Cardiac Risk Factors and Hypoglycemia in an Elderly Patient: How Good Is Good Enough?

Curtis Triplitt

Objectives: This clinical review highlights emerging data regarding the complex relationship among glycated hemoglobin (A1C) goals, risk of cardiovascular disease, and hypoglycemia in elderly patients with type 2 diabetes mellitus (T2DM). According to the ADVANCE and VADT trials, lowering patients’ A1C levels did not decrease the risk of cardiovascular disease, and the ACCORD trial found a slightly higher risk of cardiovascular disease with tighter glycemic control. Long-term follow-up data from the UKPDS indicated good glycemic control, when achieved early in newly diagnosed patients, lowered cardiovascular risk over the long term (at least 15 to 20 years). Moreover, tight glycemic control, if it results in severe hypoglycemic events, may pose a serious risk among elderly patients with T2DM.

Data Sources: Live symposium presentation based on clinical practice and research, medical literature, and studies published between October 2005 and January 2010 on managing diabetes in older adults, government statistics, and medical society guidelines.

Conclusions: If it can be achieved safely, early glycemic control is beneficial to elderly patients with T2DM. Treatment goals for older adults should be an individualized process and must include a number of considerations. Pharmacists need to manage the dual issues of avoiding intensive lowering of A1C levels and averting the risk of hypoglycemia.

Key words: A1C, Cardiovascular disease, Hypoglycemia, Hypoglycemic unawareness, Macrovascular, Microvascular, T2DM, Type 2 diabetes mellitus.

Abbreviations: A1C = Glycosylated hemoglobin, ACCORD = Action to Control Cardiovascular Risk in Diabetes Trial, ADA = American Diabetes Association, ADVANCE = Action in Diabetes and Vascular Disease Preterax and Diamicron Modified Release Controlled Evaluation Trial, CABG = Coronary artery bypass grafting, CVD = Cardiovascular disease, RRR = Relative risk reduction, T2DM = Type 2 diabetes mellitus, VADT = Veterans Affairs Diabetes Trial.

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Clinical Review

Introduction

Guidelines from the American Diabetes Association (ADA) recommend lowering glycosylated hemoglobin (A1C) levels to ≤ 7% to reduce microvascular and neuropathic complications of type 2 diabetes mellitus (T2DM). Emerging data indicate that reducing A1C levels to these evidence-based goals does not decrease the risk of cardiovascular disease (CVD) outcomes over three to five years. In contrast, long-term follow-up data (at least 15 to 20 years) from well-controlled newly diagnosed T2DM patients reported a reduction in CVD. These seemingly dichotomous results, and the risks associated with hypoglycemia in elderly patients, which have until recently been largely overlooked, are now being more fully understood and explored. In the management of elderly patients, A1C goals should be determined individually based on multiple health-based modifiers.

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Diabetes Intervention Trials: Glycemic Control and Cardiovascular Disease in Older Adults

It has long been accepted that strict glycemic control reduces microvascular complications among patients with T2DM, but the effect on macrovascular (sudden death, myocardial infarction, and stroke) complications has been clarified only recently. The evidence currently available includes three randomized controlled trials that investigated the effect of intensive vs. standard glycemic control on macrovascular disease in older, but not elderly, patients. These studies include the Action to Control Cardiovascular Risk in Diabetes trial (ACCORD), Action in Diabetes and Vascular Disease: Preterax and Diamicron Modified Release Controlled Evaluation trial (ADVANCE), and Veterans Affairs Diabetes Trial (VADT). The average age of participants in these trials was 60 to 66 years of age at enrollment. Approximately one-third of all patients had a prior history of stroke or heart attack. Each trial included intensively managed (I) and standard care (S) groups. Baseline A1C levels varied in these trials from ~7.4% in ADVANCE up to 9.4% in VADT. A summary of select baseline and follow-up data for these three clinical trials is reviewed in Table 1.

Improving glucose control did not improve patients’ cardiovascular risks, according to fine year follow-up in Action to Control Cardiovascular Risk in Diabetes trial (ACCORD), Action in Diabetes and Vascular Disease: Preterax and Diamicron Modified Release Controlled Evaluation trial (ADVANCE), and Veterans Affairs Diabetes Trial (VADT).

