Treating the Whole Patient for Optimal Management of Type 2 Diabetes: Considerations for Insulin Therapy

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Abstract: Primary care physicians are responsible for providing healthcare to most patients with type 2 diabetes. In this role, it is critical that physicians utilize a whole-patient treatment approach that includes lifestyle modifications and pharmacotherapy aimed to achieve glycemic control, in addition to the management of any comorbid conditions or risk factors for cardiovascular complications of diabetes. Due to the progressive nature of the disease, most patients with type 2 diabetes will eventually require insulin to achieve and maintain glycemic control, because of both increased insulin resistance and diminished secretory capacity of the pancreatic β cells. Thus, physicians need to be knowledgeable about and comfortable with the use of insulin, as well as with educating patients and discussing any potential barriers to insulin therapy. The use of a stepwise approach—beginning with basal insulin therapy and adding prandial insulin if necessary—is simple, effective, and appropriate for use in many patients.

Key Words: diabetes management, insulin, combination therapy, treatment barriers

In the United States, the incidence of diabetes has increased substantially over the past few years, reaching nearly 21 million in 2005, and is expected to continue to grow.[1] Of note, the occurrence of diabetes varies by ethnicity, with African Americans, Hispanic and Latino Americans, Native Americans, and Alaska Natives being 1.7 to 2.2 times more likely to have diabetes than non-Hispanic whites.[1] Diabetes frequency also varies by age.[1,2]

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Several factors have contributed to the rising prevalence of diabetes seen in the United States, including the aging of the population, increasing rates of obesity in the general population, and the shift to more sedentary lifestyles.[3] The pervasiveness of diabetes among children and adolescents is also recognized as a serious health problem.[4] The total healthcare costs for diabetes were estimated at $132 billion in the United States in 2002, with direct medical costs of approximately $92 billion.[1] It is clear that diabetes represents a serious and costly public health issue that has reached epidemic proportions.

Type 2 diabetes is a progressive disease, characterized by both insulin resistance and the gradual decline of insulin secretion. Prediabetes—defined as the presence of impaired glucose

Key Points

- Traditional treatments for diabetes involve diet and exercise, followed by 1 or more oral antidiabetic medications to achieve glycemic control.
- Most patients with type 2 diabetes eventually will require insulin, due to the progressive nature of the disease, which results in both increasing insulin resistance and diminishing secretory capacity of the insulin-producing β cells.
- Basal insulin therapy with a long-acting insulin (such as insulin glargine) can help patients with type 2 diabetes improve their overall glycemic control and achieve recommended glycosylated hemoglobin A1c goals (ie $<7.0\%$), thereby reducing the risk of diabetic complications and improving quality of life.
- Education of patients about proper self-monitoring of blood glucose, in conjunction with discussions of how to recognize, avoid, and treat the symptoms of hypoglycemia, may be helpful in addressing the fear of hypoglycemia as a potential barrier to treatment.
- It is important to explore the potential barriers to treatment with each patient and enlist family members to help encourage the patient to accept and adhere to the treatment regimen.

tolerance or impaired fasting glucose or both—often leads to the development of type 2 diabetes and increases the risk of heart disease and stroke.[1] Although insulin resistance (a condition where the body does not respond to or utilize insulin appropriately) remains relatively stable throughout the course of type 2 diabetes, the pancreatic β cells gradually lose the ability to secrete enough insulin to overcome the hyperglycemia caused by insulin resistance. As the degree of β-cell function progressively worsens, patients eventually become insulin deficient and often suffer from the complications associated with chronic hyperglycemia, including heart disease, kidney disease, and stroke.

Primary care physicians play a major role in the care of patients with diabetes, providing diabetes care to 39% of patients with type 1 diabetes and 82% of those with type 2 diabetes.[5] These physicians face multiple challenges in providing comprehensive treatment, and the focus has shifted from merely managing the patient's diabetes to actively addressing other coexisting conditions (such as hypertension, dyslipidemia, and obesity) within the context of diabetes management. Finally, individual factors and potential barriers to treatment must also be taken into consideration when selecting an appropriate treatment regimen.

