

Analysis Article: Accuracy of the DIDGET Glucose Meter in Children and Young Adults with Diabetes

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Abstract

Diabetes is one of the most common chronic diseases among American children. Although studies show that intensive management, including frequent glucose testing, improves diabetes control, this is difficult to accomplish. Bayer's DIDGET[®] glucose meter system pairs with a popular handheld video game system and couples good blood glucose testing habits with video-game-based rewards. In this issue, Deeb and colleagues performed a study demonstrating the accuracy of the DIDGET meter, a critical asset to this novel product designed to alleviate some of the challenges of managing pediatric diabetes.

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Reported in this issue of *Journal of Diabetes Science and Technology* are the findings of a study conducted by Deeb and colleagues¹ that assesses the accuracy of the DIDGET[®] blood glucose monitoring system in 123 pediatric patients with either type 1 ($n = 118$) or type 2 ($n = 5$) diabetes. During a single visit at a participating research site, a health care provider (HCP) instructed each subject and his or her parent/guardian how to use the DIDGET meter and then performed a deep finger stick to produce a capillary sample that was then used to perform duplicate blood glucose readings with the DIDGET meter: one by the provider and another by the subject. The subjects were instructed to use their usual meter-handling techniques during the study and most ($n = 114$) used the DIDGET meter without physical assistance from an adult. Samples were run in concert through a Yellow Springs Instrument (YSI), which yielded reference values for this study. In addition, some subjects agreed to a concomitant venous blood

draw in order to produce samples ($n = 94$) that were artificially modified to analyze blood glucose levels of a wider range (25.7 to 563.5 mg/dl). The DIDGET meter performed well according to International Organization for Standardization 15197:2003, in that 97.8% of values were within 15% of reference values for blood glucose levels <75 mg/dl and within 20% for values ≥ 75 mg/dl. There was a high correlation between the YSI values and the DIDGET meter readings ($r^2 = 97.2\%$, excluding those done by the HCP) as well as the capillary and modified venous samples combined ($r^2 = 98.2\%$). Clinical accuracy was also high according to the Parkes consensus error grid analyses, and within-person variability was 6.4%. There were no directly related adverse events, and the accuracy of the meter was not affected by the patients' hematocrits.

Deeb and colleagues¹ provide evidence that the DIDGET blood glucose monitoring system is an accurate tool to

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Abbreviations: (HCP) health care provider, (YSI) Yellow Springs Instrument

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measure capillary glucose in pediatric patients who are given basic instructions and standard supervision. The accuracy of the meter is an indispensable feature of this novel system that couples blood glucose testing habits with video-game-based rewards. Importantly, in a separate study, it was shown that the majority of DIDGET users indicated that the system “motivated blood glucose testing” and “promoted good testing habits.” Additionally, the HCPs of these patients agreed that it would be “motivating” and “fulfill a need in diabetes management.”² Of note, in this study, the finger sticks were performed by the HCP, allowing for consistency in blood sample quality. Such consistency, a component of optimal blood glucose testing, unfortunately cannot be guaranteed in real-life settings in which older children test their blood glucoses without direct supervision.

According to the product’s Web site³ the DIDGET meter works by attaching to a Nintendo DS or DS Lite system. Based on the user’s blood glucose testing history, points are awarded in a game called *Knock ‘em Downs: World’s Fair*. These points are used to access “minigames” and higher levels within the game. The amount of points users can earn is based on (1) daily testing frequency (maximum points for four times per day), (2) blood glucose results that are within a self-determined target range, and (3) consistent testing, giving the player the most points for testing 90 days consecutively. The primary objective of *Knock ‘em Downs: World’s Fair* is not to learn more about diabetes itself; however, it does incorporate quizzes related to diabetes topics such as carbohydrate counting. The Nintendo DS system—according to Nintendo, the best-selling gaming system in the United States—must be purchased separately.

There are a few critiques of this system. The DIDGET meter does not communicate with insulin pumps, an increasingly common way for children with diabetes to receive insulin. Therefore, pump users must manually input their glucose values directly into the pump. At this time, the DIDGET system interacts with only one game, *Knock ‘em Downs: World’s Fair*. A larger gaming audience may be reached if the system could be linked to a variety of games. Additionally, the cost of purchasing a gaming system may be prohibitive for some individuals.

With childhood onset type 1 and type 2 diabetes on the rise,^{4–7} innovative methods to encourage blood glucose self-monitoring among the pediatric population is a prime concern for HCPs and parents. Pediatric diabetes is a disease that demands a high level of patient and

parent participation for its management, an important component of which includes frequent, consistent finger stick glucose testing.⁸ Though parents/guardians are responsible for accomplishing diabetes care outside the office, the patient’s willful participation in the process is of significant value.⁹ Bayer has taken a significant step in mitigating some of these challenges by producing the DIDGET blood glucose monitoring system, which links diabetes care with an extremely popular form of entertainment. The Entertainment Software Association reports that 72% of American households play computer and video games and 18% of all game players are under the age of 18. Fifty-five percent of gamers play video games on phones or handheld devices.¹⁰ Video games have been utilized in the past in order to encourage positive health-related behaviors¹¹ and may prove to be effective in the future. This study takes one of several steps needed to demonstrate that the DIDGET blood glucose monitoring system can make a significant impact on diabetes self-management. If so, Bayer will succeed in creating a novel and timely product that caters to the pediatric diabetes population and helps makes the often burdensome management of this disease more fun.

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