Objectives

- Review clinical practice recommendations for diabetes management
- Discuss innovative and collaborative pharmacist practices in diabetes management
- Describe the Certified Diabetes Educator (CDE) credential
Diabetes Mellitus

- Metabolic disease characterized by hyperglycemia
- Affects **25.8 million Americans** (8.3% of population)
- **Diagnosed**: 18.8 million people
- **Undiagnosed**: 7.0 million people

- **New Cases**: 1.9 million new cases of diabetes are diagnosed in people aged 20 years and older (in 2010)
- **Prediabetes**: 79 million people in United States

Diabetes statistics. American Diabetes Association
Diabetes Mellitus

Health Care Costs

- **$174 billion**: Total costs of diagnosed diabetes in the United States in 2007
- $116 billion for direct medical costs
- $58 billion for indirect costs (disability, loss of productivity, premature mortality)

Diabetes statistics. American Diabetes Association
www.diabetes.org Accessed 7/18/11
## Etiologic Classification

<table>
<thead>
<tr>
<th>Type</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 1</td>
<td>β-cell destruction, often with absolute insulin deficiency</td>
</tr>
<tr>
<td>Type 2</td>
<td>Insulin resistance with insulin deficiency</td>
</tr>
<tr>
<td>Other specific types</td>
<td>Genetic defects, drug or chemical induced</td>
</tr>
<tr>
<td>Gestational</td>
<td>Insulin resistance with β-cell dysfunction</td>
</tr>
</tbody>
</table>

Adapted from The Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. *Diabetes Care*. 1997;20:1183-1197.
Pathophysiology of Type 2 Diabetes

Carbohydrate DIGESTIVE ENZYMES

Defective β-cell secretion

Excess glucose production

Resistance to the action of insulin

Excessive lipolysis

Reduced glucose uptake

Complications of Diabetes

**Macrovacular**

**Brain**
- Cerebrovascular disease
  - Transient ischemic attack
  - Cerebrovascular accident
  - Cognitive impairment

**Heart**
- Coronary artery disease
  - Coronary syndrome
  - Myocardial infarction
  - Congestive heart failure

**Extremities**
- Peripheral vascular disease
  - Ulceration
  - Gangrene
  - Amputation

**Microvascular**

**Eye**
- Retinopathy
- Cataracts
- Glaucoma

**Kidney**
- Nephropathy
  - Microalbuminuria
  - Gross albuminuria
  - Kidney failure

**Nerves**
- Neuropathy
  - Peripheral
  - Autonomic
Clinical Practice Recommendations

- Published by American Diabetes Association in January of each year
- Includes diagnosis criteria, disease classification and standards of medical care
- Non-pharmacologic and pharmacologic treatment
Diagnosis of Diabetes Mellitus

- A1c $\geq 6.5\%$

  OR

- Symptoms of diabetes AND casual plasma glucose $\geq 200$ mg/dL on 2 separate occasions

  OR

- Fasting plasma glucose $\geq 126$ mg/dL on 2 separate occasions

  OR

- 2 Hour glucose concentration $\geq 200$ mg/dL during a oral glucose tolerance test on 2 separate occasions

Adapted from The Executive Committee on the Diagnosis and Classification of Diabetes Mellitus. *Diabetes Care*. 2010
Plasma Glucose and A1c Goals (Adults)

<table>
<thead>
<tr>
<th>A1c</th>
<th>ADA</th>
<th>AACE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 7.0%</td>
<td>&lt; 6.5%</td>
</tr>
<tr>
<td>Preprandial Plasma</td>
<td>70-130</td>
<td>≤ 110</td>
</tr>
<tr>
<td>Plasma Glucose</td>
<td>mg/dl</td>
<td>mg/dl</td>
</tr>
<tr>
<td>Post Prandial</td>
<td>&lt; 180</td>
<td>≤ 140</td>
</tr>
<tr>
<td>Plasma Glucose</td>
<td>mg/dl</td>
<td>mg/dl</td>
</tr>
</tbody>
</table>

Sources:
Glucose Contributions to HbA1c

\[ \text{HbA}_1^c = \text{Fasting Glucose} + \text{Postprandial Glucose} \]