*Note: A 20% higher risk of death for every 1% rise in A1C above 6%, and excess mortality in patients who failed to achieve and maintain intensive glycemic goals.

**Abbreviations:** A1C = Glycosylated hemoglobin; CAD = Coronary artery disease; CV = Cardiovascular; F/u = Follow-up; Hx = History; I = Intensive; S = Standard; Sig. = Significant; T2DM = Type 2 diabetes mellitus; Tx = Treatment.

**Source:** References 2-5.

### Table 1. T2DM Trials and Cardiovascular Disease in Older Adults

<table>
<thead>
<tr>
<th>Trial and Size (n)</th>
<th>F/u (yrs)</th>
<th>Diabetic (yrs)</th>
<th>Age (yrs)</th>
<th>CAD Hx (%)</th>
<th>A1C (%)</th>
<th>End A1C (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCORD I: 5128</td>
<td>3.5</td>
<td>I: 10</td>
<td>I: 62.2</td>
<td>I: 35.6</td>
<td>I: 8.3</td>
<td>I: 6.4</td>
</tr>
<tr>
<td></td>
<td>S: 5123</td>
<td>S: 10</td>
<td>S: 62.2</td>
<td>S: 34.8</td>
<td>S: 8.3</td>
<td>S: 7.5</td>
</tr>
<tr>
<td>ADVANCE I: 5571</td>
<td>5</td>
<td>I: 7.9</td>
<td>I: 66</td>
<td>I: 32.2</td>
<td>I: 7.48</td>
<td>I: 6.49</td>
</tr>
<tr>
<td></td>
<td>S: 5569</td>
<td>S: 8.0</td>
<td>S: 66</td>
<td>S: 32.3</td>
<td>S: 7.48</td>
<td>S: 7.24</td>
</tr>
<tr>
<td>VADT I: 892</td>
<td>5.6</td>
<td>I: 11.5</td>
<td>I: 60.5</td>
<td>I: 39.8</td>
<td>I: 9.4</td>
<td>I: 6.9</td>
</tr>
<tr>
<td></td>
<td>S: 899</td>
<td>S: 11.5</td>
<td>S: 60.3</td>
<td>S: 40.9</td>
<td>S: 9.4</td>
<td>S: 8.4</td>
</tr>
</tbody>
</table>

Intensive lowering of A1C levels over three to five years does not reduce the risk of CVD outcomes. In fact, the ACCORD trial demonstrated a slightly higher risk of macrovascular complications, and the glycemic arm of the study was stopped early because of a significant increase in mortality in the intensive-therapy group. The cause of excess deaths in the intensive-therapy group in the ACCORD study is not fully understood.

At the 69th Scientific Sessions of ADA, an analysis of ACCORD presented by Riddle et al. reported that lower A1C levels alone in the intensively controlled group could not explain the excess mortality. A 20% higher risk of death for every 1% rise in A1C above 6%, and excess mortality in patients who failed to achieve and maintain intensive glycemic goals, were reported.

Thus, excess mortality was seen in the intensive glycemic control group that was unable to achieve the A1C goal, but it is unknown why this occurred.
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In summary, studies have not demonstrated a reduction in CVD outcomes with the use of short-term intensive glycemic control. Conversely, data from long-term follow-up investigations indicate that the time frame to attain CVD benefit from glycemic control may be decades. The United Kingdom Prospective Diabetes Study (UKPDS), at the conclusion of the original 10-year trial, conducted a 10-year follow-up of T2DM patients to determine if improved glucose control may have an effect on macrovascular outcomes. During the original study, the A1C differed by approximately 1%, whereas in the follow-up study, the A1C in the intensive and standard therapy groups was not significantly different. Early intensive glycemic control (study specifically used sulfonylurea-insulin combination) significantly reduced the risk of myocardial infarction (relative risk reduction \( RRR = 15\% \), \( P = 0.014 \)), any diabetes-related endpoint (RRR = 9\%, \( P = 0.04 \)), microvascular disease (RRR = 24\%, \( P = 0.001 \)), and death from any cause (RRR = 13\%, \( P = 0.007 \)) vs. early standard glycemic control on follow-up. This glycemic effect has been named the “metabolic memory” or “legacy effect” of long-term glycemic control. The Diabetes Control and Complications Trial/Epidemiology of Diabetes Interventions and Complications (DCCT/EDIC), in a type 1 diabetes mellitus cohort, also found a reduction in the risk of cardiovascular disease among intensively controlled patients followed after the conclusion of the main trial.4

