

Implementation Conference for ACE Outpatient Diabetes Mellitus Consensus Conference Recommendations: Position Statement

February 2, 2005

Over 20 million Americans suffer from diabetes; approximately one third of individuals with diabetes are undiagnosed (1). An additional 41 million have pre-diabetes (impaired glucose tolerance and/or impaired fasting glucose), a condition that often leads to diabetes if left untreated (1).

There is an explosive epidemic of diabetes with a 41% increase in prevalence during the 1990s with a shift to a younger age of onset. The prevalence of diabetes increased over 70% in adults 30-39 years of age (1).

The longer people live with uncontrolled diabetes, the greater their risk for developing vascular complications, including retinopathy, end-stage renal disease, neuropathy and coronary heart disease. These complications are not only debilitating but expensive. In 2002, diabetes cost the US over \$132 billion (1). The majority of these costs are related to the treatment and consequences of diabetic complications (2).

Several large prospective studies show that intensive treatment of diabetes can decrease the chronic complications of the disease (3-6). There appears to be no glycemic threshold for reduction of complications; the lower the A1C, the lower the rate.

Advances in pharmacologic therapies and treatment technologies have been shown effective in lowering glycemia to near-normal levels. Yet, diabetes management in the US has actually worsened during the past decade (7). Clearly, more aggressive and comprehensive application of these tools, supported by diabetes education is needed.

On January 31, 2005, the American College of Endocrinology (ACE) and American Association of Clinical Endocrinologists (AACE) convened a two-day consensus conference to review current research and address questions relevant to the treatment of diabetes. The conference brought together US and international diabetes researchers, clinical and educational experts and national organizations to focus on improving diabetes care. This report is a follow-up of the 2001 ACE/AACE Glycemic Control Consensus Conference, addressing the implementation of those glycemic goals.

Question 1: Are we intervening early enough to address glycemic control and insulin resistance in glucose intolerant states?

No.

Numerous studies have shown that significant cardiovascular disease develops years before the onset of diabetes (8-10). Hyperglycemia has been shown in epidemiologic studies to have a strong association with cardiovascular disease. In the absence of an intervention, impaired glucose tolerance (IGT), characterized by postprandial hyperglycemia, often progresses to type 2 diabetes.

There are sufficient data to recommend intervention to prevent progression of IGT to type 2 diabetes. Large randomized controlled studies have shown the effectiveness of lifestyle interventions in preventing the progression of IGT to type 2 diabetes; a 58% reduction was demonstrated in both the Diabetes Prevention Program (11) and Diabetes Intervention Study (12).

Clinical trials have also shown several pharmacologic agents to be effective in reducing IGT conversion to type 2 diabetes. These include the DPP (Metformin) (11), STOP NIDDM (acarbose) (13), TRIPOD (troglitazone) (14) and XENDOS (orlistat) (15). Although troglitazone, a thiazolidinedione, is no longer on the market, several thiazolidinediones with similar properties are currently being studied. Currently, only orlistat is an approved pharmacologic treatment for the prevention of type 2 diabetes.

Patients with IGT frequently have increased cardiovascular risk factors. Treatment of these risk factors is necessary to reduce cardiovascular events. Epidemiologic studies have shown postchallenge hyperglycemia to be a strong independent risk factor for cardiovascular disease. Thus, another potential benefit of treating the hyperglycemia associated with IGT may be the subsequent reduction of cardiovascular disease. The STOP NIDDM study showed that reducing postprandial hyperglycemia using an alpha-glucosidase inhibitor delayed the progression from impaired glucose tolerance to type 2 diabetes and was associated with a significant reduction in cardiovascular events (13). This is not a recommendation to initiate non-approved pharmacologic therapy in patients with impaired glucose tolerance.

Regarding the diagnosis and treatment of diabetes, current recommendations for diagnosis and treatment are adequate (16). Studies have shown when current glycemic goals are achieved early, beta cells are preserved (14). Further, early glycemic control in diabetes has been shown to provide residual long-term benefits in reducing vascular complications (17). Reports have shown that clinicians often have difficulty following these recommendations, resulting in a substantial delay in treatment.

Question 2: Is A1C the most important measure of glycemic control? What is the impact of glycemic excursions on the development and progression of complications?

Yes.

A1C remains the “gold standard” for assessing glycemic control. It is important to note that A1C is the sum of both fasting and postprandial glucose excursions. A recent study by Monnier and colleagues (18) showed that the relative contribution of postprandial glucose and fasting glucose to A1C is dependent upon the A1C level. The lower the A1C the greater the contribution of the postprandial; the higher the A1C, the greater the contribution of the fasting glucose. Controlling both fasting and postprandial glucose at all times is required to achieve A1C target.

Postprandial glucose excursions influence complications by virtue of the contribution they make to A1C. Epidemiologic data have shown that postprandial glucose excursions are associated with cardiovascular disease. Experimental data have suggested mechanisms by

which postprandial glucose “spikes” cause oxidative stress and adversely affect endothelial function.

Question 3: Are the current glycemic targets achievable?

