Measuring Bilirubin Through the Skin?
Vinod K. Bhutani, Lois H. Johnson, Glenn Gourley, William D. Engle and Gregory L. Jackson
Pediatrics 2003;111;919-920
DOI: 10.1542/peds.111.4.919

This information is current as of December 13, 2006

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://www.pediatrics.org/cgi/content/full/111/4/919
Measuring Bilirubin Through the Skin?

To the Editor.—

We commend Engle et al for their study of a large Dallas Hispanic population with elevated bilirubin levels. Visual assessment of jaundice is particularly challenging in this population. Before all differences between cutaneous bilirubin and total serum bilirubin (TSB) are ascribed as errors in transcutaneous (TcB) measurement, we must acknowledge TSB measurement is also susceptible to errors of similar magnitude in a clinical laboratory.

Quality control of their TSB measurements (using the College of American Pathologists’ guidelines) was limited to a few samples sent to an independent laboratory for high-performance liquid chromatography (HPLC) analysis (gold standard). Differences between clinical method and HPLC analysis were reported as usually <1.0 mg/dL, but 27% of the time (7/26) the differences were between 1 and 1.9 mg/dL. Though clinically acceptable, its importance should not be underestimated. Blood sample collection and handling are additional sources of error in any laboratory measurement, even by experienced clinicians. These types of error in the TSB assay would not be detected by sending the serum samples to 2 separate laboratories, but it would introduce a difference between TcB and TSB measurements.

We agree with the authors’ statement that “...a TSB value >10 mg/dL certainly could be cause for concern in a 24- to 36-hour-old infant being discharged from the hospital, whereas the higher value (>15 mg/dL) might be of more relevance in an older infant being seen in follow-up.” We recommend that this logic be utilized in the assessment of the sensitivity and specificity analysis, i.e., instead of applying cutoff values of 10 to 15 mg/dL, the bilirubin level of interest should be determined for each patient, at the time of the measurement(s), based on their respective postnatal age, using the hour-specific bilirubin nomogram4 or by established AAP guidelines.5 The author’s data could also improve our understanding of the serum-skin bilirubin dynamics. Cutaneous bilirubin and serum bilirubin have been demonstrated to have a high correlation, whether assessed visually, by icterometer, or by TcB devices. It should be noted that 36% of the study patients were outpatients, and TcB underestimation in this subset population resulting from exposure of the skin to high levels of ambient lighting might well be of importance. If true, clinicians should seek alternative anatomic sites unexposed to the same levels of ambient lighting.

Also, of 304 study patients had received phototherapy within 8 to 22 hours of their measurement and the TcB measurements were at skin sites unprotected from lights. As participants of the BiliChek phototherapy clinical trials, we observed that the post-phototherapy interval for unprotected skin sites to reequilibrate to bilirubin levels of an exposed skin site could be 36 to 48 hours. Would omission of these patients alter the results of sensitivity and specificity analysis such that the sensitivity would reach a level of 1.0 (no false-negatives) at a significantly higher cutoff point and yield a specificity that would allow for elimination of many more unnecessary blood tests? A better study design would be to arrange an accurate point-of-care bilirubin analyzer would facilitate system-based bilirubin screening, avoid unnecessary blood tests, and appeal to clinicians and parents. Obviously, we must be thorough and cautious before we adopt such technologies as a replacement for TSB measurement. By the same token, we must be thorough and cautious before we reject or diminish the BC as a replacement for TSB measurement. By the same token, we must be thorough and cautious before we adopt such technologies as a replacement for TSB measurement.

Vinod K. Bhutani, MD
Lois H. Johnson, MD
Department of Pediatrics
University of Pennsylvania School of Medicine
Philadelphia, PA 19107-6192

Glenn Gourley, MD
Department of Pediatrics
University of Wisconsin Waisman Center
Madison, WI 53705-2280

REFERENCES

In Reply.—

We appreciate the comments of Bhutani et al regarding our article1 and the opportunity to reply.

