Insulin Pumps

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I saw a 71-year-old man with type 1 diabetes last Thursday. Of his 58 years of living with diabetes, I've helped provide medical care for 7. He came to see me after his previous physician retired. A stoic, tall man with penetrating eye contact, he prefers to see doctors "as infrequently as possible." Still, he dutifully comes in twice a year and on occasion will try "new stuff." He has seen a lot of "new stuff" in 58 years of living with diabetes.

From the isolation of insulin in the early 1920s to the ability to self-monitor blood glucose in the 1970s, the field of diabetes has enjoyed many advances that have the potential to improve the lives of those with diabetes. The value of some of these advances is unequivocal. Although death will visit us all, it cometh much quicker to individuals with type 1 diabetes who are off insulin. The gentleman above would not have seen his 17th birthday, let alone his 71st, without insulin. On the other hand, the eighth angiotensin receptor blocker on the market is unlikely to yield meaningful societal benefit.

In this issue of *Clinical Diabetes*, Jay S. Skyler, MD, MACP, and his colleagues address an important advance in diabetes care: the insulin pump (p. 50). Skyler et al. highlight several benefits of pump therapy, and yet its use continues to be relatively small, despite the increase in diabetes prevalence

witnessed during the past 2 decades. Although the prevalence of diabetes is estimated to exceed 20 million in the United States, < 1% (~ 150,000 patients) use a pump. The diffusion of this product, introduced > 25 years ago, is in part a function of its efficacy, safety, cost, and convenience.

There seems little doubt that insulin pumps, in an appropriately selected group of patients, are able to improve glycemic control. Yet today, the ability to improve glycemic control is hardly the characteristic with which devices or pharmaceuticals distinguish themselves in the area of diabetes care. Avoidance of side effects has been a far easier means of separating one device or drug from another. Improvements in glycemic control are beset by two seemingly unavoidable fellow travelers: hypoglycemia and weight gain. In the landmark Diabetes Control and Complications Trial, which firmly established the benefits of glycemic control, there was a threefold increase in the development of hypoglycemia.[1] The ability of insulin pumps to improve glycemic control while reducing the frequency of hypoglycemia compared with multiple daily injections is best supported in type 1 diabetes and when compared with older insulin preparations. That is to be expected because type 1 diabetes is more associated with hypoglycemia, and older insulin preparations were more likely, owing to their pharmacokinetics, to cause hypoglycemia. Whether pumps using rapid-acting insulin analogs will continue to demonstrate a substantial superiority, beyond some smaller initial studies, when compared with multiple daily injections using both long-acting and rapid-acting newer analog insulin preparations remains to be seen. And although I have several type 2 diabetic patients on a pump who would never consider stopping, my decision to start them on pump therapy was based less on "evidence" and more on having exhausted other options or the existence of a strong patient preference.

The cost of a pump will be prohibitive for some. An initial outlay of ~ $6,000–7,000 and nearly $3,000 in yearly supplies is substantial. Although an analysis showing prevention of emergency department visits or the like as support for its cost-effectiveness may have useful policy implications, it hardly provides solace to individuals who have to cover part or all of this expense out of pocket. This is particularly relevant in type 2 diabetes, for which insurance approval for pump therapy can be difficult. A different type of cost is borne by medical practices that maintain patients on insulin pumps. Although manufacturers will provide meaningful assistance in initiating pump therapy, practices that follow pump patients must have an adequate infrastructure to support the ongoing use of these devices. The detailed description of the type of health care team needed is a particularly useful contribution by Skyler et al. in their article in this issue.

Despite some quibbles about the compelling nature of the data demonstrating superiority of pumps compared to other options and the significance of the cost involved, many of my patients seem to like pumps. Individuals with type 1 diabetes in particular describe a "finger-tip feel" for controlling their blood glucose that they just can't get with other approaches. They like the convenience of "pushing a button." And although there is a clear selection bias for those who choose to wear a pump, these patients are, at the very least, perfectly adherent with the basal portion of their insulin delivery regimen. After an individual has used a pump for a decade or so, we start having problems finding good sites for insertion. But often they are ready to go back to the pump after a couple of months of using syringes or pens again.

Not all patient experiences are so positive, however. The patient I mentioned at the start of this article tried a couple of different pumps a few years ago, before seeing me, and didn't much care for them. Maybe it was because his diabetes was already reasonably well-controlled, and he never felt that a pump provided added value; he loves insulin pens. Maybe it was because he was a physician and already wears a pedometer, a pager, a cell phone, and, recently, a continuous glucose sensor.

Pumps are a reasonable option for motivated, disciplined individuals who either struggle to control their glucose with standard options or prefer the convenience of a pump. Although pumps are certainly not the option for most people with diabetes, they are likely underused not only because of a lack of awareness by both physicians and patients, but also because of the need for a health care team to both initiate and maintain this advance in diabetes care in practices that wish to use it.

REFERENCE

[1]The DCCT Research Group: The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *N Engl J Med* 329:977–986, 1993