For consultants, these data can be confusing, but several factors may help identify patients requiring careful scrutiny. Multiple comorbidities, severe or poorly managed microvascular or macrovascular complications, difficulty in achieving A1C goals despite adherence and multiple pharmacological agents, and a longer duration of diabetes may all place patients at higher risk of poor outcomes, and alter their A1C goal. The VADT trial reported once a patient had T2DM for > 18-20 years, the risk of CVD more than doubled.4,9

Hypoglycemia Among Elderly Patients with T2DM

Presentation of hypoglycemia differs in elderly patients compared with younger patients: the elderly exhibit fewer adrenergic symptoms (such as sweating or tremor) and more neuroglycopenic symptoms (such as confusion) at earlier stages. This tendency is exacerbated by diabetic neuropathy, resulting in significant hypoglycemic unawareness among elderly patients. Coexisting medical conditions including postural hypotension, Parkinson’s disease, dementia, cerebral vascular accident, and traumatic brain injury are often mistaken for hypoglycemia in older adults.10

Hypoglycemia occurs more frequently in intensively managed patients with T2DM than those receiving standard care.11 In the ADVANCE and ACCORD trials, hypoglycemia was not associated with an increased risk of CVD.5,12 However in the VADT, severe hypoglycemia was associated with excess risk of cardiovascular mortality.11

Because of the dangers associated with cognitive impairment and falls among the elderly, and because of the potential risk of a follow-up cardiovascular event, severe hypoglycemia should be vigorously avoided in elderly patients. In patients with intact hypoglycemic awareness and infrequent hypoglycemic episodes, it may be safe to target lower A1C goals, whereas A1C goals need to be individualized in patients with hypoglycemic unawareness, frequent hypoglycemic episodes, impaired cognition, history of falls, dementia, or other vulnerabilities.
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Determine treatment goals for older adults should be an individualized process and includes a number of considerations, such as whether they have unstable CVD, severe or poorly controlled microvascular disease, hypoglycemic unawareness, hypoglycemia issues mentioned above, cognition issues, and, potentially, time since diagnosis (Figure 1).10,12 Currently, it is recommended to reduce the A1C to < 7% in healthy older adults by ADA and the Texas Diabetes Council; however, the American Association of Clinical Endocrinologists (AACE) recommends < 6.5%.1,10,13 Many elderly T2DM patients may benefit from long-term intensive glycemic control, including elderly patients who are recently diagnosed (Figures 1 and 2).

These considerations will also help in the selection of appropriate pharmacological interventions. Risk of hypoglycemia; comorbidities such as renal, hepatic, cardiovascular, and specific geriatric syndromes (e.g., sensory impairment); history of falls (in the context of differentiation from hypoglycemia); polypharmacy; cost; and life expectancy should be considered.10 A review of the risk of hypoglycemia and effect on cardiac risk factors associated with the various pharmacological agents is summarized in Table 2.3,7,14-16

The following case will review some key points from the previous sections to illustrate applications for routine clinical practice.

Clinical Case
This case involves an 81-year-old Hispanic male patient (64.5 kg) living independently. The patient has a past medical history that includes diabetes for 18 years, hypertension for 24 years, hyperlipidemia, peripheral neuropathy, and osteoarthritis. He had a myocardial infarction and coronary artery bypass grafting (CABG) 12 years ago, and a cholecystectomy 20 years ago. His neighbor shops for him as he does not drive, and he receives Meals on Wheels in the late afternoon. He has fallen three times, all mid-morning waiting for the bus to take him to bingo. His A1C is 8.1% despite receiving rosiglitazone 4 mg twice daily and glyburide 5 mg 2 tablets twice daily. He takes his diabetes medications in the morning around 6 a.m., and with his evening meal at about 4 p.m. His fasting plasma glucose is 182 mg/dL, total cholesterol 190 mg/dL, low-density lipoprotein 118 mg/dL, high-density lipoprotein 42 mg/dL, and triglycerides 151 mg/dL. Liver function tests, electrolytes, and creatinine are within normal limits and blood pressure on exam was 142/68 mm Hg. Other concomitant medications include atorvastatin 20 mg/day, aspirin 81 mg/day, lisinopril 20 mg/day, hydrochlorothiazide 25 mg/day, metoprolol ER 100 mg/day, acetaminophen 1,000 mg twice daily, and desipramine 25 mg at bedtime.