Previous studies have demonstrated a close relationship between the BiliChek (BC) and high-performance liquid chromatography (HPLC) values; however, as noted in the article, relatively few comparisons of the BC with elevated total serum bilirubin (TSB) values have been made. Rather than utilize a method that is not readily available (HPLC), our study compared BC results to the reference point that would be used routinely with this device, i.e., the hospital laboratory TSB. We believe that the international Parkland Memorial Hospital provides a reliable determination of TSB, based on the procedures outlined in the “Methods” section. This belief was supported in a separate analysis comparing 26 Parkland Memorial Hospital TSB determinations with HPLC values obtained on the same samples. In this analysis, 14 of 26 HPLC values were >13 mg/dL, and 25 of 26 were >10 mg/dL. We agree that the difference between TSB values obtained in our laboratory and HPLC values should not be underestimated. As noted in the manuscript, the difference, although small, was highly significant (P <.001), with HPLC values tending to be higher (19 of 26 samples). This tendency toward higher HPLC values compared with results in our laboratory suggests that the BC may actually underestimate TSB to a greater extent than our study suggested.

The values of 10 mg/dL and 15 mg/dL were chosen because of their apparent clinical relevance. We agree that additional analysis based on hour-specific bilirubin data developed primarily by Bhutani et al might be of interest. It should be noted that our study infants were chosen because of clinically significant jaundice that prompted the provider to order a TSB, and we did not approach infants from a screening perspective.2 We viewed the inclusion of outpatients (most seen on the day after discharge) as a strength of the study, because in the era of early discharge, these infants form a large proportion of those requiring evaluation3; from a practical standpoint, the BC is used frequently by practitioners in an outpatient setting.

As suggested by the correspondents, we recalculated sensitivities and specificities for various BC cutoff levels after excluding those infants who had been exposed to phototherapy. The results were virtually identical to those shown in Tables 3 and 4 of the article.

We agree emphatically with Bhutani et al that availability of a noninvasive method for estimating TSB is essential, and we are initiating a study to evaluate a new device4 in our nursery. We agree with Schumacher2 that the BC may be useful in screening large numbers of infants who have mild or no jaundice, while it may be less helpful in diagnosing and following infants with relatively high TSB values.
It Is Premature to Abandon Youth Access to Tobacco Programs

In a recent meta-analysis study, Fichtenberg and Glantz2 argue that youth access tobacco programs do not affect teen smoking prevalence because as fewer merchants sell tobacco to minors, teens will use social sources to obtain tobacco. They conclude, as well as in a recent editorial,2 that it is time to abandon youth access tobacco programs. The likely result of reversing this policy would be that the majority of merchants would once again sell minors tobacco, thereby providing them access to this dangerous substance.

Previous studies that have investigated the relation of retail tobacco availability (RTA) to youth tobacco use have measured this factor as the proportion of retailers assessed who illegally sold cigarettes.11 Fichtenberg and Glantz2 concur that this is the most commonly used metric for assessing youth access programs, and if this is not an accurate reflection of youth access, “then none of the studies of youth access that base their effectiveness on merchant compliance are valid.” Unfortunately, this approach does not account for the relative density of tobacco retailers in each community, which may affect the likelihood that a youth will encounter a retailer who is not compliant with the tobacco sales law. As an example, in one town we recently studied,8 17% of retailers sold tobacco to minors, and thus this town would be seen as in compliance with the Synar amendment, which stipulates that states need to keep merchant illegal sales rates of tobacco to minors under 20%.9 In contrast, a second town had rates of illegal sales of 36%. However, the number of retailers who made illegal sales per 1000 youth was higher in the town with the lower violation rate. This suggests that a more appropriate measure of risk exposure would reflect the number of retailers who illegally sell tobacco as a function of the youth population (ie, youth between the ages of 10 and 17) within each community.

A recent study examined individual, social, and environmental influences on smoking initiation and continued smoking among sixth, seventh, and eighth grade students using this new RTA index.8 Greater RTA was positively associated with smoking initiation but not continued cigarette use. Restrictions in RTA may prevent youth from initiating smoking but may have a less impact on those addicted to tobacco. Fichtenberg and Glantz’s (2002) meta-analysis only examined current smoking rather than smoking initiation.

