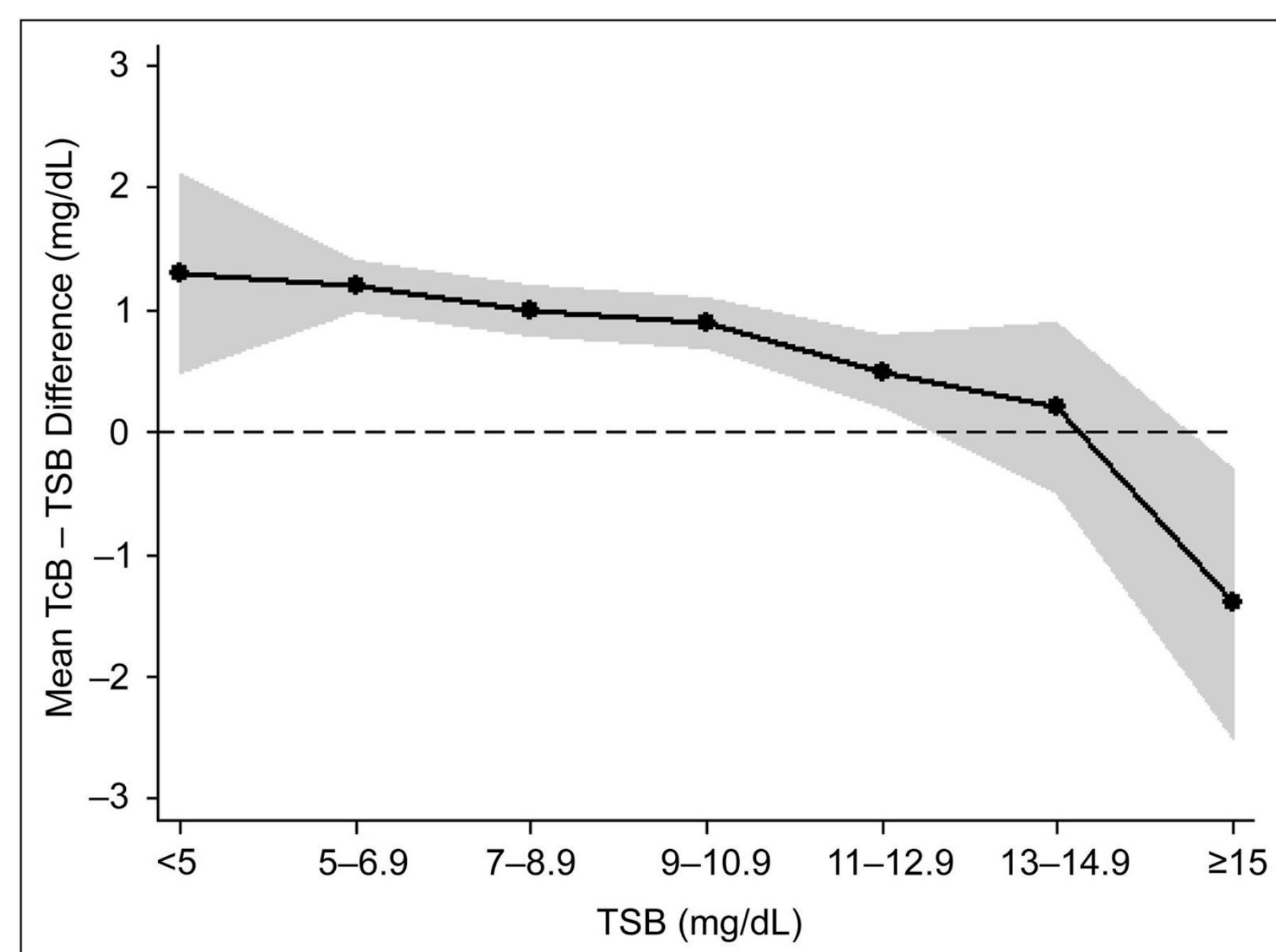


Figure 1. Transcutaneous bilirubinometers accurately estimate serum bilirubin levels up to 14.9 mg/dL; correlation of readings shown here.⁵

METHODS

- Retrospective, single-center study
- Data obtained 6 months pre-intervention (7/1/19 – 12/31/19) and 6 months post-intervention (7/1/20 – 12/31/20).
- Intervention:
 - Transcutaneous bilirubinometer (TcB monitor) obtained for the PCC.
 - Physicians, residents, & staff educated.
 - Standardized use implemented.
- Previously published nomograms (Fig. 1, 2) were used to inform decision making.
- A serum bilirubin was obtained for a TcB level above the low risk zone and for any TcB value ≥ 13 mg/dL.

