

# Addressing Cultural Barriers to the Successful Use of Insulin in Hispanics with Type 2 Diabetes

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**Abstract:** Hispanics experience a higher rate of diabetes than non-Hispanic whites and tend to have worse glycemic control and a greater risk of diabetes-related complications. Once oral antidiabetic agents become insufficient, insulin plays an important role in achieving glycemic goals. However, many Hispanic patients are resistant to initiating insulin therapy or hesitant to increase doses, as necessary, to control their glucose levels. Barriers to insulin therapy include socioeconomic issues (eg, cost, insurance status), language difficulties, poor health literacy, and cultural beliefs that impact the patient-provider relationship and negatively affect patients' perceptions of diabetes and insulin. Healthcare providers can help overcome these issues and improve patient-provider communication by practicing culturally competent care. Implementation of a simple titration regimen using once-daily basal insulin may enable Hispanic patients to maintain glycemic control and improve outcomes.

**Key Words:** diabetes, glycemic control, Hispanic, insulin therapy, oral antidiabetic drugs

Hispanics represent the largest minority population in the United States<sup>1</sup> and will comprise almost 25% of the US population by 2050.<sup>2</sup> Diabetes has been reported to occur at a higher rate in Hispanics compared with non-Hispanic whites of the same age. Approximately 2.5 million Hispanic adults have diabetes,<sup>3</sup> and this number is expected to increase as the Hispanic population expands in the United States. Hispanic patients with diabetes have higher mean glycosylated hemoglobin A1c (A1c) levels than non-Hispanic whites and are

also more likely to experience severe retinopathy or require lower extremity amputation.<sup>4-6</sup> Furthermore, age- and sex-adjusted rates of all-cause and cardiovascular mortality are significantly higher among Mexican-Americans with diabetes than among non-Hispanic whites with this disease.<sup>7</sup>

The American Diabetes Association recommends an A1c goal of <7.0% to reduce the risk of diabetic complications.<sup>8</sup> Early intensive blood glucose control has been shown to reduce the risk of microvascular complications in patients with type 2 diabetes.<sup>9</sup> The initial treatments for type 2 diabetes are meal planning and increasing exercise; if these modifications are not enough to control hyperglycemia, a stepwise introduction of oral antidiabetic drugs (OADs) can be used.<sup>10</sup> However, type 2 diabetes often is not even diagnosed in the hyperglycemic patient for 10 to 15 years.<sup>10</sup> There may be elevations in postprandial glucose (PPG) levels before fasting blood glucose (FBG) elevations are detected, since PPG makes a greater contribution to overall hyperglycemia relative to fasting blood glucose excursions at lower A1c levels.<sup>11</sup>

OAD therapy generally reduces A1c values by approximately 1.5% but may have a limited duration of effectiveness. During OAD therapy, a considerable delay to optimal glycemic control can occur, which may allow complications and comorbidities to accumulate from prolonged hyperglycemia.<sup>10</sup> Therefore, type 2 diabetes is a progressive disease that often inevitably requires the use of insulin therapy to improve glycemic control.<sup>12-14</sup>

## Key Points

- Compared with non-Hispanic whites, Hispanics experience a higher rate of diabetes and tend to have worse glycemic control and a greater risk of diabetes-related complications.
- Hispanics often resist insulin therapy initiation and hesitate to increase doses to control glucose levels due to language barriers, poor health literacy, and cultural issues.
- Healthcare providers can help overcome these barriers to insulin therapy through culturally competent care.

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Although insulin therapy is regarded as the most effective therapy to achieve glycemic goals, its initiation is often delayed due to barriers, such as fear of injection.<sup>15,16</sup> Hispanic patients are significantly more likely to resist initiating insulin therapy and are approximately 1.5 times less likely to adhere to insulin therapy than non-Hispanic white patients.<sup>17,18</sup> In addition to delayed use, insulin is often insufficiently dosed (despite having no upper dose limit and evidence from studies demonstrating that higher doses result in better glycemic control).<sup>10</sup> In light of these issues, this article discusses barriers to insulin treatment among Hispanic patients with type 2 diabetes and explores strategies to overcome these barriers and facilitate successful insulin therapy.