Table 1. Management goals aimed to reduce the risk of cardiovascular complications in patients with diabetes[10,16,45-47]

End point	Treatment goal
Blood glucose (ADA)	A1c <7.0%[a]
	FPG 90–130 mg/dL
	PPG <180 mg/dL
Blood glucose (ACE)	A1c ≤6.5%
	FPG <110 mg/dL
	PPG <140 mg/dL
Blood pressure (JNC-7, ADA)	Systolic <130 mm Hg
	Diastolic <80 mm Hg
Dyslipidemia (ADA)	LDL cholesterol <100 mg/dL
	HDL cholesterol in men >45 mg/dL
	HDL cholesterol in women >55 mg/dL
	Triglycerides <150 mg/dL
Total cholesterol (NCEP-ATP-III)	Total cholesterol <200 mg/dL

[a]*The A1c goal for an individual patient is as close to normal as possible (<6.0%) without significant hypoglycemia.*

ADA, American Diabetes Association; A1c, glycosylated hemoglobin; FPG, fasting plasma glucose; PPG, postprandial plasma glucose; ACE, American College of Endocrinology; JNC-7, Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure; LDL, low-density lipoprotein; HDL, high-density lipoprotein; NCEP-ATP-III, National Cholesterol Education Program Adult Treatment Panel III.

Management of Type 2 Diabetes: More Than Just Glycemic Control

The treatment of diabetes has traditionally focused on glycemic control. Furthermore, recent clinical studies have provided strong evidence that optimal disease management should include strategies that address traditional cardiovascular (or cardiometabolic) risk factors commonly seen in patients with type 2 diabetes. These risk factors include hypertension, dyslipidemia, lack of physical activity, smoking, and poor dietary habits, which promote the development of insulin resistance and heart disease.[6] An intensive, integrated approach that addresses multiple components of cardiometabolic risk is warranted considering the serious impact of diabetes on cardiovascular outcomes. Epidemiologic studies have documented a much higher prevalence of coronary heart disease in people with diabetes (approximately 45%), compared with people without diabetes (approximately 23%).[7] Furthermore, cardiovascular disease has been estimated to account for approximately 65% of all deaths in patients with diabetes.[1] Table 1 summarizes currently recommended goals for the treatment of hypertension and dyslipidemia in patients with diabetes, with the goal of reducing cardiovascular risk.

With regard to glycemic control, comprehensive consensus guidelines for the management of type 2 diabetes have been issued by the American Diabetes Association (ADA) and the American College of Endocrinology (ACE). The primary goals of treatment are to achieve normoglycemia and prevent the development of the microvascular and macrovascular complications associated with type 2 diabetes. Some clinicians advocate for a more individualized approach, aimed toward reducing A1c concentrations as low as possible without causing unacceptable hypoglycemia in older patients and reserving intensive therapy for younger patients.[5]

Unfortunately, recent surveys indicate that a large proportion of patients with diabetes fail to meet any of these recommended glycemic goals, despite numerous advances in treatment. In one survey conducted by the American Association of Clinical Endocrinologists (AACE), data were collected from more than 157,000 people with type 2 diabetes over a 2-year period (2003–2004) and measured against the AACE A1c goal of ≤6.5%.[8] Two out of 3 patients (67%) failed to meet that goal.[8] These findings are consistent with those of earlier cross-sectional surveys such as the Third National Health and Nutrition Examination Survey (NHANES III, conducted 1988–1994) and NHANES 1999 to 2000, which revealed that 56 to 63% of patients with diabetes failed to achieve the ADA recommended target A1c of <7.0%.[9] Furthermore, the overall percentage of patients who achieved currently recommended goals for the treatment of hypertension and hyperlipidemia in connection with the target A1c level was only 7.3% in NHANES 1999 to 2000, and a slightly lower percentage (5.2%) achieved all 3 goals simultaneously in NHANES III.[9] Clearly, improved strategies that address all

of the pathophysiologic mechanisms of diabetes—beyond glycemic control—are urgently needed for the optimal management of diabetes.