Questions for Consideration
1. Which of the following modifiers is the most significant influence on the patient’s glycemic goal?
   A. Potentially severe hypoglycemia
   B. History of myocardial infarction and CABG
   C. Nutritional status
   D. Past glycemic control

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Figure 1. Individualizing A1C Goals

Intensity management, if:
- No/stable cardiovascular disease
- Mild-moderate microvascular complications
- Intact hypoglycemia awareness
- Infrequent hypoglycemic episodes
- Recently diagnosed diabetes

Less intensive management, if:
- Evidence of advanced/poorly controlled cardiovascular and/or microvascular complications
- Hypoglycemia unawareness
- Vulnerable patient (i.e., impaired cognition, dementia, fall history)

A1C goals should be individualized according to patient comorbidities. Here, A1C is referenced to a nondiabetic range of 4%-6% using a Diabetes Control and Complications Trial (DCCT)-based assay.

Abbreviation: A1C = Glycosylated hemoglobin.

Source: References 10, 12.
### Table 2. Therapies for T2DM: Considerations in the Elderly

<table>
<thead>
<tr>
<th>Class/Medication</th>
<th>Cardiac Risk Factors</th>
<th>Hypoglycemic Risk</th>
<th>CV Outcome Study? Lowers Risk?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biguanides</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metformin</td>
<td>Weight neutral, avoid in CHF</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Insulin</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Multiple)</td>
<td>Weight gain</td>
<td>+++</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Sulfonylureas</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Multiple)</td>
<td>Weight gain</td>
<td>+++</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>TZDs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pioglitazone</td>
<td>Weight gain, improved lipid profile, potential decrease MI (Pio), fluid retention, CHF</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>Rosiglitazone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Glinides</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nateglinide</td>
<td>Weight gain</td>
<td>++</td>
<td>No</td>
</tr>
<tr>
<td>Repaglinide</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>AGIs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acarbose</td>
<td>Weight neutral</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>Miglitol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Amylin-mimetics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pramlintide</td>
<td>Weight loss</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td><strong>GLP-1 agonists</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exenatide</td>
<td>Weight loss, improved CV risk factors—lipids, blood pressure</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>Liraglutide</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DPP-4 inhibitors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sitagliptin</td>
<td>Weight neutral, limited data on CV risk factors</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>Saxagliptin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bile acid sequestrants</strong></td>
<td>Can lower LDL, but potentially raise triglycerides, constipation in &gt; 10%</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>Colesevelam</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dopamine agonists</strong></td>
<td>Currently unavailable</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>Bromocriptine</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Impact of diabetes medications on risk for cardiovascular disease and hypoglycemia in elderly patients with type 2 diabetes mellitus.

++ = Mild, +++ = Moderate-severe.

**Abbreviations:** AGIs = Alpha-glucosidase inhibitors, CHF = Congestive heart failure, CV = Cardiovascular, DPP-4 = Dipeptidyl peptidase-4, GLP-1 = Glucagon-like peptide-1, LDL = Low-density lipoprotein, MI = Myocardial infarction, Pio = Pioglitazone, Rosi = Rosiglitazone, T2DM = Type 2 diabetes mellitus, TZD = Thiazolidinedione.

**Source:** References 3, 7, 14-16.
Screening and Management of Hyperglycemia in the Geriatric Population

Geriatric is defined as age 65+ years

Screening Recommendations for IFG, IGT & DM
FPG Annualy\(^1\); if above 100 mg/dL, confirm with repeat fasting glucose. Avoid OGTT if possible\(^2\); if below 100 and high risk based on multiple risk factors and/or metabolic syndrome consider checking postload glucose?