## Barriers to Insulin Therapy

### Socioeconomic Factors

Many ethnic minorities have limited access to healthcare as a result of their lower socioeconomic status. Almost 60% of Hispanic adults with diabetes have an annual income below \$20,000 compared with approximately 28% of non-Hispanic whites with diabetes.<sup>19</sup> Accordingly, in a survey of 44 low-income Mexican-Americans with type 2 diabetes, cost was identified as a reason some patients reduced their dosage or frequency of insulin therapy.<sup>16</sup> In a separate survey, cost was also cited as a barrier to treatment in 24% of Hispanic patients with diabetes versus 8% of non-Hispanic whites.<sup>19</sup> Consequently, treatment cost appears to contribute to patients' hesitancy to seek treatment, to remain adherent to insulin, and to escalate insulin doses as needed to control hyperglycemia.<sup>19</sup>

The Institute of Medicine (IOM) conducted exhaustive research in the area of racial and ethnic disparities in healthcare and found that ethnic minorities tend to receive a lower quality of healthcare, even after controlling for insurance status and income. Reasons for disparities are complex and may include bias, stereotyping, prejudice, and the clinical uncertainty physicians experience when they have difficulty understanding the patient's symptoms to make an accurate diagnosis.<sup>20</sup> The Translating Research Into Action for Diabetes (TRIAD) study was a prospective, multicenter study of diabetes care in a managed-care setting.<sup>21</sup> Brown et al<sup>21</sup> analyzed data from 4685 individuals to evaluate potential differences in participation in diabetes-related self-care behaviors, processes of care, and intermediate outcomes of care among Hispanic and non-Hispanic white patients. Hispanic patients, especially Spanish-speaking Hispanics, were significantly less likely than non-Hispanic whites to use insulin or to have a diabetes specialist as their primary care provider. In addition, Hispanic patients had lower rates of self-monitoring blood glucose and worse glycemic control than non-Hispanic white patients. The results from the TRIAD study provide further support for the research of the IOM.<sup>21</sup>

## Language and Health Literacy Issues

Language barriers may prevent delivery of adequate care by limiting or preventing exchange of communications contributing to a loss of important cultural information; misunderstanding of physicians' instructions; poor shared decision-making; and ethical compromises (such as difficulty obtaining informed consent).<sup>20</sup> Poor adherence to treatment, missed appointments, and poor patient satisfaction can all be attributed to miscommunication.<sup>22</sup> In the TRIAD study described previously, 23% of Spanish-speaking Hispanic patients reported language as a barrier in communication with the provider.<sup>21</sup> Furthermore, Hispanics with low acculturation (ie, adjustment to the predominant culture, such as speaking English) are significantly more likely than those with higher acculturation to lack a routine location for their healthcare needs, to be without health insurance, and to have a low level of education.<sup>23</sup> After controlling for ethnicity and other parameters (age, sex, body mass index, routine place of care, health insurance, and education), low language acculturation is also associated with a significantly greater likelihood of diagnosed diabetes compared with those with the highest level of language acculturation.<sup>23</sup>

Health literacy is distinct from language fluency and refers to "an individual's ability to read, understand, and use healthcare information to make effective healthcare decisions and follow instructions for treatment."<sup>24</sup> Low health literacy is particularly prevalent among Hispanic patients with diabetes and may make it difficult for patients to understand written medication instructions or educational materials. A study of 408 patients with type 2 diabetes identified that 52% of Hispanic patients versus 15% of non-Hispanic white patients had inadequate health literacy, as assessed with the English or Spanish version of the short-form Test of Functional Health Literacy in Adults. Low health literacy in patients with type 2 diabetes was correlated with poor outcomes, including a lesser likelihood of having tight glycemic control and greater likelihood of developing retinopathy.<sup>25</sup> In addition, Hispanic patients tend to rely heavily on friends and family for information, and this may result in confusion or misinformation.<sup>26</sup> Education by the physician, in combination with the patient's family or caregivers, is critical in treating Hispanic patients with diabetes.

