

Insulin for Type 2 Diabetes Mellitus: Separating the Myths from the Facts

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ABSTRACT

Background: Reluctance to use insulin is a well-established problem among patients with type 2 diabetes mellitus (DM). Many of the concerns that prompt patients to resist insulin are rooted in myths that arose because of the medical profession's difficult history with this medication.

Objectives: The goals of this article were to articulate those myths, describe their impact on patient and clinician reasoning, and explain how clinicians can reassure patients and help them make a more informed choice about insulin therapy.

Methods: Materials used for this article were identified through a search of PubMed for the years 1993 to 2007. English-language articles were selected using the search terms *diabetes mellitus*, *psychological insulin barriers*, and *clinical inertia*.

Results: There are patient- and physician-specific barriers to insulin initiation that providers must be aware of to successfully counsel patients. Physician issues include worries regarding the effect insulin initiation in patients will have on practice resources (eg, impact patient crises have during initial stages of insulin therapy, concern there is inadequate time or personnel to teach insulin therapy); fear that patients will become angry, alienated, or leave the practice; and concern about the potential for patient hypoglycemia and weight gain. Patient-centered issues focus on the fear of weight gain, social embarrassment/stigma, hypoglycemia, lifestyle changes/restrictions, painful injections, and feelings of failure and guilt that treatment has progressed to needing insulin. Clinicians can alleviate many patient concerns by becoming aware of the personal and social dimensions of insulin therapy. Numerous strategies are available for the clinician to use for successful implementation of insulin therapy in patients with type 2 DM.

Conclusion: By investigating the new, simpler, more straightforward algorithms for initiating insulin and using them in patient care, it will be possible to help patients make an informed decision when the time comes to start insulin therapy. (*Insulin*. 2007;2:182-189) Copyright © 2007 Excerpta Medica, Inc.

Key words: insulin, type 2 diabetes mellitus, fear, hypoglycemia, weight gain.

INTRODUCTION

Diabetes mellitus (DM) has reached epidemic proportions in the United States. As of 2005, it affected 7% of the US population (20.8 million people), and among people ≥ 60 years of age, the prevalence was 21%.¹ The incidence of diagnosed DM increased 41% between 1997 and 2003,² and it is projected that if current trends continue, 33% of males and 40% of females born in 2000 will develop DM at some point in their lifetimes.³

Type 2 DM accounts for 90% to 95% of the diagnosed cases of DM in the United States.¹ It has been well established that improved glycemic control benefits people with type 2 DM⁴⁻⁷; in general, every percentage point drop in glycosylated hemoglobin (A1C) reduces the risk of microvascular complications by 40%.¹ However, 1 in 5 people in the United States still has poor glycemic control (ie, A1C $>9.0\%$).⁸

One of the barriers to appropriate treatment of DM is patients' reluctance to use insulin.⁹⁻¹⁵ Patients with type 2 DM

Every percentage point drop in glycosylated hemoglobin reduces the risk of microvascular complications by 40%.

are more likely than those with type 1 DM to resist, since they do not need insulin for physical survival and in many cases have managed their disease without it for years.⁹ **Table I** lists some of the concerns that patients—and some health care professionals—have about starting insulin therapy.¹¹ Many of the worries that make patients reluctant to use insulin are rooted in myths and folklore about this medication that arose because of the medical profession's difficult history with it. The goals of this article were to articulate those myths, describe their impact on patient and clinician reasoning, and explain how clinicians can reassure patients and help them make a more informed choice about insulin therapy.

MATERIALS AND METHODS

Materials used for this article were identified through a search of PubMed for the years 1993 to 2007. English-language articles were selected using the search terms *diabetes mellitus*, *psychological insulin barriers*, and *clinical inertia*.