Yes.

ACE targets have been achieved in clinical practice and many studies (19, 20). Persistent titration of appropriate therapies can achieve glycemic targets without unacceptable hypoglycemia. Further, early use of combination therapies, including pharmacologic agents (insulin and oral agents), medical nutrition therapy and lifestyle interventions are more effective in achieving and maintaining glycemic targets. Therapies should be added when glycemia exceeds targets. Current targets for glycemic control are:

A1C	≤6.5%
Fasting/Preprandial	<110 mg/dL
2-hr Postprandial	<140 mg/dL

Early use of insulin therapy is frequently needed for timely achievement of glycemic goals. In type 2 diabetes, targets may be achieved by basal insulin plus oral agents or basal-bolus insulin regimens; pre-mixed insulin preparations can be used in special situations. Basal-bolus insulin regimens or pump therapy is indicated for all patients with type 1 diabetes.

Insulin therapy should be tailored to minimize hypoglycemic events. Hypoglycemia is less of a risk in type 2 diabetes compared with type 1 diabetes. Use of analogue insulins has been shown to reduce the incidence of hypoglycemia. As recommended in the glycemic guidelines (16), glycemic targets and therapy should be individualized to meet the needs and conditions of each patient.

Question 4: How important is glycemic control in reducing macrovascular complications?

Likely.

As discussed above, epidemiologic and experimental evidence shows a relationship between glycemia and cardiovascular disease. Several studies demonstrate a reduction in carotid intima-media thickness (IMT), a proven surrogate marker for atherosclerosis (17, 21-23). Epidemiologic and interventional data from the UKPDS (5, 6) show that improved glycemic control improves macrovascular event rates. Further studies are underway to confirm this relationship.

Question 5: How can we implement current therapies and interventions to achieve glycemic control?

Clinical

Effective intervention begins with an uncompromising insistence to treat to target. This involves early initiation of appropriate therapies with timely and persistent titration in order to achieve glycemic targets.

Because diabetes is primarily a self-managed disease, education in self-management skills is essential in implementing interventions. An effective program involves acquisition of self-management knowledge and skills, which translate into behavioral changes. Initial and ongoing self-management education must be made available to all patients with diabetes.

Self-monitoring of blood glucose (SMBG) is a critical resource for the management of diabetes. When performed with sufficient frequency, SMBG readings allow patients and their healthcare professionals to make informed decisions about lifestyle choices and adjustments in pharmacologic therapy. SMBG can also provide ongoing feedback to patients about their nutrition and physical activity. It is a very important educational tool.

A key obstacle, however, to implementing effective interventions is a lack of supportive healthcare systems.

Systems

Too often, a fragmented healthcare delivery system is a major contributor to suboptimal care. Such a system lacks clinical information capabilities, frequently duplicates services, and is poorly structured to deliver chronic care.

Chronic care models that are focused on both outcomes and prevention have been developed and proposed as viable alternatives to our current care systems to address these problems. For example, the International Diabetes Center in Minneapolis, MN, has pioneered group education. This educational approach was shown to be as effective as traditional one-on-one education, but at significant cost savings. Another innovative approach has been applied in a Minneapolis community. A successful worksite intervention (providing diabetes education at the worksite) had a positive impact on metabolic and educational outcomes.

Similarly, redesigning systems to accommodate diabetes education in primary care practices in western Pennsylvania had a positive impact on behavioral and metabolic outcomes. Several other organizations have taken steps to implement elements of a chronic care model to improve diabetes care processes and outcomes in community, work-site and primary care practice settings with positive results. Integrating a multi-faceted approach to improving diabetes care has been shown to result in the best outcomes.

The elements of a chronic care model include: decision support, clinical information systems, self-management education, and delivery system redesign. The National Diabetes Education Program (NDEP) recently launched a new online resource to help healthcare professionals better organize their diabetes care. The www.betterdiabetescare.nih.gov website should help users design and implement more effective healthcare delivery systems for those with diabetes.

Question 6: What resources are available to support more widespread implementation of the glycemic guidelines?

Guidelines

Evidence-based guidelines are a necessary component of effective chronic disease programs. Many organizations have developed practice guidelines, however, they are frequently not implemented. Studies done at the University of Pittsburgh Medical Center demonstrated that physicians were not delivering care based on evidence-based guidelines. Interventions that included prompts, reminders and timely laboratory results helped increase utilization of guidelines with a positive effect on patient care. Guidelines should be easily accessible at the point of care (i.e., in exam rooms, on patient charts, on office computers and PDAs, etc.).

Clinical Information Systems

Clinical information systems help facilitate adherence to guidelines by providing all members of the healthcare team with timely access to data. Examples of information systems include electronic medical records (EMR) and disease-specific patient databases or registries. These systems facilitate risk stratification, application of risk-specific interventions to improve diabetes care and outcome evaluation. This approach can serve as a mechanism for healthcare professionals to improve outcomes for their patients with diabetes and gain information on performance and results.

