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Poop color screening could prevent infant deaths, avert liver transplants and lower treatment costs

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Paying attention to the color of a newborn's poop can mean the difference between life and death for babies with the rare liver disorder biliary atresia—the leading cause of liver transplants in children. The disease is almost universally heralded by white or clay-colored stools but is often diagnosed with woeful delays.

Now, research from the Johns Hopkins Children's Center reveals that a stool color screening card given to new parents and already proven to save lives and improve outcomes in Taiwan, could also mitigate the economic toll of the disease in the United States.

The findings, reported ahead of print in the *Journal of Pediatric Gastroenterology and Nutrition*, underscore the profound long-term impact of simple interventions, the investigators say, and should spark conversations and action among physicians, health insurers and health administrators toward developing national screening guidelines for biliary atresia (BA).

Untreated, BA is universally fatal. Babies who undergo liver surgery before 2 months of age have better long-term outcomes, are less likely to die and less likely to need a liver transplant. That golden two-month window, however, is often missed, experts say, with the average time to diagnosis in the United States standing at 70 days.

"Parents in the United States are rarely warned to watch for stool color anomalies, which sometimes can lead to tragic delays in seeking medical attention and receiving timely treatment," says lead author Douglas Mogul, M.D., M.P.H., a pediatric gastroenterologist at Johns Hopkins. "Our analysis shows that we don't always need elaborate interventions or fancy screening tests."

"In the case of biliary atresia, a simple stool color card that is handed out or mailed to parents, or even a quick conversation in the pediatrician's office, can go a long way," Mogul adds.

Using a complex predictive algorithm to juxtapose two screening models, the team compared the hypothetical clinical outcomes and related treatment costs among 303 U.S. children born with biliary atresia in 2012. One approach involved no screening at all—currently the case in the United States—while the other one involved a stool color chart given to new parents as an education tool, a model successfully used in Taiwan and Switzerland.

The analysis showed that the stool color card would prevent three more deaths and 11 more liver transplants among the 303 children than the traditional no-screening approach and would do so for nearly $9 million less. In Taiwan, the nationwide implementation of the stool card increased the five-year survival rate among BA patients by 33 percent—from 56 percent to 89 percent—according to a 2010 study published in the journal *Hepatology*.

"Even though the model has been proven highly effective in Taiwan and other countries, it was important for us to gauge its economic impact in the context of the U.S. healthcare system, which has some rather unique economic mechanisms," says Kathleen Schwarz, M.D., director of the Pediatric Liver Center at Johns Hopkins. "Our findings confirm that the stool color card is superior both clinically and fiscally to the status quo."

Economics aside, the Johns Hopkins team says, clinicians who care for infants, including neonatologists, primary care pediatricians and nurse practitioners, should do their part to educate parents about the importance of poop color. Such conversations needn't be formal or even conducted face-to-face, the Hopkins researchers say. In fact, the new report comes on the heels of another BA screening tool—a mobile poop-color app developed by Johns Hopkins and HCB Health. The free app, called PoopMD and available on iTunes and Google Play, uses color recognition software to analyze the color of a baby's stool. The app provides instant feedback to parents, who have the option of sending the photos to their pediatrician for further evaluation.

Biliary atresia is marked by damaged or malformed bile ducts, the passageways that drain bile from the liver into the large intestine. Build-up of bile in the liver can damage the organ. The disease progresses quickly, often requiring a liver transplant. The first line of treatment is to repair the bile ducts and restore bile flow to avert irreversible liver scarring. The timing of that first surgery is critical. Surgery successfully restores normal bile flow in nine out 10 babies who have the operation within 60 days of birth, but it does so in only five out 10 infants who have the procedure a mere two to three weeks later, at age 71 to 90 days.

More information: For more about normal and abnormal stools, follow pediatric GI expert Doug Mogul on Twitter @dbmogul. To see colors of normal and abnormal stool, go to hopkinschildrens.org/stool-color-library/

Provided by Johns Hopkins University