### Cultural Issues and the Patient-Provider Relationship

It is important to recognize and respect a patient's cultural values to ensure a positive relationship. Table 1 defines key cultural principles in the Hispanic community, including *simpatía*, *personalismo*, *respeto*, *familismo*, and *fatalismo*, and includes suggestions for addressing these values when they hinder the relationship between clinician and patient.<sup>27-29</sup>

### Diabetes Knowledge and Hispanic Culture

Many Hispanic patients have a low level of knowledge about diabetes. In a survey of 22 Hispanic patients with di-

**Table 1. Hispanic cultural values that can affect the patient-provider relationship<sup>27-29</sup>**

Term	Definition	How cultural values can serve as barriers to treatment	Ways to demonstrate respect for cultural values
<i>Simpatía</i>	Kindness, politeness, pleasantness, avoidance of hostile confrontation	<ul style="list-style-type: none"> <li>Neutral attitude of many American physicians may be perceived as negative, resulting in inaccurate history, decreased satisfaction with care, treatment nonadherence, and poor follow-up</li> </ul>	<ul style="list-style-type: none"> <li>Emphasize courtesy, a positive attitude, and social amenities</li> </ul>
<i>Personalismo</i>	Formal friendliness, warm, personal relationship, characterized by interactions that occur at close distances (eg, handshakes, placing a hand on the shoulder)	<ul style="list-style-type: none"> <li>When lacking, patients may believe that the physician does not care about them and may be reluctant to share crucial details about their diabetic status, may become nonadherent to medications, may be reluctant to consider starting insulin, and may be dissatisfied with their care</li> </ul>	<ul style="list-style-type: none"> <li>When interacting with patients, decrease physical distance and increase appropriate physical contact</li> <li>Show interest in the patient's life at each visit (eg, starting the visit with a brief conversation about the patient's family, work, or school)</li> <li>Provide a business card or beeper number</li> </ul>
<i>Respeto</i>	Respect, including targeted communication based on age, gender, social position, and economic status	<ul style="list-style-type: none"> <li>Patients may be hesitant to ask questions because questioning an authority figure (eg, a physician) is viewed as disrespectful</li> <li>Patients may nod in response to physician's instructions as a sign of respect even when they do not understand</li> <li>When <i>respeto</i> is perceived as lacking, patients may become resentful and distant</li> </ul>	<ul style="list-style-type: none"> <li>Use Spanish terms of respect (eg, <i>usted</i>, the polite form of "you," instead of the informal <i>tú</i>)</li> <li>Use appropriate titles and greetings</li> <li>Whenever possible, involve patients in medical decisions, such as decisions to start insulin</li> <li>Ask about the patient's concerns, particularly regarding insulin</li> </ul>
<i>Familismo</i>	Collective loyalty to extended family that supersedes the needs of the individual	<ul style="list-style-type: none"> <li>Patients may delay or defer important treatment decisions to permit consultation with their family</li> <li>Failure to recognize this cultural value may result in unnecessary conflict, dissatisfaction with care, nonadherence to treatment, delays in initiating insulin therapy and poor continuity of care</li> </ul>	<ul style="list-style-type: none"> <li>Encourage patients to bring family members to visits</li> <li>Provide sufficient time and opportunity for the extended family to discuss important medical decisions</li> <li>Educate the patient's family about diabetes</li> <li>Encourage the family to support the patient's treatment efforts</li> </ul>
<i>Fatalismo</i>	Fatalism, belief that individuals can do little to alter fate	<ul style="list-style-type: none"> <li>Patients may avoid effective treatment plans because they feel that they cannot control their illness</li> </ul>	<ul style="list-style-type: none"> <li>Emphasize efficacy of medications, including insulin, for diabetes</li> <li>Refer to the patient's beliefs and values</li> </ul>

abetes, 91% were unfamiliar with the term A1c.<sup>30</sup> A cross-sectional survey of 30 Puerto Rican adults with type 2 diabetes found that only 37% were able to identify a normal blood glucose level, and 33% could not identify long-term complications related to diabetes.<sup>31</sup> Many Hispanic patients with diabetes feel that their disease is a punishment from God (*fatalismo*), and they can do little to alter their fate.<sup>28</sup> Such beliefs may hinder a patient's ability to successfully manage their disease.