Disease Monitoring and Treatment Response

The optimal management of diabetes requires vigilant tailoring of therapy to the requirements of the patient. Blood glucose concentrations can be measured directly (ie, fasting and postprandial glucose measurements) to assess glycemic control at any given point in time. Glycemic control is also assessed by measuring A1c concentrations, which result from the nonenzymatic glycosylation of the β chain of hemoglobin with plasma glucose. A1c concentrations increase in proportion to plasma glucose levels and indicate the extent of a patient's overall glycemic control over the preceding 2- to 3-month period.[10]

The relationship between A1c and the incidence of diabetic complications in patients with type 2 diabetes has been explored in the United Kingdom Prospective Diabetes Study (UKPDS). This study compared the effects of conventional (dietary modification) and intensive (sulfonylurea or insulin) therapy on glycemic control and the risk of complications in patients with newly diagnosed type 2 diabetes.[11] Median A1c values were 7.0% in the intensive diabetes treatment group—an 11% reduction during the 10-year treatment period relative to the conventional treatment group. The reduction in A1c seen with intensive treatment was associated with improved morbidity and mortality, with the risk of any diabetes-related endpoint (ie, sudden death, death from hyperglycemia or hypoglycemia, myocardial infarction, angina, heart failure, stroke, renal failure, amputation, retinopathy, blindness, or cataract surgery) 12% lower in the intensive therapy group compared with the conventional therapy group ($P = 0.029$). Similarly, the risk of diabetes-related death was reduced by 10% and all-cause mortality was reduced by 6% in patients receiving intensive therapy.[11]

Ethnicity and Diabetes Complications

Ethnicity also appears to play a role in the risk of the development of long-term complications of diabetes. African Americans experience higher rates of cardiovascular disease, blindness, amputation, and end-stage renal disease than are seen in the general population of patients with diabetes.[2] Evidence from NHANES III also suggests that Mexican Americans are at higher risk of retinopathy than non-Hispanic blacks and non-Hispanic whites.[12] However, the increased rates of complications may reflect the level of glycemic control achieved; thus, it is expected that improved glycemic control would reduce the development of complications in these ethnic populations.

Results from two key studies suggest that if hyperglycemia and other risk factors are addressed appropriately, the rates of complications may actually be comparable among ethnic groups. The San Luis Valley study examined the prevalence of diabetes complications (namely, neuropathy, retinopathy, and nephropathy) in both Hispanic and non-Hispanic white patients in southern Colorado.[13,14] The investigators found that the prevalence of neuropathy and nephropathy were comparable and that the duration-adjusted prevalence of retinopathy was actually higher in non-Hispanic white patients than in Hispanics.[14] Of note, there were no significant differences between ethnic groups in terms of the duration of diabetes and A1c concentrations. The second study compared the incidence of diabetic complications in Jamaicans, West Indian blacks, and whites in Britain.[15] After adjusting for between-group differences in the duration of diabetes, no significant differences were noted in the incidence of background retinopathy or other complication rates, even though whites had significantly lower A1c concentrations than either West Indian blacks or Jamaicans.[15] Taken together, these results may imply that when all diabetes-related factors are equal (ie, blood glucose and other risk factors are controlled) the rate of diabetic complications in high-risk ethnic groups is comparable to that of non-Hispanic whites, further emphasizing the importance of optimal glycemic control in reducing the risk of complications in patients with type 2 diabetes.

The Role of Insulin and Individualized Therapy

Traditionally, the management of diabetes includes dietary modifications and exercise, either alone or in combination with pharmacologic therapy. In addition to the need to achieve good glycemic control, the presence of other comorbid conditions must be evaluated and managed with appropriate interventions. Obesity, high blood pressure, and dyslipidemia are all risk factors for cardiac disease and may necessitate earlier initiation of insulin therapy in addition to aggressive lifestyle modifications and pharmacologic treatment of the conditions themselves. Such interventions can reduce the risk of diabetes-related cardiovascular complications by approximately 20 to 50%.[1]

Throughout the course of treatment, glycemic control should be evaluated using a combination of A1c testing and results from patient self-monitoring of blood glucose (Table 1).[10] A1c concentrations should be measured at 3-month intervals to determine whether glycemic targets are being met. Fasting plasma glucose and postprandial plasma glucose results obtained by self-monitoring both contribute to overall glycemic control and can help guide treatment dose adjustments.[16,17] By reviewing all of these endpoints with patients, physicians can identify patterns of glycemic control and easily identify a need for intensification of treatment.

