A literature review of primary screening tool for biliary atresia using web-based stool color card

Novi Rahayu Arianti¹, Rendi Aji Prihatiningtyas¹, Bagus Setyoboedi¹∗, Reza Gunadi Ranuh¹

INTRODUCTION

According to reports, the prevalence of biliary atresia (BA) is roughly 1.1 in 10,000 live births in China and 1.3 in 10,000 live births in Japan, as stated in.¹ Geographically, the incidence of BA varies; in Taiwan, it can occur in 1 in 6,000 to 8,000 live births, whereas in Canada, it can occur in 1 in 19,000 live births. Other parts of the world report intermediate rates of BA prevalence. Premature infants, Asian and Black infants compared to White infants, and individuals with a feminine gender have all been found to have a higher incidence of BA. BA is typically an isolated issue, however in up to 16% of cases, it can be linked to other congenital abnormalities. Of these, more than half frequently have laterality deficiencies, especially splenic anomalies, and are referred to as syndromic BA. When biliary atresia (BA) occurs in a newborn, it usually manifests as pale feces and jaundice.² BA is an obliterative disease of the biliary tract. Early infancy sclerosing inflammation of the extra- and intrahepatic bile ducts of unknown cause results in complete incapacity to excrete bile from the liver to the duodenum.³

The nature of BA is complex, and its pathophysiology is multiple. Clinical presentation involving congenital anomalies and characterized by three primary clinical features: dark urine, persistent jaundice lasting longer than two to three weeks, and pale-pigmented feaces.³ All afflicted newborns have high liver enzymes and conjugated hyperbilirubinemia, which are frequently noticeable in the first few days of life.⁴ However, during the first few weeks of life, there may not be many clear-cut diagnostic indicators. A variety of secondary tests, including liver biopsy, radionuclide imaging, and abdominal ultrasonography, can strongly imply a diagnosis, but surgical exploration and intraoperative cholangiography are typically the only ways to confirm it. Patients who receive no treatment pass away two to three years after birth from chronic liver failure and biliary cirrhosis. The improvement of BA patients’ long-term native liver survival rate is contingent upon prompt referral and Kasai Portoenterostomy (KP).⁵ In the pediatric population, biliary atresia is the most prevalent cause of liver transplantation and the most common cause of hepatic death in early infancy.⁵

According to reports, the prognosis for BA is improved when the Kasai portoenterostomy is done early on.¹,⁶ Several procedures have been tried to detect BA early. It has been shown that stool color card (SCC) detection of BA is a cost-effective and efficient method in China, Japan, and a few other regions.⁶,⁷ In Japan, the long-term native liver survival rate significantly improved with the early identification by SCC and early Kasai portoenterostomy approach.⁸ However, the SCC employed varies depending on the nation or region, which makes it challenging to perform quality control and generate consistent results. Stool card screening is determining the infant’s stool color by using color reference cards or charts. This screening procedure is justified by the fact that babies with BA frequently exhibit pale or acholic (clay-colored) feces as a result of inadequate bile flow into the colon. Stool card usage is simple and affordable, but in the event that stools have an intermediate hue, it may present challenges for families and the medical community. Consequently, a training approach appropriate for both parents and healthcare professionals is required. It has been demonstrated that case-based learning produces good training outcomes for the medical field. This work will provide a solid theoretical basis for creating online case-based learning stool color cards.

ABSTRACT

Prompt diagnosis and appropriate Kasai Procedure (KP) are crucial for improving patients’ long-term prognosis who have BA. The notion that KP at ≤30 days of age considerably increases the native liver survival rate is becoming more widely acknowledged. It appears that screening by SCC and DB/CB is maybe possible, according to published assessments in both English and Japanese. In Tochigi Prefecture, Japan, screening with SCC has been in place since 1994. Japan introduced the idea of SCC to Taiwan, and in 2004 Taiwan became the first country to use SCC for statewide screening; Japan followed suit in 2012. SCC home-based screening is simple and affordable, but in the event that stools have an intermediate hue, it may present challenges for families and the medical community. Consequently, a training approach appropriate for both parents and healthcare professionals is required. It has been demonstrated that case-based learning produces good training outcomes for the medical field. This work will provide a solid theoretical basis for creating online case-based learning stool color cards.

