Journal of Diabetes Science and Technology
Volume 2, Issue 2, March 2008

COMMENTARY

Insulin Pen—The "iPod" for Insulin Delivery (Why Pen Wins over Syringe)

Ernest Asamoah, M.D., FACP, FACE, FRCP

Abstract

Diabetes affects most aspects of everyday life and places considerable responsibility on the patient; therefore, without patient acceptance of what we offer, the therapy is unlikely to be adhered to especially when that therapy happens to be insulin injection. In 2008, almost every physician/health care provider carries new and sleek cell phones (because the newer ones are well designed and function better). Why these same providers continue to prescribe insulin via syringes in 2008 is something that I cannot fathom. Previously, some insurance companies only paid for vials and there was no other choice, but today almost all insurance pay for pens and so the "insurance reason" is no longer tenable. Since Banting and Best discovered insulin in 1921, scientists have continued to improve the types of insulin (making them mimic physiology more closely in order to minimize hypoglycemia and improve glycemic control as seen with the latest analog insulins). In the same manner, the delivery process of insulin has also continued to evolve to make it easier and more acceptable to patients. Studies have shown that patients prefer device use over traditional vials/syringes. Pen devices used to inject insulin lead to better compliance, are quicker to inject, dosing is much more accurate, and, *surprisingly, are more cost effective*. I challenge my colleagues to take full responsibility for what their patients use. If a provider believes in pen devices, most of his/her patients will use them. The products your patients use is a direct reflection of what you practice. Educating providers to change their beliefs and practices is key to moving American diabetic patients from syringes to pen devices.

J Diabetes Sci Technol 2008;2(2):292-296

Introduction

Glycemic control is so critical for our diabetic patients because every major study published has shown convincingly that lower hemoglobin A1c (HbA1c) equals a reduction in diabetes-related complications.[1] For most patients though, the only way to prevent or minimize these complications is to use insulin therapy because of the progressive nature of type 2 diabetes.

For decades, insulin was delivered only via vials and syringes with larger bore needles that caused a lot of

Author Affiliation: Diabetes and Endocrinology Consultants, Indianapolis, Indiana

Abbreviations: (HbA1c) hemoglobin A1c

Keywords: analog insulin, insulin delivery device, pen, vial/syringe

Corresponding Author: Ernest Asamoah, M.D., Diabetes and Endocrinology Consultants, 7440 N. Shadeland Avenue, Suite 200, Indianapolis

pain. Many people with diabetes still believe that these needles are still large and painful, but in 2008, this could not be further from the truth.

There are numerous reasons why using pen devices make a whole lot of sense. Compliance with treatment is better because a pen device is easier to carry around, easy to use, provides greater dose accuracy, and is more satisfactory to patients as compared with a syringe. Injecting with devices makes the process discreet, and the overall cost of managing diabetes is also reduced.

The surprising fact is that among industrialized countries, the United States ranks last in terms of pen usage by diabetic individuals, even though the use of pen is increasing.

Advantages of Pens over Syringes

A. The current disposable pens are easy to teach, and for me that has been the best part of starting insulin therapy. Even when my nurses or medical assistants are too busy to teach patients, I can do so within 5 minutes and give the patients a handout with further instructions to take home.

B. Using 30/31-gauge short needles with pens has significantly reduced the needle phobia that patients have about taking injections. *The reason why these needles are less painful is that they do not have to be inserted into a vial first (thereby destroying the fine coating on the tip, hence the pain on injection).*

   Many times I consult patients who need to start insulin and they flatly refuse (for a number of reasons). A classic case report is as follows. A 39-year-old male patient with an HbA1c of 9.5% who has had diabetes for 8 years (after severe pancreatitis) was referred for further management. He told me that if he was to go on insulin, he would rather die than do so. After discussing the myths about insulin and reassuring him of the benefits, the biggest hurdle for him was the fact that he had to inject himself. When I showed him a pen device with the needle and the process, all his resistance faded, he walked out of my office ready to take insulin, and is now a happy patient. This scene is literally repeated several times a month in my office.

C. Teaching patients how to use pens in the office as opposed to sending them to an off-site office reduces some of the hassle of insulin initiation.