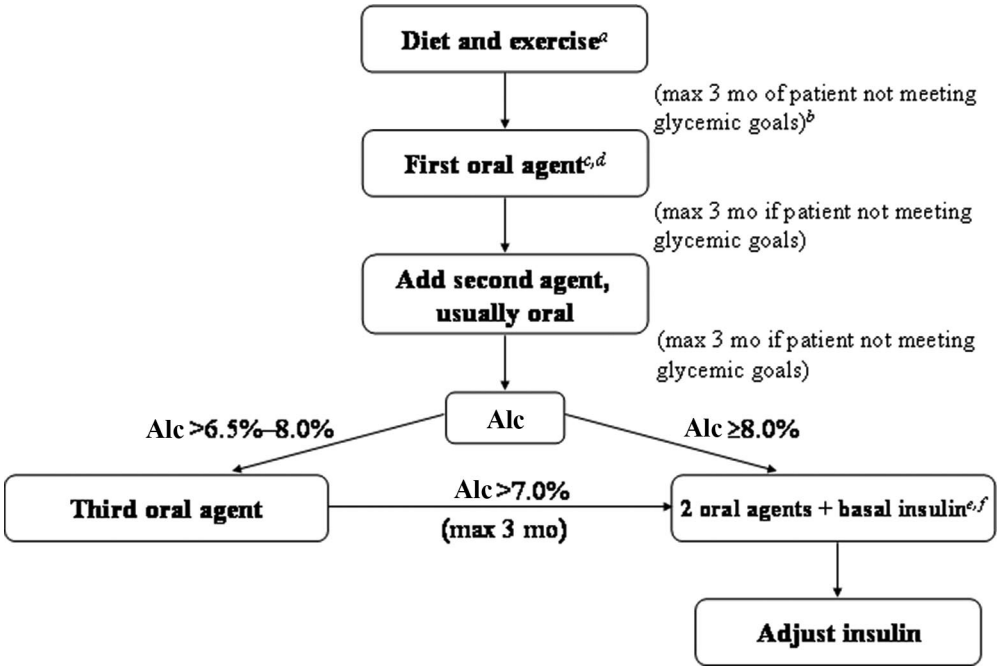

Fig. Stepwise approach to glycemic control in patients with type 2 diabetes.
Goals.[a]
- **FPG <100 mg/dL.**
- **2-hour PPG <140 mg/dL.**
- **A1c as low as possible without serious hypoglycemia.**

A1c, glycosylated hemoglobin; AACE, American Association of Clinical Endocrinologists; ADA, American Diabetes Association; FPG, fasting plasma glucose; PPG, postprandial plasma glucose.
[a]Oral agent may be started simultaneously with diet and exercise.
[b]May require 6 months to see maximal effect of a thiazolidinedione.
[c]Insulin may be used earlier and as initial therapy in some patients, such as those who are pregnant, hospitalized, or very symptomatic.
[d]May start 2 oral agents together (eg, if high baseline A1c).
[e]Exenatide has recently become available and may be a consideration.[27]
[f]AACE recommends an A1c level ≤6.5%, FPG level ≤110 mg/dL, and PPG level ≤140 mg/dL; ADA recommends an A1c level <7.0%, FPG level 90 to 130 mg/dL, and PPG (1–2 h) level <180 mg/dL.
Adapted with permission from Dailey G. A timely transition to insulin: identifying type 2 diabetes patients failing oral therapy. *Formulary* 2005;40:114–130.