Diabetes Management

Goals of Therapy: consider comorbidities before setting targets:\(^1\):
- A1C < 7% if attainable without significant hypoglycemia\(^2\)
- BP <130/80 mmHg
- LDL <100 mg/dL, <70 if clinical vascular disease present
- Aspirin therapy (if no contraindications—older adults are more susceptible for GI bleeds)

Smoking cessation

Cardiovascular Risk Reduction
- Assess fasting lipids: Refer to TDC Algorithm on Lipid Management; use fibrates in caution due to renal insufficiency & consider 
- 24 hour urine for Creatinine Clearance
- Obtain baseline EKG
- Consider stress testing based on appropriate evaluation of comorbidities & life expectancy
- Treat BP to goal
- Initiate ACE inhibitor or ARB if indicated
- Aspirin therapy if no contraindication

Diabetes Management

Initial Intervention:
1) When considering interventions, consider the following: life expectancy, comorbidities and specific geriatric syndromes such as cognitive impairment, history of falls, & sensory impairment
2) Diabetes Education: Blood glucose monitoring: establish daily glucose pattern (if appropriate and patient/caregiver able) using preprandial and 2 hours postprandial glucose checks; Lifestyle (exercise, weight control); Medical Nutrition Therapy (See TDC Algorithm & Toolkit)
3) Cardiovascular Risk Reduction [see CV risk reduction on left below]
4) If lean body habits, consider diagnosis of Type 1 DM and consider measuring ICA & GAD antibodies and C-peptide. If positive antibodies or low C-peptide then consider insulin therapy.
5) Consider initiation of pharmacologic monotherapy at this time if A1C > 7.7-7.5% [see pharmacology therapy below]

Glucose goals not met within 3-6 months

Pharmacologic Therapy

Considerations in choosing agent\(^1\): risk of hypoglycemia, comorbidities, polypharmacy, cost, life expectancy

Start with monotherapy\(^1\): acarbose, BAR, DPP-4, incretin mimetic, insulin, meglitinide, metformin, SU, TZD\(^4\)

Goals achieved: continue therapy
A1C every 3-6 months

Not at goal within 3 months
Add second agent if on monotherapy
Not at goal within 3-6 months
Consider adding third agent and/or referral to diabetes specialist

Source: Reference 10.
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Figure 2. Texas Diabetes Council Algorithm

Abbreviations

AGI  Alpha-Glucosidase Inhibitors
ACE inhibitor  Angiotensin Converting Enzyme Inhibitor
ARB  Angiotensin Receptor Blocker
BAR  Bile Acid Resin (colesevelam)
CAD  Coronary Artery Disease
DPP-4  Dipeptidyl peptidase-4 Inhibitor
FGP  Fasting Plasma Glucose
IGF  Impaired Fasting Glucose
IGT  Impaired Glucose Tolerance
GAD*  Glutamic Acid Decarboxylase
ICA*  Islet Cell Antibodies
OGTT  Oral Glucose Tolerance Test
SU  Sulfonylurea
TZD  Thiazolidinediones

*note: ICA and GAD antibodies usually take 1-2 weeks to be reported. If result is positive then patient has autoimmune mediated diabetes and insulin needs to be considered and oral agents may need to be discontinued.

Hypoglycemia: Autonomic hypoglycemic warning signs may not be recognized in older adults due to changes in counter regulatory hormone response. Symptoms of hypoglycemia are often mistaken for co-existing medical conditions including postural hypotension, Parkinson’s, dementia, traumatic brain injury or CVA. Patients that cannot communicate verbally with caregivers are at greater risk.

References


Source: Reference 10.
Reprinted with permission from the Texas Diabetes Council.
CVD, in of itself, does not disqualify the patient from intensive glycemic control, but it should be noted that if the patient had unstable CVD, such control might not be advised. Individualization of the A1C goal with CVD is mostly to avoid hypoglycemia, especially severe hypoglycemia. Nutritional status should drive the selection of antihyperglycemic agents, but not necessarily drive decisions on what glycemic goal to achieve. Avoiding severe hypoglycemia should be accomplished, and using oral medications that avoid hypoglycemia will likely be advantageous for the patient. Past glycemic control has little influence on the goal, unless it has resulted in significant comorbidities, hypoglycemic unawareness, or other disease states that should preclude intensive glycemic control. Severe hypoglycemia should always be avoided, as it may increase the risk of death.

