

Factors to consider before implementing telemedicine protocols to manage neonatal jaundice

Key message

In the rapidly changing environmental situation during the coronavirus disease 2019 outbreak, neonatal centers have developed telemedicine systems with extended coverage for neonatal monitoring and high-risk follow-up programs including neonatal hyperbilirubinemia. At this point, electronic health technology and noncontact medical system increase the effectiveness of rather than replacing the face-to-face visit and the opinions of experienced neonatologists.

Jaundice commonly occurs even in healthy newborns. In full-term newborns, the total bilirubin (TB) level increases physiologically at 48–120 hours of age and decreases over the following 5–10 days. The aggravation of jaundice or hyperbilirubinemia is mainly determined by the equilibrium between bilirubin production and elimination processes.¹⁾ Bilirubin conjugation system immaturity and a decreased hepatic uptake of unconjugated bilirubin lead to the development of jaundice in the early period after birth. Under specific conditions, such as an increased unconjugated bilirubin level resulting from a severe imbalance between bilirubin production and elimination or increased central nervous system permeability to bilirubin secondary to disruption of the blood-brain barrier, bilirubin is thought to enter the brain and may cause acute and chronic neurologic dysfunction.^{1,2)} Hemolysis and prematurity appear to increase the risk of bilirubin toxicity.

Guidelines using hour-specific bilirubin nomograms are essential for the early identification of newborns at potential risk of severe jaundice and who need intervention to prevent serious hyperbilirubinemia and bilirubin encephalopathy.³⁾ Basically, serum TB measurement is used as the gold standard for clinical assessment and therapeutic decision-making. In contrast, visual assessment is subjective and considered to be inaccurate. As a noninvasive TB level test, transcutaneous bilirubin (TcB) measurement developed. The BiliChek (Philips Children's Medical Ventures, Monroeville, PA, USA) and the JM-103 Jaundice Meter (Konica Minolta/AirShields JM 103 Jaundice Meter and Draeger Medical AG and Co., Lubeck, Germany) are two popular devices used. Hour-specific TcB nomograms have been set up and used as a screening method for late preterm and term infants.⁴⁾ However, further studies are needed to confirm a reliable correlation between TB and TcB at levels of 15 mg/dL and higher as well as among preterm infants.

The recent emergent situation caused by the coronavirus disease 2019 (COVID-19) pandemic and the remarkable development of electronic health (eHealth) technology has accelerated the need for a functional telemedicine health care system.^{5,6)} eHealth is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies.⁶⁾ Various eHealth diagnostic technologies use smartphone cameras that utilize the characteristic of excessive hyperbilirubinemia that changes babies' skin and sclera yellow. Althnian et al.⁷⁾ reviewed current studies using diverse feature extraction methods and data processing technologies. Although more technological advancements are necessary to minimize discrepancies and false positives, the noninvasiveness and accessibility of these applications for diagnosing neonatal jaundice make them even more promising.

Empirical reports of telemedicine use that expanded the scope of its applications have increased exponentially during the COVID-19 pandemic. Previous telemedicine studies in the newborn field were limited to increasing access to worldwide resource-poor regions or settings to support neonatal specialist examinations and related subspecialty care. Even in the rapidly changing environmental situation during the COVID-19 outbreak, in which face-to-face visits have become difficult, newborn diseases including jaundice are time sensitive, so their early detection and intervention are essential to preventing long-term sequelae such as kernicterus. Currently, neonatal centers developing telemedicine systems with extended coverage for routine neonatal monitoring and high-risk follow-up programs are increasing.^{8,9)}

In a recent issue of *Clinical and Experimental Pediatrics*, Joshi et al.¹⁰⁾ reviewed telemedicine suggestions concerning neonatal jaundice monitoring, which can be considered under specific situations such as the COVID-19 outbreak.¹⁰⁾ This editorial summarized recent studies of two representative smartphone-based jaundice screening method, drive-through TcB screening, a telemedicine follow-up visit program, and home phototherapy.

The safety, reliability, and validity of any telemedicine health-care service system should be sufficiently verified before its implementation, including those for the diagnosis, monitoring and treatment of neonatal jaundice. Such offerings should also be customized for each society and country according to the social necessity, medical care accessibility, and legal system regulations. The screening and early detection of factors associated with the

potential risk of significant hyperbilirubinemia (such as preterm birth, low birth weight, perinatal asphyxia, neonatal sepsis, hemolysis or hemorrhage in the early neonatal period, dehydration, and hypoalbuminemia) are much more important than the simple confirmation of the bilirubin level itself. At this point, noncontact system is considered to play a limited role in increasing the effectiveness, rather than alternatively replacing the face-to-face visit and the opinions of experienced neonatologists in every steps of history taking, physical examination, interpreting hyperbilirubinemia severity, and decision-making for the initiation/cessation of optimal treatment.

See the article “Telemedicine as progressive treatment approach for neonatal jaundice due to the coronavirus disease 2019 pandemic” via <https://doi.org/10.3345/cep.2021.01235>.

Heui Seung Jo, MD

Department of Pediatrics, Kangwon National University Hospital, Chuncheon, Korea

Corresponding author: Heui Seung Jo, MD

Department of Pediatrics, Kangwon National University Hospital, Baengnyeong-ro 156, Chuncheon 24289, Korea

✉ Email: jozo@knuh.or.kr

<https://orcid.org/0000-0001-6406-2153>

Footnote

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ORCID:

Heui Seung Jo  <https://orcid.org/0000-0001-6406-2153>

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