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Analysis of the NovoPen[®] Echo for the Delivery of Insulin: A Comparison of Usability, Functionality, and Preference among Pediatric Subjects, Their Parents, and Health Care Professionals

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Abstract

In the current issue of *Journal of Diabetes Science and Technology*, Dr. Olsen and colleagues analyzed the attitudes of children, their caregivers, and health care professional towards the usability, functionality, and preference of the NovoPen[®] Echo (Novo Nordisk Inc., Princeton, NJ). A comparison is made to two other insulin pen devices with half-unit increment capability—the NovoPen Junior and the HumaPen[®] Luxura[®] (Eli Lilly and Company, Indianapolis, IN). Their results support the idea that the NovoPen Echo has the highest overall satisfaction among pen devices capable of delivering half-unit increments, is equally simple to assemble and inject, and has the added benefit of a simple recall memory function. A major concern is their finding that fewer adolescents dialed a dose correctly with NovoPen Echo than with the other two pens tested. Furthermore, the true test in validating their claims of the importance of this device lays in future studies, which should be undertaken to demonstrate that a preferred delivery device actually leads to improved compliance in children and adolescents with type 1 diabetes.

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Diabetes care and insulin delivery in pediatric patients presents a great deal of challenges that differ from those in adults. Children can be extremely sensitive to very small changes in insulin doses, particularly those with newly diagnosed diabetes in the honeymoon phase and the very young children (under 5 years of age). Therefore, the ability to accurately draw up and administer small incremental doses of insulin in this population is critical. The introduction of insulin pens capable of delivering insulin in half-unit increments is of great advantage in this regard. Unfortunately, insulin pen delivery devices for the pediatric population remain limited in number. Currently, many pediatric patients have to choose between the NovoPen[®] Junior (Novo Nordisk

Inc., Princeton, NJ) and the HumaPen[®] Luxura[®] (Eli Lilly and Company, Indianapolis, IN). The NovoPen Echo was developed and targeted towards the pediatric population, combining the half-unit dosing option and a memory function to display the last dose given. Additional features, such as customizable colored skins, have made the NovoPen Echo a child-friendly evolution of the pediatric insulin pen devices.

In their article, Olsen and colleagues interviewed 205 total participants: 79 children, 78 parents, and 48 health care providers. They analyzed various aspects of the NovoPen Echo to determine its usability and preference among those interviewed. Ultimately, compared to the

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NovoPen Junior and HumaPen Luxura, they found that 80% of participants preferred the NovoPen Echo to the other pens (P < 0.0001).

The authors evaluated many aspects of the pen's features by performing usability and preference assessments. One of the attractive features of this study was the unbiased ability of either the parent or child to answer questions and demonstrate the proper use of the device. The investigators laid the device in front of the family and asked them to handle the pen injector as they normally would. Whoever picked up the device (either the parent or the child) then answered the questions and displayed device use. In pediatrics, there is a transition period during growth and development, and children often take greater roles in their own care as they become more mature and knowledgeable about their disease. This also means they give their own injections, making their opinions of the pen devices and their ability to use them properly more pertinent to the value of the results.

The memory function of the pen had an overall rating of 89% user-friendliness as very easy or easy to use in pediatric subjects as compared to 94% in parents. There is no mention of health care providers in the analysis of the memory function. Although there is high overall satisfaction with the memory function, there are no other pediatric pens with memory capability available to compare overall satisfaction ratings. In our opinion, this is a positive note to the makers of the NovoPen Echo for advancing the technology of the pediatric insulin pen devices. Memory functions can be helpful in recalling bolusing information, especially when multiple people can be administering the child's insulin doses. This is highlighted in the authors' discussion of the importance of the care provided by school nurses. Their ability to recall the last dose administered can greatly aid in their decision making and management decisions. Memory functions also allow parents the ability to monitor a child's compliance with insulin administration. This can be beneficial to adolescents who are transitioning to more independent diabetes care but still need monitoring and supervision.

The size and weight of the insulin pens is critical, as for any device meant to be portable and easy to store. Additionally, the attractiveness of a device, casually termed the "cool factor" by many children and adolescents, is key in getting children to remember and want to always carry the pens with them. When comparing the size and weight of the three pens, the NovoPen Echo strongly surpassed the NovoPen Junior and the HumaPen Luxura. The NovoPen Echo's option of personalizing the pen with a skin may contribute to greater overall adherence. It is hopeful that a more appealing insulin pen will eliminate the fear or embarrassment of administering injections in public or at school. While these theories all support the NovoPen Echo as a better choice over the other two pens, statistical data showing improved adherence and positive psychosocial outcomes may be difficult to analyze but should be a goal of future studies.

The Diabetes Control and Complications Trial clearly showed that tight glucose control is important to minimize microvascular and macrovascular complications.¹ Achieving optimal glucose control relies on regular administration of proper insulin doses. In this regard, we found some of the authors' results concerning. The usability assessment portion of the study reviewed setting up, adjusting, and injecting with the various pen devices. Importantly, the NovoPen Echo was found to be the most difficult pen to set up. It was also found to be the second most difficult for dose dialing, with the HumaPen Luxura producing better results. When pediatric subgroups specifically analyzed for dialing the dose were successfully, they found that "fewer adolescents dialed a dose successfully with NovoPen Echo compared with adolescents using NovoPen Junior and HumaPen Luxura HD." When children were analyzed, "more children completed the dialing task successfully with NovoPen Echo and NovoPen Junior compared with children using HumaPen Luxura HD. However, more children found it easy/very easy to dial with NovoPen Junior compared with NovoPen Echo."

In their discussion, the authors cite the lack of knowledge of having to pull out the dose button as a reason why some of those studied failed to deliver the doses properly with the NovoPen Echo. If this limitation poses a hindrance to proper use, perhaps a design change emphasizing this dose button would be beneficial, as it may ultimately detract in use from those who are less mechanistically inclined.

As Olsen and colleagues point out, diabetes control and management is more difficult in children and adolescents, with frequent lack of compliance leading to increased rates of hospitalizations for ketoacidosis. There are a multitude of factors causing poor compliance and glucose control including the insulin resistance seen in puberty, behavior struggles in adolescence, family involvement, parental diabetes-specific knowledge, youth negative effect related to blood glucose management, and parental perceived burden.² There are also disparities among various ethnic and socioeconomic groups.³ To address these issues, one of the choices providers and families make is in insulin delivery devices that are most ideal for every individual. For all of these reasons, we would have liked to see more information detailing the characteristics of the study participants, particularly the children and their families. This may have highlighted the potential benefit and increased the value of the NovoPen Echo for a particular demographic of children.

Prior studies have already shown that pen devices are more accurate than insulin syringes in measuring out insulin at low insulin doses,⁴ a key actor for more precise control in pediatric patients who have smaller insulin requirements. The critical question remains whether a device preferred by children for its functionality, design, and portability will translate to improved compliance. One such study⁵ in adults showed increased compliance in those prescribed insulin pens versus vials and syringes. Such benefits in children and adolescents would greatly reduce the acute and chronic complications associated with poor glycemic control.

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