D. Another important advantage of pen devices is their portability and their ability to be used discreetly. These features help render insulin therapy more socially acceptable, especially to younger patients who may be sensitive to peer group approval and the embarrassment and stigma surrounding injections. Several studies suggest that patients feel less conspicuous carrying a pen device and more comfortable about using it in public compared with using a syringe.

E. Pen devices (e.g., NovoPen®) have been shown to be more accurate than syringes for the delivery of doses of insulin ≤5 units[2,3] and so may benefit children and adolescents who usually require smaller doses.

F. Patients across all age spectrums have unique challenges for which pen devices help address.

   - For children, needle fear is minimized significantly (e.g., with the new Novo autocover needle).
   - Adolescents like pen devices for their social acceptability—they are "cool."
   - Older patients with diabetes who have comorbidities or disabilities (e.g., visual impairment, impaired motor skills) that may exacerbate the difficulties of self-injection and increase the risk of dosing errors can find solace in using a pen-injecting device that overcomes some of their limitations.

Indeed, studies suggest that insulin preparation by elderly patients is highly inaccurate[4]; in one study in patients >60 years, the insulin dosage became less accurate as age increased, such that two-thirds of patients >75 years were found to be injecting the wrong dose.[5] Patients with visual impairment have been shown to feel more active and more relaxed about insulin injection when using a NovoPen-based regimen[6] with its useful audible clicks. These benefits are likely to be applicable to other pen devices.

Clinical Studies Comparing Pens and Syringes

- Results from two multicenter, randomized, open-label, crossover trials in insulin-experienced patients with type 2 diabetes were analyzed. The trials assessed the efficacy and safety of the Novolog Mix 70/30 FlexPen, as well as preference for this device compared with a vial/syringe (n = 121). Results showed that 74% of

patients preferred the Novolog Mix 70/30 FlexPen compared with the vial/syringe device.[7]

- A 2001 mail survey examined respondents' preferences for pen devices and vials/syringes between insulin naïve and insulin users.[8] A total of 242 type 1 and 2 patients (99 were insulin users and 143 were insulin naïve) completed a 19-item self-administered questionnaire designed to assess their expectations of attributes related to these devices. These items were analyzed on a five-point Likert-type scale with higher scores indicating greater agreement that attributes met expectations. Finally, the composite scores for ease of use, activity interference, and social acceptability were used to further examine differences among patients regarding their preference for either syringes or pens.

  The overall preference was higher for the pen device compared with the vial/syringe (**Table 1**). Social acceptability was the strongest predictor of preference for the pen device. For current insulin users, social acceptability and ease of use were the significant predictors of preference for pens.

  The inference therefore is for providers to place emphasis on *ease of use* and *convenience of pen* devices when initiating insulin therapy.

Table 1.
Comparison of Pens/Syringes

	Pens	Syringes
Ease of use	Yes	No
Patient acceptance	Yes	No
Reduces needle phobia	Yes	No
Dosing accuracy	Yes	No
Cost-effective	Yes	No
Patient preference	Overwhelming yes	No
Convenience	Yes	No

- Another study evaluated patients' preferences for an insulin delivery system by comparing a disposable device (InnoLet) to a vial/syringe.[9] This was a prospective, randomized, open-label, two-period, crossover study. A total of 262 (mean age of 60) type 1 or 2 diabetic patients were enrolled with 162 completing the study.

  Eight-item diabetes fear of self-injection questionnaires were administered at baseline, week 12, and week 24. These items were rated on a four-point Likert scale (1 = almost never, 4 = almost always) with a maximum fear score of 32. The patients also completed a preference survey at week 24.

  These patients reported a significantly lower fear of self-injection after using the InnoLet device compared to the vial/syringe method (mean ± SEM: 9.5 ± 0.2 vs 11.2 ± 0.4; $p < 0.0001$). The majority of patients (71.5%) indicated a preference for the InnoLet device compared to the vial/syringe method ($p < 0.0001$).

Cost Benefit of Pens vs Syringes

The argument in the past has been that pen utilization for insulin delivery is more costly than syringes. That argument is no longer tenable, as most insurance companies cover these pen devices. Moreover, studies show that the overall cost of health care delivery is reduced with pens.