**Fasting Glucose influenced by:**
- Hepatic glucose production
- Hepatic sensitivity to insulin

**Postprandial Glucose influenced by:**
- Preprandial glucose
- Insulin secretion
- Glucose load from meal
- Insulin sensitivity in peripheral tissues
## Correlation Between A1C and Mean Plasma Glucose Level

<table>
<thead>
<tr>
<th>A1C (%)</th>
<th>Mean Plasma Glucose (mg/dL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>126</td>
</tr>
<tr>
<td>7</td>
<td>154</td>
</tr>
<tr>
<td>8</td>
<td>183</td>
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<td>9</td>
<td>212</td>
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<tr>
<td>10</td>
<td>240</td>
</tr>
<tr>
<td>11</td>
<td>269</td>
</tr>
<tr>
<td>12</td>
<td>298</td>
</tr>
</tbody>
</table>

Standards of Care

- BP $< 130/80$ mm Hg
- Lipid: LDL $< 100$ mg/dl, optional $< 70$ mg/dl
  - HDL $> 40$ mg/dl in men, $> 50$ mg/dl in women
  - Triglycerides $< 150$ mg/dl
- Smoking cessation
- Foot, eye and dental examinations
- ASA: 75-162mg daily for patients
  - Primary prevention in those with Type 1 or 2 at increased CVD risk, including men $> 50$ years, women $> 60$ years or those with additional risk factors
  - Secondary prevention in those with diabetes and a history of CVD
- Immunizations
  - Influenza: yearly for all patients $\geq 6$ months
  - Pneumococcal: At least 1 lifetime dose
Approach to Medical Nutrition Therapy for Primary Prevention of Diabetes

- Moderate weight loss (7% body weight)
- Balance of calories from carbohydrate, protein and monounsaturated fats
  - Individualized based on weight, glucose control, and lipid abnormalities
- Increased dietary fiber intake

ADA: Physical Activity/Exercise Recommendations for Patients With Diabetes

- Patients with type 2 diabetes should be evaluated prior to initiation of any exercise program beyond brisk walking.
- Exercise program (absent contraindications) should include:
  - 150 min/week moderate-intensity (50%-70% max heart rate) aerobic activity
- Resistance exercise 3 times/week targeting all major muscle groups

Oral Medication Therapy

- Biguanide (Metformin)
- Sulfonylureas
- Meglitinides
- Thiazolidinediones (Pioglitazone)
- Alpha-Glucosidase Inhibitors
- DPP-4 Inhibitors
  - Sitagliptin (Januvia®)
  - Saxagliptin (Onglyza™)
  - Linagliptin (Tradjenta™)
Injectable medication therapy

- **Incretin/GLP-1 agonists**
  - Exenatide (Byetta®)
  - Liraglutide (Victoza®)

- **Amylin analog**
  - Pramlintide (Symlin®)

- **Insulin**
T2DM Treatment Algorithm

The ADA and EASD released a new consensus statement in November 2008 for the treatment of patients with type 2 diabetes.

Pharmacists providing diabetes care management
Pharmacists

- Most accessible health care professionals
- Provide pharmaceutical care
  
  "the responsible provision of drug therapy for the purpose of achieving definite outcomes that improve a patient's quality of life."

- Pharmaceutical care includes providing services such as monitoring, documenting, and reporting patient adherence, drug therapy outcomes, and drug-related problems

Practice sites

- Community
- Ambulatory care
- Government agencies
- Managed care systems
- Hospital
Community Practice -
The Asheville Project

- Pharmaceutical care services (PCS) program in Asheville, North Carolina, which began in 1996
- Education for diabetes, asthma, hypertension and high cholesterol
- 12 community pharmacies received reimbursement for providing cognitive services
  - patient education and training, clinical assessment, monitoring, follow-up, and referral

Asheville Project

- 85 patients with diabetes insured by one of two local employers -- the City of Asheville (March 1997) or the Mission-St. Joseph's Health System (March 1999) received these services for 7-9 months

- Pharmacists in project completed certificate training

Patient Characteristics

- Median age: 50 years
- Ethnicity: White (85%)
- Gender: Group 1-Male (65%), Group 2 (38%)
- High School Graduates: 76%
- Mean Baseline A1c: 7.7%
- Diabetes treatment: Orals only (50-69%)
- Diabetes for 6 years
Asheville Project - Short Term outcomes

- **A1c**
  - 37% had at least 1% decrease
  - 57% had A1c <7% (from 40% baseline)

- **Total cholesterol, HDL-C, LDL-C**

- **LDL-C/HDL-C ratio**

- **Health Care Utilization and Costs**
  - Diabetes-specific costs increased by 87% ($52) PPPM ($P < .01), and all-diagnosis costs decreased by 16% ($82) PPPM (not significant).
  - Diabetes-specific utilization increased 100% ($P < .01), and all diagnosis utilization increased 42% ($P < .01).