Inclusion Criteria

- Initial visit for infants 0-10 days old
- Gestational age 37+0 weeks and greater
- Birth weight greater or equal to 2500g

Outcomes

- Primary: To calculate the number of infants with potentially pathologic jaundice identified before and after the introduction of use of a TcB monitor.
- Secondary: Comparison of results pre- and post-intervention based on patient's race, ethnicity, and insurance type.

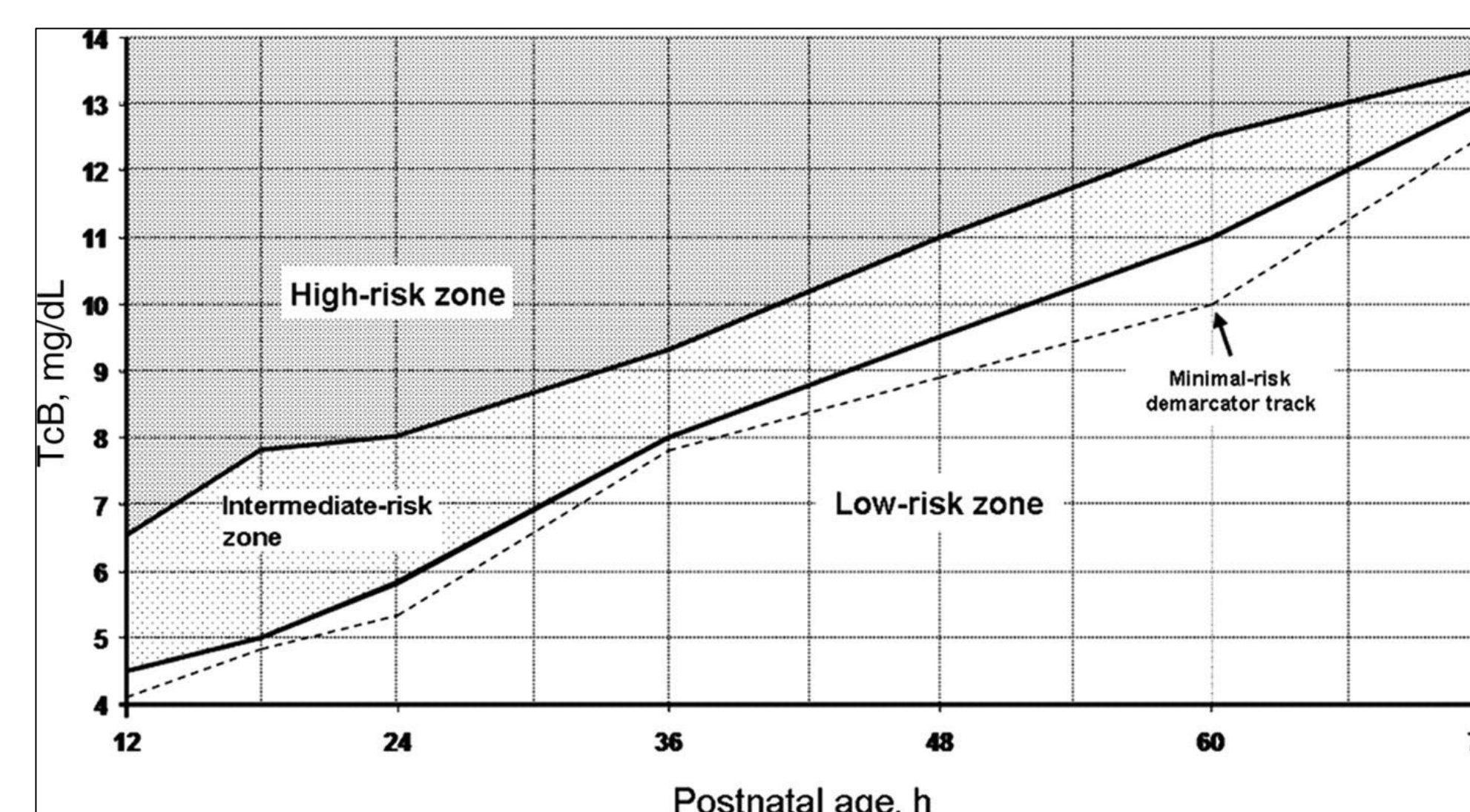
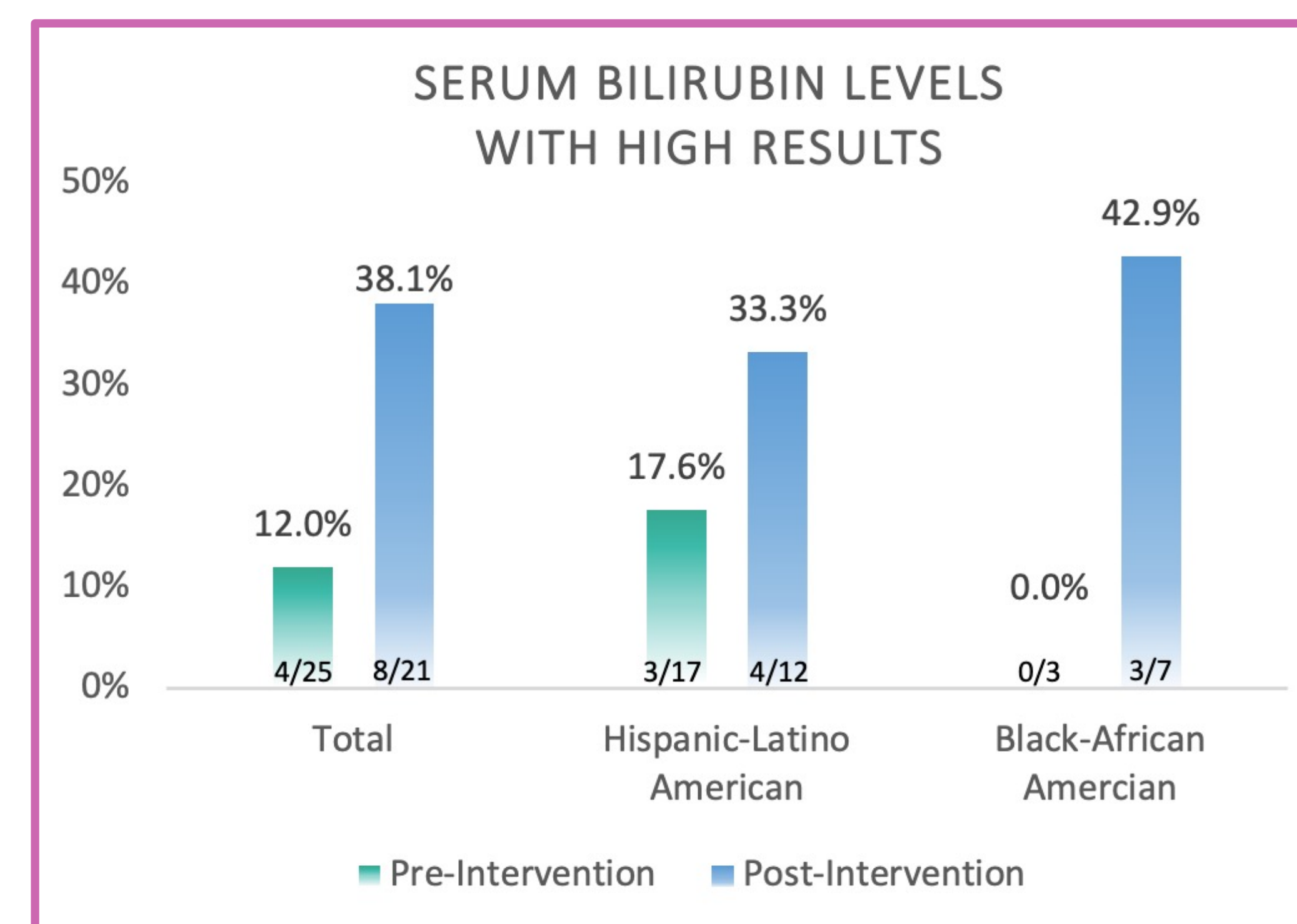
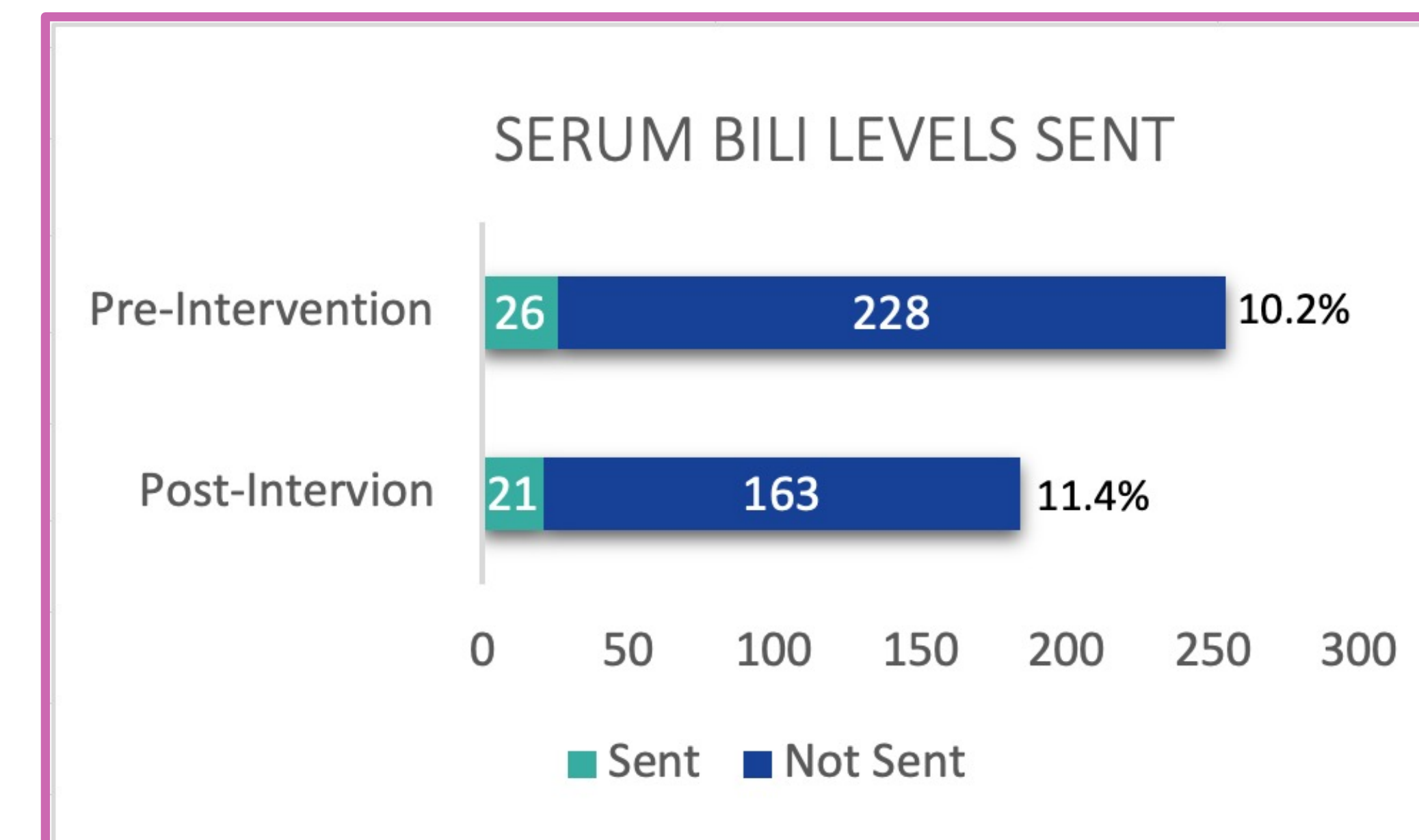