When sufficient efforts with diet and exercise fail to achieve glycemic control, pharmacologic treatment is indicated. As shown in the Figure, the next steps in diabetes management usually involve treatment with 1 or more oral antidiabetic drugs (OAD).[18] Currently, there are 6 classes of oral agents available: sulfonylureas, meglitinides, biguanides, α-glucosidase inhibitors, thiazolidinediones, and dipeptidyl peptidase-4 inhibitors. Review of the literature indicates that each class reduces A1c by 1.0% to 2.0%; because each class has its own distinct mechanism of action, combined treatment approaches are frequently used, with potential additive effects on glycemic control.[19,20] A detailed review of OAD therapy is beyond the scope of this review; however, those wishing more information are directed to reviews by Inzucchi[19] and Willett and Albright.[21]

Although treatment with OADs is effective when used alone or in combination, the progressive decline in pancreatic β-cell function seen in patients with type 2 diabetes will eventually result in the need for insulin therapy to achieve or maintain adequate glycemic control.[22–24] Results from the UKPDS have shown that one half of the patients receiving sulfonylurea treatment were able to maintain A1c <7.0% after 3 years of treatment. As time went on, fewer patients were able to achieve glycemic control with sulfonylurea therapy alone, with 34% of patients having A1c levels <7.0% after 6 years of treatment.[22] After 9 years of treatment, only 24% of patients were able to achieve adequate glycemic control with sulfonylurea treatment.[22] Notably, treatment with other OADs was associated with a similar progressive decline in glycemic control over time.[22] Because treatment failure

may occur over a short period of time, regular patient monitoring at 3-month intervals is recommended in patients who are not achieving glycemic goals as measured by self-monitoring of blood glucose.[10]

When Is the Initiation of Insulin or Intensification of the Existing Insulin Regimen Appropriate?

Treatment options for patients who are already receiving maximum doses of 2 OADs involve either adding a third OAD (such as a thiazolidinedione) to the current regimen or the initiation of insulin to achieve glycemic control; no longer than 3 months (6 mo if a thiazolidinedione is added) should be allowed to elapse without intensifying treatment for patients who are not achieving glycemic targets (Fig. 1).[16,18,25] Generally, physicians should consider starting basal insulin therapy in patients whose A1c level is >7.0% (>6.5% if following ACE guidelines) despite optimal oral therapy.

The goals of insulin therapy involve the administration of exogenous insulin to approximate the normal physiologic patterns of pancreatic insulin secretion and reduce A1c, fasting, and postprandial plasma glucose concentrations to recommended target levels. Thus, physiologic insulin regimens attempt to mimic normal insulin secretion in healthy individuals by addressing basal and prandial needs separately. From a clinical perspective, basal insulin replacement mimics the constant physiologic release of insulin that regulates metabolism and hepatic glucose production.[26] Prandial insulin replacement is intended to mimic the postmeal insulin response to nutrient intake. Another injectable agent that may be considered for postprandial glucose control, the incretin mimetic exenatide, is administered before morning and evening meals but is not yet approved for use with insulin.[27] Finally, correction-dose insulin is given to control pre- or between-meal hyperglycemia.[26] Thus, the selection of insulin therapy is based on pharmacokinetic properties (Table 2), with longer-acting insulins used for basal therapy and rapid-acting insulins used prandially. Several premixed insulin preparations are also available and are aimed toward simplifying insulin regimens with twice-daily dosing. However, these preparations have limited flexibility, which may be an issue for a patient whose insulin deficiency is severe, as there may not be sufficient insulin available to meet postlunch requirements.[26] Thus, mixed insulins may be most appropriate for patients who eat relatively small lunches or are unable to adhere to more complex insulin regimens.[26] Importantly, due to the progressive loss in the insulin secretory capacity of pancreatic β cells, type 2 diabetes, there is a need for exogenous insulin therapy.

Table 2. Pharmacokinetics of basal and prandial insulins[5,48–50]

Insulin type	Onset	Peak activity	Duration of action
Basal			
NPH insulin	2–4 h	4–10 h	10–16 h
Insulin glargine	2–4 h	None	20–24 h
Insulin detemir	2–4 h	6–8 h	20–24 h[a]
Prandial			
Regular insulin	30–60 min	2–3 h	5–8 h
Insulin lispro	5–15 min	30–90 min	5 h
Insulin aspart	5–15 min	30–90 min	4–6 h
Insulin glulisine	5–15 min	30–90 min	4–6 h
Inhaled insulin	30–90 min	60 min	6–8 h

NPH, neutral protamine Hagedorn.