Other Resources

Organizations conduct live diabetes-related education programs. Other educational resources including Web-based education programs, teleconferences, medical journals, magazines, and newsletters reinforce these educational efforts, as do books, manuals and audiovisual materials which can usually be located through the websites of diabetes-related organizations and the National Diabetes Clearinghouse.

Increasingly educational resources are available on organization websites, including extensive information about diabetes, daily tips, risk tests for diabetes and/or its complications, recipes, guidance for exercise and even computer forums to get information from healthcare professionals or exchange information with other people who have diabetes.

Electronic media has also been used to support follow up education. Several computer-based interventions have been shown to be effective in improving physical activity levels and nutrition goals in those with diabetes (40, 41). Computer-assisted programs that facilitate goal setting and self-management planning, available on an office kiosk with a touch screen computer have been shown to improve self-care skills (42). Similar applications are being included on diabetes-related websites and / or as software for personal computers and PDAs

Websites of the American Association of Diabetes Educators (AADE) and the American Diabetes Association (ADA) can help patients and healthcare professionals locate programs and educators. Table 2 presents a listing of these and other selected websites.

Recommendations from Consensus Panel

1. Detect and treat impaired glucose tolerance (IGT) for the purpose of preventing type 2 diabetes and potentially reducing cardiovascular disease
 - Utilize currently recognized profiles to identify patients at-risk for type 2 diabetes and perform 2-hour oral glucose tolerance test (OGTT)
 - Promptly start education and appropriate therapy for risk reductions

2. Adopt an uncompromising “treat-to-target” approach to achieve and maintain glycemic goals in patients with diabetes
 - Initiate early treatment and persistent titration to safely achieve and maintain glycemic targets in patients with diabetes
 - Address postprandial glucose as well as fasting glucose levels to safely achieve target A1C
 - Minimize glucose excursions throughout the 24-hour period
 - Utilize therapy that is physiologic to address multiple defects
 - Combine pharmacologic treatment with medical nutrition therapy (MNT) and other lifestyle intervention as initial therapy when appropriate

3. Promote the tools for self-management
 - Allocate necessary resources to support the provision of patient-centered, team care
 - Provide diabetes education
 - Use SMBG to support therapeutic decisions and enhance patient education
 - Advocate system redesign to support a chronic care model in the treatment of diabetes

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Table 1.

The panel recommends targeted screening at age 30 for populations at high risk for the development of diabetes. Risk factors include the following:

- Family history of diabetes
- Cardiovascular disease
- Overweight
- Sedentary lifestyle
- Latino/Hispanic, African American, Asian American, Native American, or Pacific Islander ethnicity
- Previously identified impaired glucose tolerance or impaired fasting glucose
- Hypertension
- Increased levels of triglycerides, low concentrations of high-density lipoprotein cholesterol, or both
- History of gestational diabetes
- Delivery of a baby weighing more than 9 pounds (4 kg)
- Polycystic ovary syndrome

Table 2. Selected Useful Websites

Websites that publish, aggregate or help translate practice guidelines include:

American Association of Clinical Endocrinologists - www.aace.com
 American Association of Diabetes Educator – www.diabeteseducator.org
 American Diabetes Association - www.diabetes.org
 Centers for Disease Control and Prevention (CDC) - www.cdc.gov/diabetes
 Council for the Advancement of Diabetes Research and Education (CADRE) –
www.cadre-diabetes.org
 Lawson Wilkins Pediatric Endocrine Society - www.lwpes.org
 National Diabetes Education Program - www.ndep.nih.gov
 National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) -
www.niddk.nih.gov
 National Guideline Clearinghouse™ (NGC) - www.guideline.gov
 International Diabetes Federation (IDF) - www.idf.org
 Texas Diabetes Council - www.tdh.state.tx.us/diabetes

Websites with information that can help enhance adherence to lifestyle choices and pharmacologic therapy include:

American Association of Clinical Endocrinologists (AACE) and American College of Endocrinology (ACE) - www.aace.com
 AACE Power of Prevention - www.powerofprevention.com
 American Diabetes Association - www.diabetes.org
 American Association of Diabetes Educators - www.diabeteseducator.org
 National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) -
www.diabetes.niddk.nih.gov
 Lawson Wilkins Pediatric Endocrine Society - www.lwpes.org
 MedlinePlus - www.medlineplus.gov
 National Diabetes Education Program - www.ndep.nih.gov
 Nutrition.gov - www.nutrition.gov
 American Dietetic Association -
www.eatright.org/Public/NutritionInformation/92.cfm

Examples of some resources that can help clinicians answer clinical questions at the point of care:

American Association of Clinical Endocrinologists/American College of Endocrinology – www.aace.com
 American Diabetes Association – www.diabetes.org
 Council for the Advancement of Diabetes Research and Education –
www.cadre-dibetes.org

National Library of Medicine's PubMed -
www.ncbi.nlm.nih.gov/entrez/query.fcgi
Physicians' Information and Education Resource -
www.pier.acponline.org//info/?hp
InfoPOEMS - www.infopoems.com
UpToDate - www.uptodate.com

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