### Myths about Insulin Therapy

Insulin is often initiated late in treatment, at a time when disease complications are more likely to occur. Therefore, some patients mistakenly perceive these complications to be the result of insulin therapy instead of prolonged hypergly-

cemia. Compared with non-Hispanic white patients, Hispanic patients are more likely to think that insulin injections will be too painful and that insulin may cause long-term complications<sup>18</sup>; a survey of Hispanic patients in a diabetes program found that 43% believed treatment with insulin could cause blindness.<sup>30</sup>

### Overcoming Barriers to Insulin Therapy

Table 2 contains strategies to overcome treatment barriers in the Hispanic patient with diabetes. These barriers are discussed below.

### Practical Barriers

When treating a Hispanic patient with diabetes, it is useful to discuss practical concerns, such as transportation and

**Table 2. Barriers to insulin therapy in Hispanic patients and strategies for overcoming these barriers**

Barrier	Strategies to overcome barrier
Practical barriers (eg, financial constraints, limited or no insurance, transportation issues)	<ul style="list-style-type: none"> <li>● Ask patients about these potential barriers</li> <li>● Direct patients to available resources (eg, <a href="https://www.pparx.org/Intro.php">https://www.pparx.org/Intro.php</a>; <a href="http://www.clevelandclinic.org/socialwork/medicationassistance.htm">http://www.clevelandclinic.org/socialwork/medicationassistance.htm</a>)</li> </ul>
Language barriers	<ul style="list-style-type: none"> <li>● Employ a diverse workforce of health professionals</li> <li>● Use translation services as needed</li> </ul>
Poor health literacy	<ul style="list-style-type: none"> <li>● Evaluate patients to determine their level of health literacy</li> <li>● Use nonclinical language</li> <li>● Use pictorial and audiovisual educational materials</li> <li>● Create and maintain a shame-free environment</li> </ul>
Cultural values	<ul style="list-style-type: none"> <li>● Practice culturally competent care by being aware of and respecting cultural values (see Table 1)</li> </ul>
Lack of adequate knowledge about diabetes	<ul style="list-style-type: none"> <li>● Educate and enable patients using culturally sensitive and language-appropriate materials</li> <li>● Direct patients to available diabetes educational programs</li> </ul>
Resignation	<ul style="list-style-type: none"> <li>● Educate patients about diabetes and self-management in a culturally sensitive manner</li> <li>● Focus on achieving glycemic goals</li> <li>● Begin insulin therapy with a simple titration regimen using once-daily basal insulin</li> </ul>
Misconceptions about insulin, especially beliefs that insulin therapy indicates the disease has progressed or that insulin may cause complications (eg, blindness)	<ul style="list-style-type: none"> <li>● Educate patients about the natural history of diabetes and the role of insulin therapy</li> <li>● Add insulin to the treatment regimen earlier in the course of therapy</li> </ul>

financial issues. Patients can be directed to mail-order pharmacy services, as well as community outreach and support programs. Furthermore, low-income patients and those with limited or no insurance may be eligible to receive free or discounted medications from various sources.

### Language and Literacy

A diverse workforce of healthcare professionals is important to overcome language and cultural barriers.<sup>20,32</sup> Translation services are essential when the clinician and patient do not speak the same language. Several different translation options exist, such as employing professional, full-time interpreters; using existing, Spanish-speaking staff as ad hoc interpreters; subscribing to a telephone service; and having a patient's English-speaking family member or friend facilitate communication. These options vary with regard to availability, cost, and need for training. The interpreter should always be asked to translate as literally as possible to avoid miscommunication.<sup>28</sup> Although it is convenient and cost-effective, using nonclinical employees, family, and friends instead of professional interpreters may result in misinterpretation due to poor understanding of medical terminology or restrictions arising from confidentiality issues.<sup>22</sup>

