

## An Analysis of Alternate Site Tests to Improve Patient Compliance with Self-Monitoring of Blood Glucose

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### Abstract

#### Background:

Multiple barriers stand in the way of patients performing self-monitoring of blood glucose (SMBG). Alternate-site testing (AST) has been introduced as one solution to reduce pain and improve compliance. In a study published in this issue of *Journal of Diabetes Science and Technology*, Ito and colleagues studied patients who exclusively used the traditional fingertip blood glucose testing (FBGT) and introduced these patients to the palm blood glucose testing (PBGT). These patients did not see much benefit in using PBGT over FBGT but did plan to use PBGT in the future (likely allowing for increased testing frequency). Future studies should consider populations of patients who may find more benefit to AST—minimizing barriers and improving compliance in diabetes self-management. Additionally, other barriers to SMBG should be explored and solutions studied to improve compliance in diabetes care.

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Patients with diabetes must frequently monitor their blood glucose. The benefits of self-monitoring of blood glucose (SMBG) include the ability to detect or prevent hypoglycemia, assess treatments (medications, exercise, and medical nutrition therapy), adjust treatments, and improve diabetes mindfulness. Self-monitoring of blood glucose has been shown to improve outcomes, especially in patients who are treated with insulin, and the American Diabetes Association (ADA) recommends the use of SMBG in these patients.<sup>1</sup> Most health care providers see benefits to SMBG, which has traditionally been performed using blood from the fingertip, but many patients have perceived barriers to performing this test—leading to their “noncompliance” in this self-care activity.

Minimizing barriers to testing should theoretically lead to increased satisfaction and improved compliance in SMBG. Some barriers to initiating SMBG include cost per test and the anticipation of pain or scarring from the test. Once initiated, the following disincentives may limit the frequency with which patients test:

- pain experienced,
- difficulty obtaining an adequate sample size,
- accuracy of the test,
- the aftermath (bleeding, calluses, scarring), and
- frustration with suboptimal readings.

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**Abbreviations:** (ADA) American Diabetes Association, (AST) alternate-site testing, (FBGT) fingertip blood glucose testing, (PBGT) palm blood glucose testing, (SMBG) self-monitoring of blood glucose

**Keywords:** alternate-site testing, barriers to self-care, blood glucose, diabetes, self-monitoring of blood glucose

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In this issue of *Journal of Diabetes Science and Technology*, Ito and colleagues<sup>2</sup> present their study that looked at a few of these barriers and what effect, if any, alternate-site testing (AST) had on these barriers. The study collected data describing the patients' experience with AST comparing traditional fingertip blood glucose testing (FBGT) versus palm blood glucose testing (PBGT).

Surprisingly, the results of this study indicate that there is no significant difference between FBGT and PBGT for patients in either anticipating pain or scarring before the test or perceiving pain or scarring during the test. The overall satisfaction of the process skews toward a more positive experience with FBGT—related to ease of obtaining a blood sample.<sup>2</sup> Other studies have reported less pain with AST and a willingness to increase testing frequency with the option of AST. In these earlier studies, the tests were conducted by technicians rather than the patient, which excluded technique as a barrier to using AST.<sup>3,4</sup>

The patients in the study of Ito and colleagues were experienced testers (testing at least three times per day), were reasonably well controlled (hemoglobin A1c level  $7.4 \pm 1.1\%$ ), and were treated with insulin. It is likely that their previous positive experience using FBGT contributed to the lack of enthusiasm for PBGT. They were, however, not opposed to using their palms on occasions in the future.<sup>2</sup> The fact that they are willing to use AST in the future may increase testing frequency in these already compliant patients—likely leading to improved glucose control. These authors recommend further advancement of the AST technology to allow for higher satisfaction.

Further studies should be done to understand how AST can reduce barriers to SMBG and if other patient populations experience less pain and/or less scarring from AST. Two populations that should be targeted in future studies are patients new to testing and patients with “diabetes burnout.” These populations will likely benefit the most from AST and will especially benefit from advanced technology in this area. Both patient populations may be easily frustrated by the difficulty of obtaining an adequate sample from an alternate site.

While AST may reduce pain, the accuracy of AST versus traditional FBGT is frequently called into question. If a patient does not trust the test, the patient may feel that it is necessary to recheck his/her blood glucose on their finger, thereby negating any benefit of AST. Testing on the forearm and thigh has been shown to be

adequately accurate in premeal and steady state levels only.<sup>5</sup> Palm testing, unlike forearm and thigh testing, has been shown to be an accurate substitute for fingertip testing in evaluating blood glucose values at all times (including premeal, postmeal, and postexercise).<sup>3,4</sup>

One barrier to SMBG that is indirectly affected by using AST is the cost of SMBG, and AST may actually increase the cost of testing. The yearly expense of testing blood glucose three times per day (as recommended by the ADA) is over \$1000 per year. According to Bina and associates,<sup>3</sup> FBGT has a 98.3% success rate while PBGT has a 94.5% success rate; this can cost the patient an extra \$90 per year on wasted test strips alone. The only solution to this problem is a reduction in the cost of test strips, but that is an article for another day. For now, any barrier reduction obtained through AST is a step in the right direction.

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