A BRIEF HISTORY OF INSULIN THERAPY

When insulin was released for clinical use in the early 1920s, patients and physicians found that it was a challenging medication to manage. This first type, termed “soluble” or “regular” insulin, was a rapid-acting, unmodified form derived from beef or pork insulin. It had an activity curve of <8 hours for most patients, with a peak at 2 to 3 hours.¹⁶ In addition, regular insulin was associated with complications that are rarely seen today, including sterile abscesses and production of antibodies to the animal source proteins.^{17,18} The tools used to inject the insulin were crude by today’s standards. The needles were large-bore and had to be honed and sterilized regularly, limitations that posed a substantial risk of infection as well as pain from the injection.

In 1936, a longer-acting insulin—protamine zinc insulin—was introduced. The 1946 launch of another immediate-duration formulation, neutral protamine Hagedorn (NPH) insulin, was an additional breakthrough because NPH could be mixed with either regular or protamine insulin for greater flexibility in managing nighttime increases in blood glucose levels. In 1953, the lente family of long-acting insulins (lente, ultralente, and semilente) was presented. These newer formulations allowed fewer injections and even greater flexibility, and because the delaying agent was zinc, patients had fewer allergic reactions.^{17,18} However, with all the longer-acting insulins, insulin action curves had to be considered; these were often confusing for both the physician and the patient.

Much of what has been described here is remote from today’s clinical experience, with readily available recombinant DNA insulin analogues, insulin delivery devices, and

home glucose and point-of-service A1C monitoring. It is important to remember, however, that many of our current patients with type 2 DM have witnessed or have been told what older relatives or friends experienced while attempting to manage their DM, sometimes 2 or even 3 generations ago.

THE SCOPE OF THE PROBLEM

A 1997 report on what is now termed *psychological insulin resistance* documented the link between patient misconceptions about insulin and their reluctance to use it. Hunt et al¹⁹ interviewed 44 low-income Mexican Americans with type 2 DM about their attitudes toward insulin; 36% were current insulin users and 12% were former users. Because of the high prevalence of DM in this ethnic group, most of the patients had several family members who also had type 2 DM and had taken insulin. A qualitative analysis of the interview transcripts showed that 75% of the comments about insulin were negative. The patients gave a number of explanations for their attitudes, but the concern reported most frequently was the risk of complications. Overall, 44% of the respondents said they had heard or observed that in many cases, when people start taking insulin, they develop serious health problems. Blindness was mentioned by 58% of the people who spoke of this connection. Other complications mentioned as being possibly associated with insulin were tooth loss, deterioration of the organs, loss of energy, weight gain, heart attack, kidney failure, and a general loss of vitality. The family stories and personal recollections of the patient sitting before us are powerful and must be addressed if we are to establish a meaningful collaboration.

A more recent survey examined the attitudes of insulin-naive people with type 2 DM who attended one of several daylong educational sessions held across the country.²⁰ Of the 708 respondents, 53% were non-Hispanic whites. Overall, 28% of the respondents said they were unwilling to start insulin therapy, and 24% said they were only slightly willing. Their attitudes about insulin are shown in **Table II**.²⁰

Table I. Common concerns regarding insulin injection therapy.

Patient	Health Care Professional
Fear of weight gain	Fear of patient’s anger.
Fear of social embarrassment and stigma	Fear of patient noncompliance.
Fear of hypoglycemia	Resentment about extra burden of patient crises during initial stages of insulin therapy.
Fear of lifestyle changes and restrictions	Anger and irritation regarding oral antidiabetic drug failure.
Fear of painful injections	Fear of losing patient to another provider or alienating the patient.
Feelings of failure and guilt	Concern that there is inadequate time or personnel to teach insulin therapy.
Concern about becoming “more ill,” disease progression	Concern about the potential for patient hypoglycemia and weight gain.

Adapted from Korytkowski.¹¹

Despite the improvements in insulin therapy over the past 10 years, myths and misunderstandings persist. As providers, we must remember how important it is to elicit our patients' perceptions about insulin. Providing our patients with an opportunity to ask questions and explore many of their preconceived notions is critical to therapeutic success. Providers and team members also need to be aware of their own attitudes regarding insulin. A stray remark or negative outlook can be detrimental to our goal of glycemic control. Patients will internalize a provider's negative inclination regarding insulin.