[a]*Based on BID dosing.*

Table adapted with permission from DeWitt DE, Hirsch IB. Outpatient insulin therapy in type 1 and type 2 diabetes mellitus: scientific review. JAMA 2003;289:2254–2264.

Basal Insulin Therapy

Perhaps the most simple and effective approach toward intensifying therapy is to add basal insulin to the existing OAD regimen. This approach improves glycemic control and decreases the risk of diabetic complications by first reducing fasting plasma glucose concentrations, which in turn results in lower postprandial plasma glucose concentrations.[28] Intermediate-acting insulin, such as neutral protamine Hagedorn (NPH), and long-acting insulin analogs such as insulin glargine and insulin detemir, provide therapeutic options for basal insulin replacement (Table 2).[5] Insulin glargine has a relatively consistent time-action profile, is effective for use as a once-daily injection, and offers greater dosing flexibility, as it may be administered either at bedtime or in the morning.[29–31] Insulin detemir was approved recently for once- or twice-daily dosing.

A 22-week comparison between once- or twice-daily insulin detemir plus a rapid-acting analog versus NPH plus regular human insulin was conducted in patients with type 2 diabetes.[32] The A1c reduction was comparable with a lower but not statistically different rate of hypoglycemia in patients receiving insulin detemir; the majority of patients required twice-daily dosing in both treatment groups. Several clinical studies have compared once-daily insulin glargine with once- or twice-daily NPH insulin when added to OAD therapy in patients with type 2 diabetes.[30,31,33–35] In each of these studies, the addition of insulin glargine or NPH insulin to oral therapy improved glycemic control from baseline levels, with 2 studies indicating better glycemic control with insulin glargine.[30,34] With regard to safety, insulin glargine has demonstrated a consistent advantage over NPH insulin in terms of significantly fewer episodes of nocturnal hypoglycemia.[30,31,33,35,36] This is an important difference, as concerns about the risk of hypoglycemia may be a common barrier to the initiation of insulin for both physicians and patients.[37]

Prandial Insulin Therapy

Although both the fasting plasma glucose and postprandial plasma glucose contribute to A1c, the relative contribution of prandial glucose excursions to A1c is greater at lower A1c levels.[38] Thus, patients may need the addition of prandial insulin to basal insulin therapy if they are nearing target fasting plasma glucose concentrations but their A1c level is >7.0% and/or postmeal blood glucose concentrations remain above target levels. Available options for initiating prandial insulin therapy include regular human insulin, rapid-acting insulin analogs (insulin aspart, insulin lispro,[5,39] insulin glulisine) and inhaled insulin. The rapid-acting insulin analogs are particularly well-suited for prandial glycemic control, with peak concentrations occurring within 1 hour of administration and antihyperglycemic effects lasting for 5 hours, which closely mimics normal physiology (Table 2).[5] Inhaled insulin similarly has a rapid onset and peak and offers a noninjectable option. Regular human insulin has a delayed absorption and prolonged duration of action, making it less desirable because it must be given 30 to 45 minutes before a meal. However, although the addition of prandial insulin to basal insulin is an effective approach to physiologic insulin replacement, some patients may be resistant to multiple daily injections.[18]

An effective strategy for introducing prandial insulin is to add it gradually, starting with administration before the largest meal of the day, with the goal of improving glycemic control in patients already receiving basal insulin therapy. As the disease progresses, prandial insulin can be added to additional meals if required to maintain glycemic control.

Premixed Insulins

As mentioned previously, premixed insulins have been developed in an effort to address basal and prandial insulin requirements with fewer injections, but these products require rigid adherence to regular mealtimes and limit the ability to adjust the dosages of the individual components.