2. Which modifiers of hypoglycemic risk in the elderly have been documented with the patient?
   A. Inadequate or irregular nutrition
   B. Polypharmacy
   C. Use of alcohol, other sedating medications
   D. Impaired autonomic nervous system
   E. Cognitive disorder
   F. Renal or hepatic changes
   G. All of the above
   H. A, B, C, and D

The patient gets Meals on Wheels and there is no documentation of morning nutrition status. Thus, it is suspected that he may simply wait for the Meals on Wheels to get his daily calories. Polypharmacy is evident. Desipramine at bedtime, though an appropriate dose, may sedate the patient and make him less likely to notice hypoglycemia symptoms, or recognize the symptoms late. Clear autonomic testing confirming dysfunction is not available, but considering his age, duration of diabetes, and diagnosed diabetes-related sensory peripheral neuropathy, the chance that the patient does have autonomic dysfunction is very high. Further, there is no evidence suggesting that he suffers from a cognitive disorder or severe renal or hepatic dysfunction other than that expected with an 81-year-old patient.

3. Which of the following modifications to the glycemic control regimen for the patient is most logical?
   A. Stop glyburide, start glimepiride
   B. Stop rosiglitazone, consider low-dose acarbose
   C. Stop glyburide and rosiglitazone, place on basal insulin at bedtime, and titrate to FPG of 100 mg/dL
   D. Stop glyburide and start sitagliptin 100 mg daily
   E. Stop glyburide, add exenatide two times a day

Are the patient’s falls caused by hypoglycemia? It worth noting that we do not have definitive proof that hypoglycemia is causing the patient’s falls. Other causes could be bradycardia, hypotension, carry-over effect of the desipramine, balance issues, etc. It is known that he takes his diabetes medications in the morning around 6 a.m., but takes the bus at mid-morning. It is known that he may not experience the typical symptoms of hypoglycemia since he is receiving a β-blocker and the fact that he likely has autonomic dysfunction and his presenting symptom would likely be neuroglycopenic symptoms, such as falls. It is very possible, especially with a long-acting sulfonylurea (such as glyburide), that he could be experiencing hypoglycemia. Since this case involves both imperfect data and consequences that could be severe (i.e., the risk of falls with potential serious injury), action should be taken to remove this negative outcome.

Nonpharmacologic interventions for the patient are appropriate, and should include education about why he may be experiencing hypoglycemia, suggested change in morning eating habits, or delaying the medication until nutrition is ingested. Medication adjustment is appropriate as well. Glimepiride is also a sulfonylurea, and the risk of hypoglycemia is not eliminated by switching sulfonylureas. Switching to low-dose acarbose is likely to result in deterioration of his glycemic control and would require coordination with his meals. Basal insulin does not eliminate the risk of hypoglycemia, but may be an appropriate therapeutic option; however, this will require education about insulin and insulin administration. Dexterity may be an issue with elderly patients, and use of insulin pen devices may be appropriate. Exenatide introduces injecting with a pen device as well, and it is not stated that the patient is overweight,
though this choice would eliminate the risk of hypoglycemia (as GLP-1 agonists cause release of insulin in a glucose-dependent fashion).

The most appropriate short-term answer is to stop glyburide and start an oral medication that does not cause hypoglycemia, such as a DPP-4 inhibitor like sitagliptin. Over the long-term, the patient’s glycemic goal will need to be individualized through a comprehensive reassessment of his current medical status, and additional antihyperglycemic therapy may also be considered.

Answers:
Q 1. A
Q 2. H
Q 3. D

Summary
Early glycemic control in elderly patients with T2DM is optimal if it can be achieved safely. Multiple modifiers must be considered when choosing the A1C goal of each patient. The results of studies to date have shown that intensive lowering of A1C levels does not reduce the risk of CVD outcomes. Because the elderly are unable to tolerate hypoglycemia as well as younger patients can, severe hypoglycemia should be avoided if possible and risk of hypoglycemia should be a consideration when selecting pharmacologic therapy for diabetes in the elderly.

References