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The motivational interview is a technique that can be successful when discussing behavioral changes.²¹ The client-centered approach, which allows providers the opportunity

to explore patients' expectations and perceptions, is of great utility. Support for the patient's self-motivated desire to change can be very beneficial when discussing the lifestyle adjustments that accompany DM.²²

MYTHS REGARDING INSULIN

Many myths surround insulin therapy. The following sections review some of the more important misconceptions that are seen in daily encounters with patients.

Insulin Causes Serious Complications

As the study by Hunt et al¹⁹ suggests, in some cases a patient's concern about initiating insulin can be traced to a friend or family member who had a bad experience with insulin decades ago. Patients have long memories when it comes to early life experiences. Their recollections are often incomplete, but they know that a grandparent or uncle was taking insulin and lost a leg, eyesight, or kidney function. They see insulin as the protagonist and believe they may succumb to a similar fate. A key technique is to elicit these stories from patients and help them understand that their past does not have to be their future. Explain that it is the disease process that causes complications, not the insulin.

Table II. Attitudes about insulin in a 2005 survey of insulin-naive patients with type 2 diabetes mellitus. Data are percentages of patients who agree (either mildly, moderately, or strongly) with each barrier.

Attitudinal Statement	Unwilling to Take Insulin (n = 200)	Willing to Take Insulin (n = 508)	Total (N = 708)	P*
Expected harm: Insulin therapy can cause problems, such as blindness	16.7	8.0	10.1	0.005
Illness severity: Taking insulin means my diabetes will become a more serious disease	46.7	35.4	38.1	0.000
Restrictiveness: Insulin therapy would restrict my life; it would be harder to travel, eat out, etc.	56.1	41.6	44.8	0.000
Lack of fairness: I've done everything I was supposed to do; if I had to do insulin therapy, it just wouldn't be fair	41.5	21.9	26.8	0.000
Anticipated pain: I couldn't take the needle every day; it would be just too painful	50.8	30.2	34.7	0.000
Problematic hypoglycemia: Insulin therapy might cause serious problems with low blood sugar	49.3	37.9	40.6	0.021
Low self-efficacy: I'm not confident I could handle the demands of insulin therapy	58.1	39.7	43.9	0.000
Personal failure: Insulin therapy would mean I had failed, that I hadn't done a good enough job taking care of my diabetes	55.0	33.6	38.4	0.000
Permanence: Once you start insulin, you can never quit	53.1	42.6	44.9	0.000

*P values compare differences between willing and unwilling patients. Copyright © 2005 American Diabetes Association. From *Diabetes Care*[®], Vol. 28, 2005;2543-2545. Reprinted with permission from The American Diabetes Association.²⁰

Their relative's complications almost assuredly were developing long before insulin therapy began. Physicians use insulin much earlier now, with the goal of preventing just the kind of results that the patients' loved ones suffered.

A related myth is that the use of insulin causes heart disease. Some physicians have this concern, too, that the anabolic effect of insulin on fat depots promotes or exacerbates atherosclerosis. This notion has been addressed by a 20-year, prospective observational study of patients with type 2 DM (N = 5102), the United Kingdom Prospective Diabetes Study (UKPDS).⁶ This study demonstrated that neither conventional treatment with insulin nor intensive insulin therapy increased the risk of atherosclerosis. In fact, intensive glycemic control with insulin significantly decreased the risk of microvascular complications. More proof disputing the idea that insulin is cardiotoxic can be found in the Diabetes and Insulin-Glucose Infusion in Acute Myocardial Infarction study (N = 620).²³⁻²⁵ It showed that intensive insulin therapy reduced mortality among patients with acute myocardial infarction.