Potential Barriers to Insulin Therapy

Despite the many clinical benefits of insulin therapy for patients with type 2 diabetes, many patients and physicians are reluctant to begin insulin treatment, even if it is clearly indicated to achieve optimal glycemic control. There are many potential reasons for this reluctance. Physicians may be concerned about the possible side effects (ie, weight gain, hypoglycemia), as well as having limited time for patient education regarding proper insulin administration techniques.[18] In addition to the anxiety about potential side effects and learning self-injection techniques, patients may be concerned about the possibility of discomfort related to injections and complexity of regimens. Finally, some patients have the misperception that the need to start insulin therapy is a signal that their diabetes has advanced to a more serious stage or that they have "failed" in their efforts to achieve glycemic control.[40]

Physicians can help their patients by taking an active role in addressing or eliminating some of these barriers to treatment. Patients should be informed that hypoglycemia can be expected with the initiation of insulin therapy but that severe hypoglycemia is rare in patients with type 2 diabetes, affecting less than 1% of patients receiving insulin.[37] Education about proper self-monitoring of blood glucose, in conjunction with discussions of how to avoid, recognize, and treat the symptoms of hypoglycemia, may also be helpful in addressing the fear of hypoglycemia as a barrier to treatment. In addition, group diabetes patient education programs have been shown to improve glycemic control and quality of life in patients with type 2 diabetes, as well as the ability of such patients to self-manage their insulin therapies.[41]

It is important to explore the potential barriers to treatment with each patient and enlist family members to help encourage the patient to accept and adhere to the insulin regimen. For example, a patient may be a candidate for insulin therapy but has a language barrier that further complicates the initiation of insulin. The use of Spanish-speaking healthcare staff in offices serving large Hispanic populations would facilitate patient education. Notably, the ADA offers a Spanish-language website with patient education information and resources (www.portufamilia.org).[42] A recent study observed that culturally appropriate health education has a high potential to positively impact the health of Hispanic migrant farmworkers.[43]

Addressing Socioeconomic Barriers to Care: A Nonprofit Model

It is difficult to care for the whole patient and not address his or her socioeconomic situation. Healthcare professionals and community groups should partner to address such issues. For example, I founded a nonprofit organization, The Institute for Public Health and Education Research Inc., (TIPHER),[44] to help address community healthcare issues. We collaborated with other foundations, as well as private and public organizations, to build and manage a community center in the most indigent section of our service area. Free diabetes education classes are provided at this center that address patient health management. In addition, high-school diploma equivalency (GED) and English as a second language (ESL) classes are provided to improve the patient's ability to obtain better employment and thus gain access to healthcare (health insurance). A medical ESL class is also offered to increase the patient's ability to understand healthcare providers and thus facilitate healthcare for themselves and their families. This class teaches medical terminology, which can prepare students to take a certified nurse assistant class and can open employment opportunities in the healthcare industry. Additional community support services include

after-school tutoring for children at risk for dropping out of school and a volunteer-run soup kitchen that serves a noon meal Monday through Friday. My experience with this center illustrates that primary care physicians can facilitate more than prevention of end-organ damage when addressing the whole patient. We truly need to be advocates for our patients. Addressing barriers that affect access to healthcare is imperative.

Conclusions

Primary care physicians are responsible for providing healthcare to most patients with type 2 diabetes. In this role, it is critical that physicians utilize a whole-patient approach that includes lifestyle modifications and pharmacologic therapy designed to achieve glycemic control, as well as management of any other comorbid conditions and risk factors for the cardiovascular complications of diabetes.

Although many patients initially will achieve adequate glycemic control with OADs, the progressive nature of type 2 diabetes results in the eventual need for the addition of insulin; indeed, the addition of insulin therapy is the key to glycemic control in many patients. Thus, physicians need to be comfortable with the use of insulin, as well as with educating patients and discussing any potential barriers to insulin therapy. The use of a stepwise approach—beginning with the initiation of basal insulin therapy and adding prandial insulin if necessary—is simple, effective, and appropriate for many patients. By individualizing care and taking the patient's specific needs and concerns into consideration, physicians can successfully manage diabetes and prevent the development of long-term complications.

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Humor is reason gone mad.

—Groucho Marx