Clinicians should take the literacy level of their patients into account when disseminating health information. Strategies include using plain, nonclinical language, pictorial explanations of diabetes and its treatment, and audiovisual educational materials (eg, DVDs, videos, and audiocassettes or CDs).<sup>24</sup> Using the "teach-back" or "show-me" technique may help confirm that patients understand instructions.<sup>24</sup> As pa-

tients with limited literacy are often ashamed of their restriction, it is essential to maintain a shame-free environment in which patients feel comfortable asking questions or requesting further clarification when they do not understand. This may be accomplished by saying to the patient, "Many people have difficulty reading and understanding the medical information I give them, so please feel comfortable asking questions if there's something you don't understand."<sup>24</sup> Asking patients with limited health literacy if they would like a family member or friend to attend the visit may also help them feel more comfortable.<sup>24</sup> Additional information for patient education can be obtained in the Latino Initiative Website of the ADA: [www.portufamilia.org](http://www.portufamilia.org).<sup>33</sup>

### Culturally Competent Care and Patient Education

Healthcare providers can enhance outcomes with Hispanic patients by practicing culturally competent care.<sup>32</sup> Delivering effective services to racially, ethnically, and culturally diverse groups of patients involves understanding and responding to health-related cultural attitudes and beliefs, as well as to the ways that patients of a given culture prefer to interact in the clinical setting. A physician's linguistic ability and cultural competence are independently associated with the patient's assessment of interpersonal care. In particular, fluency in Spanish and cultural competence are associated with a greater ability to elicit and respond to patients' problems and concerns and to explain the condition, prognosis, and treatment.<sup>34</sup> It should be noted that involvement of the family in education and treatment decisions is particularly important in this population. The family unit should be en-

**Table 3. The LEARN model<sup>35</sup>**

Listen with sympathy and understanding to the patient's perception of the problem
Explain your perception of the problem
Acknowledge and discuss the differences and similarities
Recommend treatment
Negotiate agreement

couraged to support the patient's treatment efforts and should be incorporated into educational opportunities as often as possible.<sup>22,27</sup>

The LEARN Model is a well-established and commonly used mnemonic device designed to improve cross-cultural communication between patients and providers (Table 3). These guidelines are intended to supplement the medical interview and help the clinician focus on the patient's perceptions and understanding of the disease. The emphasis of the LEARN Model is on understanding the patient's conceptualizations and preferences, reaching a consensus or shared understanding of the problem, and involving the patient in the decision-making process. Following such a model may help to identify and address barriers to insulin therapy. Use of this model has resulted in improved communication, raised awareness of cultural issues in medical care, and enhanced patient acceptance of treatment plans.<sup>35</sup>

Culturally sensitive and language-appropriate materials written at the proper reading level can be used to educate and empower patients.<sup>22,27</sup> Patients can benefit from culturally appropriate educational programs (including pamphlets, in-person instruction, CD-ROM-based materials, and Internet-based information) designed to increase their knowledge of accessing care, communicating effectively with healthcare providers, and participating in treatment decisions.<sup>20</sup> Incorporating visual images in education materials may help minority patients to better understand how to self-manage their diabetes.<sup>26</sup>

Several studies have demonstrated improved health status, including statistically significant reductions in A1c, as a result of culturally competent diabetes care.<sup>36–39</sup> Improvements have also been seen in glucose monitoring, diabetes knowledge, patient empowerment, and satisfaction with care.<sup>36–39</sup> Common elements of successful programs have included availability of instruction in Spanish; involvement of nurses, certified diabetes educators, and other healthcare professionals; and involvement of community health workers for outreach and support.<sup>36–39</sup> In addition, a number of Internet resources are available that may be useful for clinicians treating Hispanic patients with diabetes (Table 4).