Insulin Causes Weight Gain

Weight gain is a major concern of many patients facing insulin therapy, and clinicians worry as well, especially since a large percentage of patients with type 2 DM are already overweight. The apprehension is not unfounded, because insulin does promote the movement of carbohydrates into metabolically active tissues such as muscle and adipose cells.²⁶ However, insulin is similar in this regard to most of the oral agents. For example, in the UKPDS,⁶ patients who used glyburide monotherapy gained a mean of 4 to 7 pounds over 10 years, versus 9 pounds gained by those on insulin. Furthermore, weight gain can be due to factors besides insulin, such as patients' real or imagined need to increase food intake (defensive eating) to treat hypoglycemia or patients' belief that improvement in glucose levels allows some "cheating" on meal plans.

The job of the clinician is to help patients develop a balance between medical nutrition therapy (MNT), exercise, medication (especially insulin), and glucose control needs. Whenever possible, patients prescribed insulin should see a nurse educator or certified diabetes educator (CDE), a registered dietitian, and an exercise physiologist. These professionals can help the patient match food choices with insulin dosing and explain how to keep weight gain to a minimum. Enthusiasm for MNT and exercise programs is bound to wane over time, and, ideally, patients will have occasional "refresher" courses. In a recent nationally representative survey,²⁷ 60% of patients with DM reported that they do not exercise regularly, which was defined as spending half an hour or more in moderate or vigorous physical activity at least 3 times a week. To find a CDE in your area, see the Web site of the American Association of Diabetes Educators (<http://www.aadenet.org>).

Careful selection of the medication regimen is another strategy for helping patients minimize weight loss. In

patients with type 2 DM, insulin analogues have been associated with significantly less weight gain than human premixed insulin²⁸ or NPH.²⁹ The addition of metformin to insulin is weight neutral,³⁰⁻³³ apparently because metformin decreases appetite.

Insulin Therapy Is Always Permanent

Many patients and clinicians worry that once insulin use is started, it can never be stopped. This is not true in all cases. Insulin is sometimes used for only a short time to reverse hyperglycemia, and the patient with type 2 DM then transitions to oral medications. However, many patients with DM do require insulin for the remainder of their lives. It is crucial to explain to patients—early in the disease process, if possible—that DM is a progressive disease. The UKPDS established that patients with type 2 DM suffer ongoing loss of β -cell function, which occurs at different rates but is typically present before diagnosis (Figure).⁶ More than half of the participants required insulin within 6 years after diagnosis. Patients need to understand that changes in their body—not a failure on their part—can make it necessary for them to receive insulin. DM is a defect of metabolism, not character; hence, clinicians should never use insulin as a threat to persuade patients to comply with lifestyle interventions or oral antidiabetic therapy.

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Using Insulin Is Complicated

Many patients assume that insulin therapy will be inconvenient and complex. This concern is not unfounded, especially for patients who are required to inject short-acting regular insulin 30 to 45 minutes before a meal. Few other diseases have the tremendous impact on day-to-day living that DM can present. Even for patients using insulin analogues, insulin management does require more effort than swallowing a pill once or twice a day. However, it is important to remind patients that the complications of DM would be a much worse burden. Insulin is a very effective way to meet metabolic goals, and as blood glucose levels are controlled, the patient can look forward to having more energy, less nocturia, and improvement in other symptoms. "Insulin failure" does not exist. A great deal of effort may be required, but unlike oral agents, insulin can lower everyone's blood glucose levels.³⁴

Clinicians also may believe that insulin will be too complicated and time-consuming. Half of primary care physicians and nurses delay insulin therapy until absolutely necessary, according to findings from a survey sponsored by Novo Nordisk Pharmaceuticals Inc. (Princeton, New Jersey), the Diabetes Attitudes, Wishes, and Needs study.³⁵ This