A. In a 2007 observational study, initiating insulin therapy using a preloaded insulin pen was shown to be associated with reduced health care utilization compared with using traditional vials and syringes, and just as in a previous study in 2006, the reduced use of health care resources translates directly into cost savings.[10]

   Pawaskar *et al.*[10] accessed the North Carolina Medicaid program patient-claims database to compare costs related to starting of insulin therapy using either pens (NovoPen or FlexPen, Novo Nordisk, Inc.) or syringes. A total of 1330 type 2 diabetic patients (1162 using syringe vs 168 using pen) patients enrolled in the Medicaid program between September 2001 and July 2006 and who had completed at least 24 months follow-up were analyzed.

   Excluding prescriptions cost, the total annual health care cost averaged roughly $14,900 in the pen group and $32,000 in the syringe users. The cost savings were driven primarily by a reduced use of hospital-based treatment (approximately $1200 and $5000, respectively).

   Even though the initial cost of an insulin pen is greater than that for syringes (looking at the amount one pays at the pharmacy), the overall cost benefits of using pens exceed those for syringe use.

   Pawaskar and associates[10] concluded that "diabetes management programs should therefore be designed

with components to improve patients' awareness of insulin devices and encourage their use in low-income minority populations with type 2 diabetes to prevent excessive expenditures for other health care resources."

B. Lee and colleagues[11] also showed similar cost-effectiveness when insulin pens were used in preference to vials/syringes in 2006. This study looked at patients records and showed that converting from vials/syringes was associated with a significant improvement in medication adherence and a reduced likelihood of experiencing a hypoglycemic event (odds ratio = 0.50; 95% confidence interval = 0.37–0.68; $p < 0.05$).[11]

Even more practical (for those concerned about cost) was that all-cause annual treatment costs were reduced by $1590 per patient (from $16,359 to $14,769; $p < 0.01$) (**Figure 1**).

The key indicators for good diabetes management were impacted in this study and also the overall cost to the health care system was reduced by going from vials to pens.

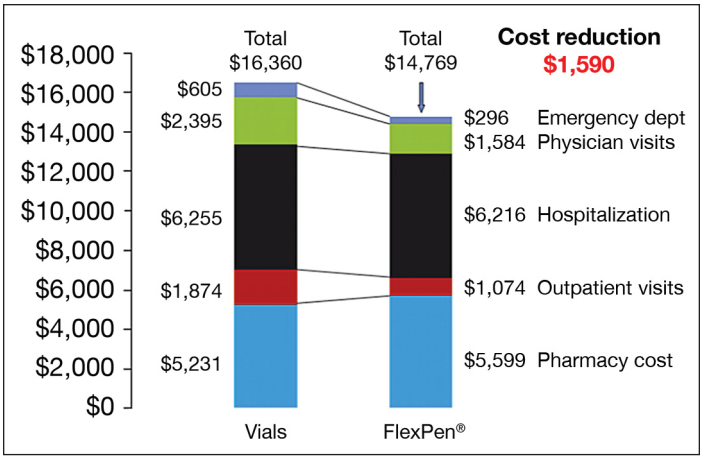

Figure 1. FlexPen vs vial/syringe results: adherence, hypoglycemia, and health care costs. From Lee *et al.*[11]

Figure 2. Pen devices used for injecting insulin.

Modern Delivery Devices

Various pen devices have been on the market, including Novo Nordisk's FlexPen, InDuo; Sanofi-Aventis' OptiClik, Solostar; and Lilly's HumaPen, Memoir (**Figure 2**). These devices are all designed to be patient friendly. Diabetes educators, nurse practitioners, and even the sales representatives of the companies that market these devices offer training on them. DVDs and other teaching materials are also readily available to providers and patients.

Device Preference

Providers may have personal preferences on which devices are better. I believe that what is more important is to initially convince patients to go on insulin sooner (if needed) in order to get glycemic control and to get them to use analog insulins (which cause less hypoglycemia). Using pens with analog insulins is a win–win situation. Again, as with cell phones, in 2008 there are many new devices and all offer various features that may appeal to different people (one size does *not* fit all).

Conclusion

The diabetic patient is faced with many challenges in managing their condition and the least that providers can do for them is to make their lives easier. Discussing and prescribing pen delivery devices to use for insulin injection are major help we can provide.