Typically, youth who conduct retail tobacco access assessments are not permitted to lie about their age, use an ID card, dress to appear older, purchase other items, or engage the clerk in irrelevant friendly conversation. It is with these types of procedures that low rates of merchant sales rates have been found. This research protocol may be more similar to methods used by youth who are less experienced at purchasing cigarettes. However, when youth who are experienced at purchasing tobacco are allowed to use their usual purchase methods (eg, appear as they want, purchase other items, lie about their age, present a valid underage ID, and engage the clerk in conversation), they are 6 times more likely to obtain cigarettes from clerks than youth who use methods required by standard assessment protocols.10 In other words, efforts might be most successful in limiting relatively inexperienced smokers from purchasing cigarettes, but these efforts are probably less successful for addicted and experienced smokers. The fact that young smokers are beginning to shift to social sources for tobacco11 suggests that, for some, the barriers to purchasing retail tobacco are strengthening. Rather than reducing these obstacles to youth access to tobacco, it might be more appropriate to assess the effects of even tougher barriers to retail and social sources of tobacco.

Several studies have found that tobacco-control policies, which might be influencing norms that impact retail and social sources, have reduced prevalence of youth smoking. Jason and colleagues12 found that high school youths who lived in communities with regular enforcement of age access policies had significantly lower rates of smoking compared with youths who lived in communities without such enforcement. A longitudinal, statewide study in Massachusetts found that youths living in communities with local tobacco sales laws were less likely to progress to established smoking over a 4-year period than were youths living in communities without such laws.13 In addition, a national study of state youth tobacco control policies found that youths living in states with more comprehensive policies had significantly lower rates of smoking than did youths living in states without such policies.14

It is too early to eliminate youth access programs, as they represent one of the more popular vehicles for galvanizing public support for antismoking activities and establishing social norms against youth tobacco use. Moreover, given the methodologic limitations of the current research,15 future research with more rigorous and controlled designs might indicate that such interventions, particularly those that change social norms, might even have a role in reducing smoking initiation and prevalence rates.

LEONARD A. JASON, PhD
STEVEN B. POKorny, MD
Center for Community Research
DePaul University
Chicago, IL 60614

MICHAEL E. SCHOENY, MD
University of Illinois at Chicago
Chicago, IL

REFERENCES

2. Ling PM, Landman A, Glantz SA. Is it time to abandon youth access tobacco programmes. Tobacco Control. 2002;11:3–6
7. Fichtenberg CM, Glantz SA. Fichtenberg and Glantz respond. Tobacco Control. 2002;May 29 [electronic letter to the editor]
15. DiFranza JR. It is time to abandon bad science. Tobacco Control. 2002; May 13 [electronic letter to the editor]
Measuring Bilirubin Through the Skin?
Vinod K. Bhutani, Lois H. Johnson, Glenn Gourley, William D. Engle and Gregory L. Jackson

Pediatrics 2003;111;919-920
DOI: 10.1542/peds.111.4.919

This information is current as of December 13, 2006

<table>
<thead>
<tr>
<th>Updated Information</th>
<th>including high-resolution figures, can be found at:</th>
<th><a href="http://www.pediatrics.org/cgi/content/full/111/4/919">http://www.pediatrics.org/cgi/content/full/111/4/919</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>References</td>
<td>This article cites 6 articles, 5 of which you can access for free at:</td>
<td><a href="http://www.pediatrics.org/cgi/content/full/111/4/919#BIBL">http://www.pediatrics.org/cgi/content/full/111/4/919#BIBL</a></td>
</tr>
<tr>
<td>Citations</td>
<td>This article has been cited by 1 HighWire-hosted articles:</td>
<td><a href="http://www.pediatrics.org/cgi/content/full/111/4/919#otherarticles">http://www.pediatrics.org/cgi/content/full/111/4/919#otherarticles</a></td>
</tr>
<tr>
<td>Permissions &amp; Licensing</td>
<td>Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at:</td>
<td><a href="http://www.pediatrics.org/misc/Permissions.shtml">http://www.pediatrics.org/misc/Permissions.shtml</a></td>
</tr>
<tr>
<td>Reprints</td>
<td>Information about ordering reprints can be found online:</td>
<td><a href="http://www.pediatrics.org/misc/reprints.shtml">http://www.pediatrics.org/misc/reprints.shtml</a></td>
</tr>
</tbody>
</table>