

Finger Stick Blood Glucose Testing in the Healthy Athletes Setting

Date: March 1, 2012

Purpose: To determine the efficacy and advisability of providing finger stick blood glucose testing to Special Olympics athletes in the Healthy Athletes setting.

Recommendation: Given the state of current technology available for measuring blood glucose via finger stick blood samples, it is recommended that Special Olympics **not** offer this type of blood glucose screening to its athletes in the Healthy Athletes setting.

Summary: Accurately measuring blood glucose is a method by which diabetes is diagnosed. Typically, in the clinical setting, the subject is required to fast for eight hours prior to a blood sample being taken. The sample, usually filling a blood vial, is taken from the antecubital veins (the veins opposite the elbow) and is sent to a lab for analysis. Utilizing this method, blood glucose values under 70 indicate hypoglycemia, above 70 but below 100 indicate normoglycemia, above 100 but below 126 indicate pre-diabetic normoglycemia, and above 126 indicate diabetes. This method is the most commonly used method of testing for diabetes. There are other tests that also may be utilized, but each requires a “full blood draw” as described above. Though these methods of testing are quite accurate, for many reasons, they are not practical or advisable in the Healthy Athletes setting.

Recently, there has been discussion about utilizing finger stick blood glucose technology as a screening methodology for diabetes in the Healthy Athletes setting. The finger stick test offers numerous practical advantages in that it requires only a few drops of blood, the machinery involved costs less than \$100 per unit, there is no need to involve a third party laboratory and there is no need to worry about storage of blood samples onsite. Additionally, there is typically less pain and less anxiety for people who are afraid of needles or blood.

In the Healthy Athletes setting, requiring an 8-hour fast prior to testing is an impossibility, thus the only practical protocol in question would be the protocols surrounding “random glucose screening.” In the clinical setting, it is understood that random glucose screening is a less accurate methodology. The cut-off value for random glucose screening is 200. Assuming that the test itself is very accurate (that is, utilizing a full blood draw), the fact that athletes could be tested in various states of fasting means that it is entirely conceivable that athletes whose 8-hour fasting blood glucose is 180 (clearly in the diabetic range) would not be considered at-risk for diabetes because their glucose levels were not above 200 on a random glucose screening test. While this testing methodology would clearly have high false negative rates, athletes who were screened above 200 would like be properly classified as being at high risk for diabetes. This methodology can be acceptable utilizing a full blood draw, because the full blood draw test is very accurate. Though

usually a positive finding (above 200) on the test would be followed up with a more definitive test.

According to multiple sources, including the American Diabetes Association, finger stick blood glucose meters meet an industry standard of +/-20% on 95% of the samples taken. In other words, if 100 samples are taken, 95 of those samples would show a glucose value that is within +/- 20% of the subject's actual blood glucose, and five of those samples could be outside of that range. This level of accuracy poses a problem for utilizing finger stick glucose testing in the public health (Healthy Athletes) setting. For this reason both the American Public Health Service and the American Diabetes Association advise against it.

As an example, utilizing finger stick glucose screening, a fasting athlete with a true blood glucose level of 248 (highly abnormal) could receive a reading of 199 (normal, by this protocol) and still be within the industry standard. Alternatively, an athlete could have a completely normal non-fasting blood sugar reading of 164 on this test and be referred inappropriately for further testing. Given the wide range of accepted variability in this technology, finger stick blood glucose testing is neither a sufficiently sensitive nor specific means by which to screen athletes for diabetes. In other words, utilizing this testing methodology would produce such a high degree of false positive results and false negative results that the recommendations for either further testing or no further testing would be highly inaccurate.

While it would be theoretically possible to increase either the specificity or sensitivity of the test by increasing or decreasing the cut-off values, such an increase in sensitivity would necessarily come with a decrease in specificity or vice versa. In other words, it would be possible to virtually assure that 95% of the referrals made represented true cases of diabetes, however, in doing so there would be a significant increase in the number of true diabetics who would be classified as normal by this test. Unfortunately, there are no widely accepted medical protocols that support doing this.

In conclusion, the accuracy of the finger stick glucose technology is not sufficient enough to warrant offering it as part of a public screening methodology for diabetes. The use of this methodology would simply produce too many false negative and false positive results. Thus, until this technology improves, it is recommended that Special Olympics not offer finger stick blood glucose testing to its athletes at this time.

Matthew Holder, MD, MBA
Global Medical Advisor
Special Olympics, Inc.