## Treatment Strategies

### Optimizing Therapeutic Success with Insulin

Healthcare providers have an important responsibility to provide education to Hispanic patients about the role of in-

**Table 4. Internet resources for clinicians treating Hispanic patients with diabetes**

1. American Diabetes Association—Latinos and Diabetes: <http://www.diabetes.org/communityprograms-and-localevents/latinos.jsp> <http://www.portufamilia.org>
2. Cross Cultural Health Care Program: <http://www.xculture.org>
3. EthnoMed: <http://ethnomed.org/ethnomed/cultures/hispanic/hispanic.html>
4. National Alliance for Hispanic Health: <http://www.hispanichealth.org>
5. National Center for Cultural Competence: <http://www11.georgetown.edu/research/gucchd/nccc>
6. National Diabetes Education Program: [http://www.ndep.nih.gov/campaigns/PasoPaso/Paso\\_a\\_Paso.htm](http://www.ndep.nih.gov/campaigns/PasoPaso/Paso_a_Paso.htm)
7. National Hispanic/Latino Diabetes Initiative for Action: <http://www.cdc.gov/Diabetes/projects/latino.htm>

sulin in the treatment of type 2 diabetes. It is essential for clinicians to inform these patients that they may require insulin therapy in the future regardless of their compliance with other therapies. This may help patients be more accepting of insulin therapy and less likely to blame themselves for the natural progression of the disease.

Prescribing a simple, straightforward insulin regimen that allows ease of initiation and titration can help patients feel more confident about managing their treatment, thus allowing them to take control of their diabetes.<sup>15,40</sup> Furthermore, introducing insulin earlier in the course of the disease may help patients achieve optimal glycemic control.<sup>40</sup> Insulin pens are easier to use than the traditional vial and syringe and may appear less forbidding; therefore, Hispanic patients may be more willing to adhere to insulin therapy regimens if pens are utilized.

Follow-up appointments can be used to monitor treatment efficacy for possible regimen modification (eg, dose titration).<sup>15</sup> It is important to focus on glycemic outcomes, such as A1c, by sharing laboratory results with patients and emphasizing that the goal is to protect their health by achieving individual glycemic targets.<sup>15</sup> Patients should be informed that there are no dose limits with insulin therapy,<sup>10</sup> and the dose should be increased until the patient meets glycemic goals or hypoglycemia becomes problematic. Educating patients may make them feel more confident in recognizing the symptoms of hypoglycemia and initiating self-treatment.<sup>15</sup>

### Basal Insulin

Insulin therapy can be initiated with a once-daily basal insulin in combination with OADs, titrated to achieve good glycemic control.<sup>40</sup> Intermediate- or long-acting insulin analogs are useful for basal insulin therapy; options include once- or twice-daily neutral protamine Hagedorn (NPH) insulin, once- or twice-daily insulin detemir (Levemir<sup>®</sup>), and once-daily insulin glargine (Lantus<sup>®</sup>).<sup>41</sup> Insulin glargine can be administered either in the morning or the evening.<sup>42</sup> A recent study showed that adding insulin to 2 OADs (sulfonylurea

[glipizide, glyburide, or glimepiride] and metformin [Gluco-*phage*]) produces significantly greater reductions in A1c in patients with baseline values  $\geq 9.5\%$  than adding a third OAD (rosiglitazone [Avandia<sup>®</sup>]).<sup>43</sup> In this study, the addition of insulin was associated with less weight gain but an increased incidence of hypoglycemia compared with treatment with rosiglitazone.