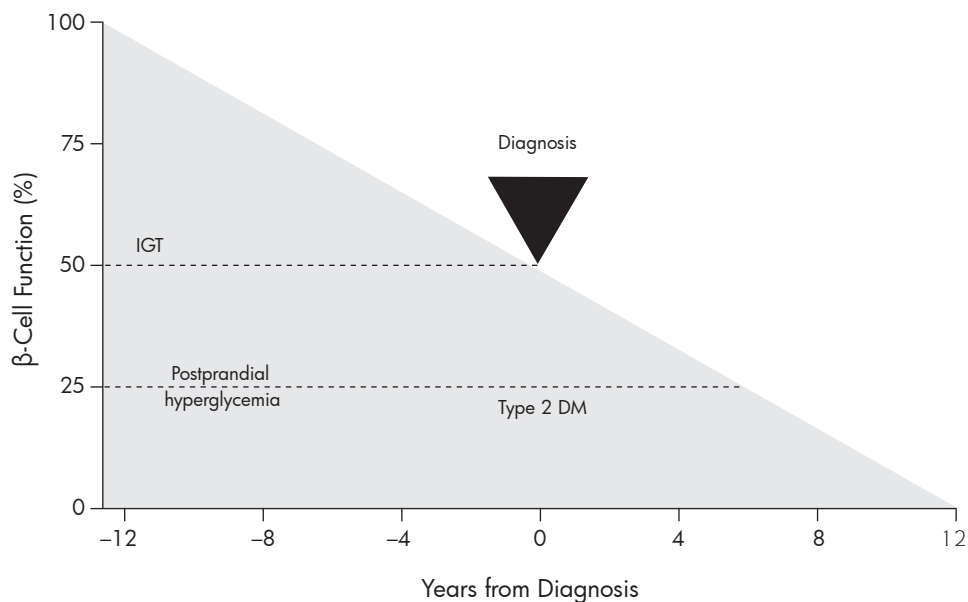


Figure. Decline in β -cell function over time in the United Kingdom Prospective Diabetes Study (UKPDS). IGT = impaired glucose tolerance; DM = diabetes mellitus. Data from the United Kingdom Prospective Diabetes Study Group.⁶ Reprinted from Meece.¹⁴

study was conducted in 13 countries in 11 regions worldwide. Clinicians may be particularly concerned about choosing the “correct” starting dose. It is important to recognize that a starting dose is exactly that—a starting point. All patients will require titration of their dose; indeed, the ability to give exactly the right amount at the right time is what makes insulin therapy so useful.

Recent reports have described simple, straightforward protocols for initiating insulin,^{36–40} such as adding a once-daily injection of basal insulin to oral therapy³⁶ or using twice-daily injections of a premixed insulin analogue.³⁸ The newer insulins are much more predictable and specific in their actions than regular insulin. Still, most of the algorithms are designed to be conservative, and it is likely that the starting dose will result in suboptimal blood glucose control. Titration based on the algorithm will help the patient reach the glycemic goal quickly. If needed, a more complex regimen can be introduced as the patient adapts to using insulin. Insulin management is a dynamic process. Ongoing adjustment is the rule rather than the exception in patient care. With a basic understanding of insulin action curves, it can be professionally rewarding to help patients adjust their insulin to match their blood glucose trends. Based on my clinical experience, I have found that many patients discover that insulin is not as burdensome as expected once they have started the therapy, and they are willing to continue with support from their primary care providers.

As mentioned previously, patients starting insulin therapy should be referred to a nurse educator or CDE. In addition to assisting with MNT and exercise plans, these pro-

fessionals can help patients learn the basics of insulin management, including correct technique, insulin action curves, trend identification, troubleshooting, and the importance of sick-day management. The team management approach can improve the insulin experience for both the patient and the provider.

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People Who Use Insulin Are Viewed as Weak or Disabled

Many patients are concerned about the social stigma surrounding the use of insulin. They may view insulin as an indication that they have a serious disease. They may be concerned that, since their insulin use will be visible to family and friends, they will be regarded as disabled. They may know of someone who required assistance for a severe hypoglycemic episode that occurred in public and was embarrassing or even dangerous. It is important to elicit these impressions during your clinical encounter. Many times it is possible to help patients see that the complications of uncontrolled DM would be a greater hardship than the

perceived “disability” of using insulin. In addition, patients may be willing to accept insulin therapy if there is a possibility that they can use an insulin pen, which is more discreet than syringes as well as more convenient.