Figure 2. A study of this nomogram showed high-risk zone had 73.9% sensitivity and low-risk zone had 97.7% sensitivity at 24 hours. Sensitivity increased at 48 hrs with high-risk zone at 90% and low-risk zone at 98.8%.⁸

RESULTS

- 300 pre-intervention - 254 met criteria
- 215 post-intervention - 184 met criteria



Significance

- Primary outcome: significantly more patients were identified with high bilirubin levels post-intervention ($p=0.04$)
- Secondary outcome:
 - Latino and black patients: higher number were identified with hyperbilirubinemia post-intervention but this was not statistically significant ($p = 0.30$, $p = 0.21$, respectively)
 - Given majority had public insurance (89.2%), comparison between insurance types was unable to be completed.

DISCUSSION

- Standardized evaluation with the TcB for newborns at the PCC showed an increased number classified with significant hyperbilirubinemia
- Suggests there may have been missed diagnoses before use of the TcB monitor
- Though not statistically significant, there was an increased number of elevated bilirubin results identified in Latinos and blacks post-intervention
- This may suggest that clinicians had increased difficulty visually identifying jaundice in these patients.

CONCLUSION

- The TcB monitor improved the identification of pathologic jaundice for newborns in the PCC.
- Not generalizable to other settings as results pertain specifically to said clinic.
- Further research required to determine differences based on race/ethnicities and socioeconomic status given limited data.

REFERENCES

1. Keren, R, et al. "Visual Assessment of Jaundice in Term and Late Preterm Infants." *Archives of Disease in Childhood - Fetal and Neonatal Edition*, vol. 94, no. 5, 22 Mar. 2009, doi:10.1136/adc.2008.150714.
2. Moyer, Virginia A., et al. "Accuracy of Clinical Judgment in Neonatal Jaundice." *Archives of Pediatrics & Adolescent Medicine*, vol. 154, no. 4, 1 Apr. 2000, p. 391., doi:10.1001/archpedi.154.4.391.
3. Paul A. Harris, Robert Taylor, Robert Thielke, Jonathon Payne, Nathaniel Gonzalez, Jose G. Conde, Research electronic data capture (REDCap) - A metadata-driven methodology and workflow process for providing translational research informatics support, *J Biomed Inform.* 2009 Apr;42(2):377-81.
4. Panburana J, Boonkasidach S, Reakyal S. Accuracy of transcutaneous bilirubinometry compare to total serum bilirubin measurement. *J Med Assoc Thai.* 2010;93 Suppl 2:S81-S86.
5. Taylor, J. A., et al. "Discrepancies Between Transcutaneous and Serum Bilirubin Measurements." *Pediatrics*, vol. 135, no. 2, Feb. 2015, pp. 224-231., doi:10.1542/peds.2014-1919.
6. Shah, Muhammad Hussain, et al. "Quality Improvement Initiative Using Transcutaneous Bilirubin Nomogram to Decrease Serum Bilirubin Sampling in Low-Risk Babies." *BMJ Paediatrics Open*, vol. 3, no. 1, 7 Jan. 2019, doi:10.1136/bmjpo-2018-000403.
7. Subcommittee on Hyperbilirubinemia. "Management of Hyperbilirubinemia in the Newborn Infant 35 or More Weeks of Gestation." *Pediatrics*, vol. 114, no. 1, 1 July 2004, pp. 297-316., doi:10.1542/peds.114.1.297.
8. Varvarigou, A., et al. "Transcutaneous Bilirubin Nomogram for Prediction of Significant Neonatal Hyperbilirubinemia." *Pediatrics*, vol. 124, no. 4, Oct. 2009, pp. 1052-1059., doi:10.1542/peds.2008-2322.