Keywords: Biliary atresia, Screening, Stool color card, Online case-based learning.

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¹Department of Pediatrics, Faculty of Medicine, Universitas Airlangga/Dr. Soetomo General Academic Hospital, Surabaya.
²Corresponding author: Bagus Setyoboedi; Department of Pediatrics, Faculty of Medicine, Universitas Airlangga/Dr. Soetomo General Academic Hospital, Surabaya; baguzze@gmail.com

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card screening for biliary atresia. Screening was described as “the presumptive identification of unrecognized disease or defect by the application of tests, examinations, or other procedures which can be applied rapidly” at the CCI Conference on Preventive Aspects of Chronic Disease, held in 1951. Screening tests distinguish between people who appear healthy and who most likely do not have an illness. It is not the purpose of a screening test to be diagnostic. Individuals who have questionable or positive results should be sent to their doctors for a diagnosis and appropriate care. Note that by definition, both pre-symptomatic and undiagnosed symptomatic diseases are covered; also, physical examinations are included in the process as long as they can be categorized as quick. Questionnaires are also included in the category of “other procedures” because they are becoming a more and more important part of screening processes. Generally speaking, we have interpreted the definition to suggest a rather straightforward (though not inherently unsophisticated) approach to case-finding.

Crucial to the screening process for atresia bilier as primary prophylaxis is the utilization of the SCC as a teaching tool for parents upon hospital discharge and the inclusion of initial outpatient screening in the first two visits in the first and second week following discharge by incorporating the SCC into the Maternal and Child Health Booklet. We suggest that an SCC be updated to a digital case-based learning model that is available to caregivers and parents alike. Thus, the purpose of this article is to investigate the possibilities of web-based stool color cards.

Stool Color Card

The basic concept of early disease identification and therapy is straightforward. Even though it can occasionally seem quite simple, the road to its effective completion—which involves both treating people with diseases that were previously undetected and protecting those who do not require treatment—is far from straightforward. Because of this, we have dedicated this section to a rather thorough description of some topics that could be used as a roadmap for organizing case findings. This is particularly crucial in the case-finding process when a public health organization is involved, since there may be more potential for error than in the case of a personal physician performing the screening.

We have referred to these ideas together as “principles” for the sake of simplicity of explanation rather than dogma. An effort is made to elaborate on at least a few of these ideas in the following manner: a) the illness that needs to be treated needs to be a serious health issue. Due to the fact that 80% of BA patients will need a liver transplant (LT) by the time they are ten years old, BA is a significant health issue; b) patients with diagnosed diseases ought to receive an accepted course of care. For BA patients identified based on symptoms and signs suggesting cholestatic jaundice, Kasai Portoen-terostomy (KP) /LT is a suitable treatment when necessary; c) diagnostic and treatment facilities should be accessible. Most industrialized countries have access to facilities for diagnosis and treatment; d) latent or early symptomatic stages should be identifiable; early symptoms can be identified; jaundice may be moderate and not all BA patients have pale, pigmented stools in their first month of life; e) an appropriate test or examination should be performed, standard liver function tests and ultrasonography are two appropriate diagnostics or examinations that can suggest cholestatic jaundice; f) the population should find the test acceptable, since the governments of Taiwan and Japan chose to implement universal SCC screening, the screening test is acceptable to the general public; g) a thorough understanding of the condition’s natural history, particularly how it progresses from a latent to a proclaimed disease, is necessary; h) a policy regarding who should be treated as a patient should be established, it was said that in order to increase the likelihood of a successful KP, BA patients should receive treatment in facilities with experience; i) the expense of locating cases (including diagnosing

Figure 1. Five transverse stripes of a precise and graded hue are painted on a clear plastic hand-held gadget known as an icterometer.