Carole W. et al. The Asheville Project: Short-Term Outcomes of a Community Pharmacy Diabetes Care Program J Am Pharm Assoc. 2003;43(2)
Asheville Project

- Long Term outcomes (5 year follow-up)
- 7 follow-up visits
  - A1c reduction up to 1%
  - LDL-C returned to baseline by 7th follow-up visit
  - HDL-C improved by 10%
  - Total mean direct medical costs decreased by $1,200 to $1,872 per patient per year compared with baseline
  - Days of sick time decreased every year (1997–2001) for one employer group, with estimated increases in productivity of $18,000 annually

Diabetes Ten City Challenge

- Multisite community pharmacy health management program for patients with diabetes (enrollment-January 2006)
- 832 patients enrolled, 573 patients analyzed
- Objectives
  - Implement employer funded, collaborative health management program
  - Community based pharmacist coaching, using evidenced-based diabetes care guidelines, and patient self-management strategies
  - Assess participant satisfaction with diabetes care and pharmacist services

Diabetes Ten City Challenge Sites

- Charleston, SC
- Chicago, IL
- Colorado Springs, CO
- Cumberland, MD
- Honolulu, HI
- Milwaukee, WI
- Northwest Georgia
- Pittsburgh, PA
- Los Angeles, CA
- Tampa Bay, FL
## Diabetes Ten City Challenge - Year 1 results

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Baseline</th>
<th>Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1c</td>
<td>7.5%</td>
<td>7.1%</td>
</tr>
<tr>
<td>BP goal &lt;130/80</td>
<td>28%</td>
<td>39%</td>
</tr>
<tr>
<td>LDL-C &lt;100</td>
<td>57%</td>
<td>63%</td>
</tr>
<tr>
<td>Eye examinations</td>
<td>57%</td>
<td>81%</td>
</tr>
<tr>
<td>Foot examinations</td>
<td>34%</td>
<td>74%</td>
</tr>
</tbody>
</table>
Diabetes Ten City Challenge
Health Care Costs

- Medical costs decreased by 19%
- Medication costs increased by 19%
- Employer costs per patient decreased by 3.84%
- Mean total health care cost per patient decreased by 7.24%
Pharmacists’ Diabetes Care Study Review

- Review of **47 Studies** published in June 1, 2010 issue of Journal of Pharmacy Practice
- Patient outcomes improved through education, consultation or collaborative drug therapy management
- 9 studies: A1c improved by at least 2%
- 28 studies: A1c improved by at least 1%
- Health maintenance organizations in 2 reports estimated savings of **$695 to $995** per patient per year when A1c reduction was reported

Ambulatory Care Practices

- 20 studies reviewed
- Diabetes education and medication management
- Collaborative practice
- 3 months-2 years
- Average A1c reduction: 0.8-3.4%
Government Agencies

- Veterans Affairs Medical Centers
  - 3 months - 2 years
  - A1c reduction 1.6 - 3.4%
  - Pharmacist managed clinic settings

- Military Bases
  - 1 - 4 years
  - A1c reduction 1.4%

- Community Health Centers
  - 7 months - 2 years
  - A1c reduction 0.53% - 2%

Managed Care Systems

- Kaiser Permanente
- Southern California study with 6000 patients - focused on counseling and intervention
  - 21% decrease in medical costs for each new prescriptions filled
- Northern California study: 6 month duration
  - A1c reduction: 1.3%

Diabetes Management - Hospital Practice

- Discharge counseling
  - Medication and Blood Glucose Meter teaching
- Diabetes Education Programs
- Clinical team management
- Committee membership
  - Glycemic control committee
  - Nutrition
  - Discharge planning
The Role of Certified Diabetes Educators and Importance of Education
"The red circles are your red blood cells. The white circles are your white blood cells. The brown circles are donuts. We need to talk."