The benefits of using devices are clear—pen devices are preferred by patients because they make insulin administration easy and convenient. They also offer lifestyle flexibility and reduced pain, both of which are considered likely to translate into enhanced quality of life and compliance. Remember, your patients reflect you in many ways and what you discuss or not discuss is what they will do.

I often ask providers what their preference would be if they had diabetes and *all* of them say they prefer pens over syringes. "What is good for the goose (physician) is also good for the gander (patients)" so unless cost is truly a barrier, there is no reason whatsoever to start insulin therapy with a vial/syringe.

The question as to which pen is more acceptable to patients is not what I intended to address here because I think that is a secondary issue when one looks at the big picture. As long as the pen device chosen is acceptable to patients and makes them comply more with treatment, the issue of which pen is used is of secondary importance, especially when larger insulin doses are delivered.

Therefore, I argue strongly that a pen device should be the first option offered to new insulin starters and that patients already using vials should also be offered the opportunity to convert to pens (unless they choose not to or there are other compelling reasons not to do so).

This can only happen if providers know about the new insulin pens available and are educated about them as well as feel comfortable using them. Any provider taking care of diabetic patients owes it to his/her patients to offer the *best* option, and in this situation (vials vs pens), there is a clear winner—pens.

Acknowledgment:

Thanks go to Dr. David Klonoff for inviting me to write this commentary and for some material support.

Disclosure:

I am a consultant and on the speaker bureau for Sanofi-Aventis, Novo Nordisk.

References:

1. The Diabetes Control and Complications Trial 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. 1993;329:977-86.
2. Gnanalingham MG, Newland P, Smith CP. Accuracy and reproducibility of low dose insulin administration using pen-injectors and syringes. Arch Dis Child. 1998;79:59-62.
3. Gnanalingham MG, Newland P, Smith CP. An evaluation of NovoPen, BD-Pen, and syringe devices at small doses of insulin [abstract no. P118]. British Diabetic Association's Medical and Scientific Section Spring Meeting; 1998 Mar 25-27; Heriot Watt University, Edinburgh; 1998. p. S49.
4. Coscelli C, Calabrese G, Fedele D, Pisu E, Calderini C, Bistoni S, Lapolla A, Mauri MG, Rossi A, Zappella A. Use of premixed insulin among the elderly. Reduction of errors in patient preparation of mixtures. Diabetes Care. 1992; 15(11):1628-30.
5. Liebermeister H, Sammler A. Problems of the elderly, insulin injecting diabetic patients in ambulatory care [in German]. Versicherungsmedizin. 1990;42(2):59-64.
6. Hyer SL, Froyd HE, Kohner EM. Effect of the NovoPen on glycemic control and patient independence in diabetics with visual impairment. Practical Diabetes Int. 1988; 5:197-9.
7. Korytkowski M, Bell D, Jacobsen C, Suwannasari R; FlexPen Study Team. A multicenter, randomized, open-label, comparative, two-period crossover trial of preference, efficacy, and safety profiles of a prefilled, disposable pen and conventional vial/syringe for insulin injection in patients with type 2 or 3 diabetes mellitus. Clin Ther. 2003;25:2826-48.
8. Stockl K, Ory C, Vanderplas A, Nicklasson L, Lyness W, Cobden D, Chang E. An evaluation of patient preference for an alternative insulin delivery system compared to standard vial and syringe. Curr Med Res Opin. 2007;23(1):133-46.
9. Summers KH, Szeinbach SL, Lenox SM. Preference for insulin delivery systems among current insulin users and nonusers. Clin Ther. 2004;26(9):1498-505.
10. Pawaskar MD, Camacho FT, Anderson RT, Cobden D, Joshi AV, Balkrishnan R, Health care costs and medication adherence associated with initiation of insulin pen therapy in medicaid-enrolled patients with type 2 diabetes: a retrospective database analysis. Clin Ther. 2007;29:1294-305.
11. Lee WC, Balu S, Cobden D, Joshi AV, Pashos CL. Medication adherence and the associated health-economic impact among patients with type 2 diabetes mellitus converting to insulin pen therapy: an analysis of third-party managed care claims data. Clin Ther. 2006;28(10):1712-25.