Ease of use, efficacy in reaching glycemic goals, and reduced risk of hypoglycemia are important considerations for a treatment regimen with basal insulin. The Treat-to-Target trial showed that the systematic titration of insulin glargine, when added to OAD therapy at bedtime in patients with type 2 diabetes, can achieve an A1c concentration of 7.0% with significantly less nocturnal hypoglycemia compared with NPH insulin.<sup>44</sup> Treatment with insulin detemir was compared with NPH insulin in patients with type 2 diabetes.<sup>45</sup> At 24 weeks, both treatments produced similar reductions in A1c (from 8.6% to 6.7% and from 8.5% to 6.6% for detemir and NPH, respectively), with a greater proportion of patients using insulin detemir achieving these values without hypoglycemia (26% versus 16%, respectively,  $P < 0.008$ ).<sup>45</sup> During a 24-week, randomized, open-label study in patients with type 2 diabetes uncontrolled with OADs, active titration following a simple algorithm using insulin glargine achieved significant glycemic control and A1c reduction with low rates of moderate and severe hypoglycemia (0.69 and 0.14 events per patient-year, respectively).<sup>46</sup> Notably, this study included 587 Hispanic patients who received treatment. In another study, a simple patient-driven titration algorithm (patients self-adjust insulin glargine dose every 3 d by 2 U based on mean FBG level for the previous 3 consecutive days) significantly improved glycemic control with no increase in severe hypoglycemia when compared with a clinic-driven algorithm (insulin glargine dose managed weekly by physician during visits or by telephone).<sup>47</sup>

Basal insulin therapy with insulin glargine was evaluated in a predominantly Hispanic population by a retrospective analysis in a community-based diabetes management program (Project Dulce).<sup>48</sup> As part of this program, patients received education from a certified diabetes educator, OAD therapy and insulin therapy with a short-acting analog depending on the patient's progress to glycemic control. If A1c remained above goal after 12 weeks, insulin glargine was added to pre-existing therapy. After 6.9 months, treatment with insulin glargine significantly decreased A1c compared with similar treatment without glargine (from 7.89–7.34%,  $P < 0.001$ ).<sup>48</sup>

### Postprandial Glucose and Prandial Insulin

Postprandial glucose can significantly contribute to overall hyperglycemia, especially in patients with acceptable A1c concentrations.<sup>11</sup> Patients with elevations in postprandial glucose can still have significant comorbidities despite control of

FBG levels. An elevated 2-hour postprandial glucose value is associated with increases in the risk of microvascular complications, including nephropathy and retinopathy, and death from cardiovascular disease.<sup>49,50</sup> Prandial insulin can be replaced using either a short-acting (regular human insulin [RHI; Humulin<sup>®</sup>, Novolin<sup>®</sup>]) or rapid-acting insulin analog (insulin aspart [NovoLog<sup>®</sup>], insulin lispro [Humalog<sup>®</sup>], or insulin glulisine [Apidra<sup>®</sup>]). RHI has a longer time to onset and a longer half-life, which may result in inadequate efficacy directly after a meal and in postprandial hypoglycemia a few hours after a meal, thus requiring administration well before the meal intake.<sup>40</sup> Certain rapid-acting analogs, such as insulin glulisine and insulin lispro, provide the additional benefits of allowing premeal or postmeal dosing to accommodate unpredictable meal schedules.<sup>10</sup> A basal-prandial treatment regimen with insulin detemir and the rapid-acting insulin aspart was shown to be as effective as NPH insulin in combination with mealtime RHI in patients with type 2 diabetes; 69% of the patients required a twice-daily dosing of insulin detemir.<sup>51</sup> Another study examined a basal-prandial therapy with once-daily insulin glargine and adjusted mealtime doses of the rapid-acting insulin glulisine using an algorithm to target preprandial glucose patterns in patients with uncontrolled type 2 diabetes. This simple algorithm for titrating mealtime prandial insulin was as effective as carbohydrate counting in reducing A1c levels at 24 weeks and resulted in significantly less symptomatic hypoglycemia (blood glucose,  $< 50$  mg/dL).<sup>52</sup>

The evaluation of the cost-effectiveness is key when initiating a given insulin therapy and for subsequent adherence. A study of a managed care organization showed that an approximate 10% increase in total healthcare expenditures for insulin therapy; however, these costs were offset by a 40% decrease after 9 months following initiation of insulin therapy.<sup>53</sup> In fact, adding a third oral agent to patients with T2DM that have not achieved glycemic control with 2 oral agents was not as cost-effective when compared with insulin therapy plus metformin (mean cost \$3.20/d versus \$10.40/d, respectively,  $P < 0.001$ ).<sup>54</sup>