"I think diabetes is affecting my eyesight. I have trouble seeing the consequences of poor food choices."
Diabetes Education

- Diabetes education is defined as a collaborative process through which people with or at risk for diabetes gain the knowledge and skills needed to modify behavior and successfully self-manage the disease and its related conditions.

- Also known as diabetes self-management training (DSMT) or diabetes self-management education (DSME)
Diabetes Education

- An interactive, ongoing process involving the person with diabetes (or the caregiver or family) and a diabetes educator
- The intervention aims to achieve optimal health status, better quality of life and reduce the need for costly health care
- Diabetes education focuses on seven self-care behaviors that are essential for improved health status and greater quality of life
  - AADE-American Association of Diabetes Educators
  - ADA-American Diabetes Association
Diabetes Education

The AADE7™ Self-Care Behaviors are:

- Healthy eating
- Being active
- Monitoring
- Taking medication
- Problem solving
- Healthy coping
- Reducing risks
Diabetes Educators

- Apply in-depth knowledge and skills in the biological and social sciences, communication, counseling, and education to provide self-management education/self-management training.
- Provide their services in hospitals, physician offices, pharmacies, managed care organizations, home health care and other settings.
- May be nurses, pharmacists, dietitians and other trained professionals.
Diabetes Educators

- Help individuals identify barriers to diabetes self-management
  - How to be confident in managing diabetes
  - How to adjust emotionally to diabetes
- Facilitate problem solving and coping skills
  - How to balance eating, physical activity, medication and blood sugar monitoring routines
- Help patient achieve positive behavior changes
National Standards for Diabetes Self-Management Education

- Developed through Task Force
- Representative from American Pharmacists Association
- 10 standards, which are used to determine if program can be recognized nationally by the American Diabetes Association
- Goals to improve clinical outcomes and quality of life
- Incorporate behavioral and psychosocial strategies
ADA recognized programs

- Meet National Standards for diabetes education
- Can receive reimbursement from Medicare and Medicaid
- Recognized for 3 year period, then reapply
- Submit 3 months of outcomes data
- Online application + supplemental materials
- Cost: $1100/submission period
Certified Diabetes Educator

- First awarded in 1986 by the National Certification Board of Diabetes Educators (NCBDE)
- Professional Practice Experience
  - A minimum of two years (to the day) of professional practice experience in diabetes self-management education. **AND**
  - A minimum of 1,000 hours of diabetes self-management education experience. **AND**
  - Current employment in a defined diabetes educator role providing diabetes self-management education a minimum of four hours per week, or its equivalent, at the time of application.
Certified Diabetes Educator (CDE)

Disciplines

- Clinical psychologist, registered nurse, occupational therapist, optometrist, pharmacist, physical therapist, physician (M.D. or D.O.), or podiatrist
- Dietitian holding active registration with the Commission on Dietetic Registration
- Physician assistant
- Exercise physiologist (*minimum of a master's degree*)
- Master’s degree in social work, nutrition, health education, or specified areas of public health
Certified Diabetes Educator

- Certification every 5 years
- Initial certification: $350
- Re-certification: $250
- Re-certification through examination or continuing education (15 hours/year = 75 hours)
- Continuing education must be related to diabetes management or education
Certified Diabetes Educator

CDE Examination Content

- Assessment
- Intervention
- Program Development and Administration

As of 12/31/2010, need to document a minimum of 1000 hours of professional practice experience in diabetes self-management education at the time of application for renewal of certification.
Certified Diabetes Educators

- 17,073 health care professionals have credential in United States (January 2011)
  - Registered nurses: 54%
  - Registered dietitians: 39%
  - Registered pharmacists: 4.7%
  - Other disciplines: 2.3%

COUNT OF CDE®S BY STATE AND OTHER STATISTICS (1/2011)
Benefits of CDE credential

- Medicare reimbursement for providing diabetes education
- Recognition of experience providing diabetes education
Role of pharmacists in Diabetes Care management

- Provide comprehensive diabetes education
- Medication management through collaborative practice
- Improve continuity of care
- Reduce A1c, medical costs and possibly complications
Questions