

# Alternate Site Glucose Monitoring: A Welcome Respite

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## Case Presentations

### Case 1

C.K. is a 21-year-old man who has had type 1 diabetes since the age of 8. A sophomore in college, he has been a patient of a comprehensive diabetes care and education program in the Midwest since his diagnosis.

Upon arrival at his latest diabetes refresher course, he handed the nurse educator his business card, which read "Guitarist." The educator asked C.K. if he had been performing self-monitoring of blood glucose (SMBG) at home, and he responded by showing his bruised, tender fingertips.

C.K. is passionate about playing the guitar but had been hindered in this pursuit because frequent SMBG had left his fingertips very sensitive. An insulin pump user, C.K. tests his blood glucose levels at least four times a day, 7 days a week. His careful monitoring of diet, exercise, and

insulin has helped him keep his glycemia under control despite his hectic college schedule.

The educator demonstrated the new Freestyle (Therasense) alternate site meter. C.K. was so excited about alternate site testing that he asked his mother to buy him a new meter that evening.

At his next clinic visit, C.K.'s HbA<sub>1c</sub> concentration was 7.3% and reported that alternate site testing was improving his guitar playing.

### Case 2

B.T. is a 52-year-old man who was recently diagnosed with type 2 diabetes and prescribed two oral agents. He works as a market analyst and spends much of his days at a computer keyboard. Upon diagnosis, he was obese, hypertensive, and hyperlipidemic.

B.T. was extremely anxious about

his diagnosis because of his aversion to sticking his fingertips, which he feared would cause him pain when using the computer.

After he and his wife researched available alternate site meters, he purchased an At Last (Amira) model. Since then, he has faithfully checked his blood glucose levels before meals and 2 h after meals and expressed determination to master the tasks of self-managing diabetes.

B.T. now thrives on studying and testing blood glucose meters. He has compared most of the alternate site meters against each other and is comfortable with testing technique and comparison. His most recent HbA<sub>1c</sub> concentration was 4.3%, which attests to his ability to effectively use glucose monitoring as one important tool in his diabetes self-management regimen. He has lost 9 lb and is no longer on oral agents.

## Discussion

Alternate site testing of blood glucose is a promising new advancement in diabetes care. Several blood glucose meters now have Food and Drug Administration approval for testing with blood taken from alternate sites. These include the Freestyle and At Last meters mentioned above, as well as the One Touch Ultra and One Touch FastTake (LifeScan), and Sof-Tact (Abbott). These meters are approved for testing blood from the finger, forearm, or thigh.<sup>1</sup>

Many patients would welcome a change from the fingerstick testing that has become a standard of SMBG.

This is especially true for those who use their fingertips a great deal, such as computer users and some musicians. Fingertips offer a rich blood supply, but they are also very sensitive to pain.<sup>2</sup>

Alternate site testing may be less painful for such patients. However, there are not many published studies regarding the relative efficacy of alternate site testing.

One study<sup>3</sup> suggests that there is a delay in the ability to detect blood glucose changes when using blood from the forearm as compared to that from the fingertip. When SMBG

results were compared to laboratory-determined blood glucose values, readings using fingertip blood were closely correlated to the laboratory values, whereas those using forearm blood were higher. This finding was most likely caused by the lead/lag time of blood glucose changes. Fingers always lead forearms in the detection of blood glucose changes. The forearm lag occurs because of reduced capillary flow and capillary density in the forearm.<sup>4</sup> In the study, the time delay of the forearm glucose values was demonstrated when blood glucose values were fluctuating.<sup>1</sup>

This delay could be problematic for patients who have symptoms or hypoglycemia or have hypoglycemia unawareness. In such cases, forearm blood glucose measurements may not confirm actual low blood glucose levels. Therefore, if hypoglycemia is evident or if patients have hypoglycemia unawareness, fingertip testing should be used. Manufacturers of alternate site testing meters are stressing this in their contacts with health care professionals and in the owner manuals for their meters.<sup>4-8</sup>

The amount of blood required to perform SMBG with the new testing strips for alternate site meters is minimal: 0.3–1.0  $\mu$ l. This amount is obtainable from the alternate sites using the lancing devices provided. However, because of decreased capillary volume in the arm, patients testing from a forearm may need to rub their arm before the stick to obtain an adequate blood sample.<sup>5</sup> The amount required is also easily obtainable from the side of the finger. If there is any question regarding the accuracy of the alternate site value, a fingertip reading should be taken to confirm it.

### Surveys

We conducted informal surveys of patients in a private Midwestern endocrine practice and a Western diabetes education program. A majority of the patients surveyed were interested in alternate site testing, although some remained comfortable with the fingerstick method.

Many patients reported that alternate site testing was desirable because it was less painful and required a smaller blood sample than fingerstick testing. Patients who were not interested in changing to an alternate test site meter gave reasons including the possibility of bruising at alternative sites, difficulty in obtaining

an adequate blood sample, and reluctance to change their present routine.

We also conducted an informal survey of 23 children ages 5–8 at the Kansas Diabetes Day Camp. All of those surveyed expressed interest in alternate site testing. The main reason for this interest, as one child succinctly put it, was that “It doesn’t hurt as much.” In response to this growing interest, some of the companies have donated meters for campers.

Anecdotally, some health care professionals involved in the education and care of young patients with diabetes have reported a change in the outlook of patients and their parents after introducing alternate site testing. Said one Midwestern diabetes educator and family therapist, “I have noticed the most dramatic response from parents of diabetic children. The parents seem relieved when offered an alternative to what can be a painful routine for their kids.”

### Summary

According to the available literature and our own informal surveys, alternate site blood glucose testing is appealing to many patients with diabetes. Alternate site testing may improve patients’ compliance with their diabetes management regimen by reducing the pain of testing, decreasing apprehension for newly diagnosed patients, decreasing resistance to testing from children with diabetes, and offering patients a choice of several test sites. The risks of alternative site testing may include inaccurately high forearm readings and inadequate collection of an appropriate-sized blood sample. With additional studies and continued development of blood glucose meters in the future, alternate site testing will likely be used by more patients and with more confidence.

### References

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**Note of disclosure:** Ms. Hinnen serves on an advisory panel for Home Diagnostics, Inc., which manufactures blood glucose meters.