Figure 2. The color card for the SCC infant version in Indonesia.
patients and treating them) had to be moderated financially in comparison to the total amount that could be spent on healthcare.\textsuperscript{11}

Instead of being a “once and for all” project, case-finding needs to be an ongoing practice. When using SCC for screening, case discovery costs are fairly distributed. In many countries, the process of detecting cases is ongoing in areas where BA screening is in use or being studied\textsuperscript{12}. As such, BA is thought to be a good candidate for a condition that ought to be identified when an appropriate test with a tolerable cost-benefit ratio is available. A jaundice score can then be determined by comparing the yellow color of the balanced skin to the yellow stripes (Figure 1).

All expectant mothers receive a stool color card along with a “Maternal and Child Health Handbook.” The colors of the stools were numbered. Stools in photos 1-3 were light-pigmented, while stools in images 4-5 had bile pigmentation. Just before the one-month health exam, a mother is instructed to match the color of her infant’s feces to the card, fill in the matching number, and give the card to the attending physician (Figure 2). Seven photographic photos of stool color obtained from both healthy and biliary atresia newborns comprised the third edition stool color card used in Tochigi Prefecture from August 1994 to March 2011 (Figure 3).

In order to screen for atresia bilier as the primary prophylactic, it is crucial to use the SCC as a teaching tool for parents at the time of maternity hospital discharge as well as to incorporate the SCC into the Maternal and Child Health Booklet for initial outpatient screening during the first two visits in the first and second week following discharge.

### Media on the Web

In the field of education, web-based media has been extensively utilized. Numerous academic works demonstrate the great efficacy of using web-based resources for learning.\textsuperscript{11,12,14} This is due to the dynamic, adaptable, and attention-grabbing nature of web-based media.\textsuperscript{14} One could consider the application of SCC to identify BA to be a self-directed learning task. Using web-based media would be ideal since, as demonstrated by another study, it is highly

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**Figure 3.** The stool color in photographs 1-3 is abnormal, whereas the color in images 4-7 is typical.\textsuperscript{7}

**Figure 4.** Stool color card algorithm on the web. “choose feces color,” “explanation,” “precaution,” and “consult with pediatrician” are all included in this algorithm.
beneficial for self-directed learning.15
In addition, because it requires fewer
travel fees and time, web-based media
or technology-based learning, such as
blended learning, e-learning, and mobile
learning, are thought to be efficient and
cost-effective.12 This is consistent with
another study, which states that the cost
of case finding—which includes diagnosing
patients and treating them—should be
economically evaluated against the total
amount that may be spent on medical care.7
However, if consumers lack the requisite
technical or instructional abilities, using
web-based media won’t be effective.11
According to other studies, there are a
number of factors that must be taken into
account in order to produce trustworthy
web-based media16: create websites that
emphasize the “real world” element, make
websites user-friendly, add credentials
to the site, add badges of competence,
customize the user experience, steer clear
deficiency of excessively commercial content on a
website, steer clear of amateurism’s traps.

Web-Based Stool Chart Algorithm
We suggest that a SCC be updated to a
digital case-based learning model that is
available to caregivers and parents alike.
In this case, a referral network should
be established, and the results of this
practice’s application should be verified
with the algorithm below (Figure 4).
The limitation of this literature review
is that we have not added the limitations
of the internet network in each location
for working on the stool color card
questionnaire and also for the mother’s
knowledge of how to operate the cellphone.
For further research, alternatives can be
added if there is no internet network at
the location and for mothers who cannot
operate the cellphone.

CONCLUSION
Parents and medical professionals will
find it simpler to identify biliary atresia
with the web-based Stool Color Card.
In addition to enabling better and more
suitable patient care, this will lessen the
likelihood that the worst dangers will
materialize.

ETHICAL CLEARANCE
This article is a literature review there is no
ethical issue

CONFLICT OF INTEREST
There is no conflict of interest.

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