Insulin Therapy Is Expensive

Some patients consider insulin therapy too expensive to be worthwhile. The cost of testing does have the potential to increase once patients begin using insulin, since they typically need to monitor their blood glucose more frequently to ensure glycemic stability. Many patients find that the cost of insulin itself is similar to that of some of the newer oral antidiabetic agents. The cost may be even less, if a patient is transitioned from multiple oral agents and has a high copayment for ≥ 1 of the drugs.

A managed care organization recently analyzed its records from 1177 patients with type 2 DM who had started insulin therapy.⁴¹ By the end of the 9-month period after initiation of insulin, mean total health care costs and DM-related costs had increased significantly, compared with the 9-month preinsulin period. However, further analysis showed that most of the increase occurred during the first 2 months and that the costs then dropped significantly, by 57% for total costs and by 49% for DM-related costs.

In another cost analysis study,⁴² 188 patients with type 2 DM who had inadequate response to 2 oral antidiabetic agents were randomly assigned to add a third oral agent or to switch to insulin 70/30 plus metformin. The expenses considered were the costs of the medications, liver function tests for patients on certain oral agents, needles, and instruction in the use of an insulin pen. Other expenses, such as those for blood glucose-monitoring supplies and dietary counseling, were assumed to be equal for the 2 groups. Over 24 weeks of therapy, insulin 70/30 plus metformin was as effective as the triple oral drug regimens in lowering A1C, yet it cost only about one third as much (mean daily cost, \$3.20 vs \$10.40).

STRATEGIES FOR SUCCESS

The following are strategies for clinicians to use for successful implementation of insulin therapy for patients with type 2 DM. They include: (1) recognize our own beliefs regarding insulin and whether we telegraph optimism for success or despair to our patients; (2) discuss insulin as a therapeutic tool early in the disease process, preferably at diagnosis or first visit; (3) ask patients what they know about insulin and how did they learn it (**Table III**¹⁵); (4) ask about family members with DM (eg, were/are they on insulin and how long ago was it; what were their experiences); (5) explore the patient’s biggest concerns regarding insulin (it is often not what you think it is); (6) do not allow insulin therapy to be seen in a moral context (eg, no good/bad patient imagery; no “failure” language; use neutral language such as *data*, *numbers*, *therapeutic adjustments*); (7) do acknowledge the emotional content of this disease (ie, empathize with the patient); and (8) develop, with your patient, a plan that will move that patient toward clinical success.

Table III. Questions for assessing attitudes toward insulin therapy.

- What does it mean to you to start insulin therapy?
- What does it say about having DM?
- What does it say about how you managed DM in the past?
- Why do you think it might be helpful (or unhelpful) to start insulin now?
- How do you think using insulin will change things at home? At work?
- What worries you most about insulin?
- What will family members say when they learn you will be starting insulin?
- How will things at home or work make it easy (or difficult) for you to use insulin?
- Do you think you can manage insulin therapy?
- What do you need to know before starting insulin therapy?
- What will make it easier for you to start insulin therapy?
- Do you think it will be hard to learn?
- When should we plan to start insulin therapy?

DM = diabetes mellitus.

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CONCLUSIONS

Insulin therapy remains our most powerful medication for the treatment of DM. The short-term improvement in well-being and the long-term reduction in the risk of complications give us compelling reasons to educate and encourage our patients to use insulin. However, many psychosocial hurdles have to be overcome. Spend time with patients listening to and addressing their concerns about insulin. Explore barriers—real and perceived—as you develop your treatment plan. Involving family and team members will improve your chances of successful implementation. Overcome any desire on your or your patient’s part to see this as a personal or moral failing. We can assist our patients by addressing the myths, misunderstandings, and fears they may have and helping them overcome their reluctance to initiate insulin. They will then be better able to make an informed decision regarding starting their insulin therapy.

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