A significant contributor to the economic consequences of insulin therapy are the costs associated with hypoglycemia.<sup>55</sup> An analysis of a large midwestern health plan indicated the mean cost per hypoglycemic episode was \$7.04/patient/mo, and this cost is smaller than that of late complications of diabetes.<sup>56</sup> An insulin therapy that has a reduced rate of hypoglycemia may offer a cost-effective advantage compared with other treatment options. Patients treated with insulin glargine had significantly lower hypoglycemia compared with NPH insulin, and although a cost increase in treating patients with glargine over NPH insulin was reported, there was a savings associated with the reduced hyperglycemia that offset the increased cost of using insulin glargine.<sup>57</sup> Insulin glargine was also associated with incre-

mental cost saving in the Medicaid program in California by reduced inpatient hypoglycemia-related claims paid.<sup>58</sup>

The subgroup of patients labeled as Hispanic is as varied as the insulin available to treat them. Each provider has barriers specific to their locale and practice setting. Recent additions of basal, rapid acting analogs, as well as inhaled insulin, limit the ability to state which regime is best for this subgroup of patients. The author's experience has been, like most practitioners, to meet the patient where one finds them (ie, to treat the patient in view of the specific situation using all the tools available in our tool box to achieve our treatment goal as quickly and safely as possible).

### Additional Injectable Drugs

New classes of injectable drugs have recently become available and can be considered for patients who have type 2 diabetes inadequately controlled with OADs. Exenatide (Byetta), a mimetic of the incretin hormone, glucagon-like peptide-1, functions by enhancing glucose-dependent insulin secretion and regulation of glucagon release.<sup>59</sup> A recent 26-week study comparing exenatide with once-daily insulin glargine showed that A1c was reduced by 1.1% in both groups (from 8.3% to 7.2% and from 8.2% to 7.1%, respectively).<sup>59</sup> However, the mean end-of-study dose of insulin glargine was only 25 U compared with the 47 U reported in the Treat-to-Target trial. Therefore, the full potential of insulin glargine may not have been realized.<sup>44,59</sup> A mean weight loss of 2.3 kg was reported in the exenatide group compared with a mean weight gain of 1.8 kg with insulin glargine. The most commonly reported adverse events for exenatide were gastrointestinal (nausea, vomiting, and diarrhea).<sup>59</sup> Nasopharyngitis was slightly more common with insulin glargine and the rate of headache was similar between the 2 treatments.<sup>59</sup> Pramlintide (Symlin), a synthetic analog of amylin (a 37-amino acid neurohormone secreted with insulin), is approved for patients with type 2 diabetes who are using mealtime insulin only or using metformin and/or a sulfonylurea.<sup>60</sup>

Exenatide and pramlintide produce modest reductions in A1c, similar to changes seen with OADs, and therefore are not suitable for patients who require more significant reductions in A1c (>1.5%). In addition, exenatide was not as cost-effective with respect to achieving glycemic control when compared with NPH insulin and insulin glargine.<sup>61</sup> These agents induce weight loss<sup>59,60,62</sup> and was cost-effective for weight loss compared with insulin,<sup>61</sup> which could be beneficial for some overweight Hispanic patients with type 2 diabetes in achieving glycemic control; however, exenatide is not a substitute for insulin.

### Conclusions

Type 2 diabetes is more common in Hispanics than in non-Hispanic whites in the United States. These minority patients have higher rates of diabetes-related complications

and may be at greater risk for all-cause and cardiovascular mortality. Intensive glycemic control reduces the risk of microvascular and macrovascular complications in patients with type 2 diabetes. Most patients with type 2 diabetes eventually require insulin once OADs are no longer effective in maintaining glycemic control. However, the Hispanic community may have a complex set of treatment barriers including socioeconomic issues, language difficulties, poor health literacy, and cultural beliefs. Patient education and enhanced patient-provider communication are necessary to optimize treatment adherence and outcomes. In particular, providing culturally competent care may result in greater patient satisfaction, understanding, and compliance with insulin therapy.

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## Answers to CME Questions

1. D, 2. C, 3. C, 4. B