Diabetes Care Update

2013 Geriatric Update
Meharry Consortium Geriatric Education Center

Inter-Professional Panel

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Speaker’s Bureau: Nipro

Objectives

- Discuss effective patient teaching techniques for enhancing a patient’s use of medications for diabetes control.
- Describe standards of care in diabetes treatment across the continuum of care.
Diabetes in the Elderly: Introduction

James N. Sullivan, MD
Associate Professor
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We are Witnesses to the Third Revolution in Diabetes Management

1. Discovery and use of insulin
2. Glucose Monitoring and Tight Control
3. Patient-Centered Diabetes Management
Child in 1922 before and 32 days after starting Insulin
Management of Hyperglycemia in Type 2 Diabetes: A Patient-Centered Approach

Position Statement of the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD)

Impact of Intensive Therapy for Diabetes: Summary of Major Clinical Trials

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“Diabetes” is Four Things

• Hyperglycemia (and hypoglycemia)
• Microvascular complications
• Macrovascular complications
• An incredible inconvenience for anyone and an overwhelming burden for some

• AND associated conditions:
  • Hypertension
  • Abnormal lipids
  • Other factors (probably unknown)
  • Predisposition to infections

Risk Factors DM2
PIER

• Age > 45
• Overweight
• FH parents sibs
• B H A NA
• Prior increase in fasting and postprandial glucose
• History of gestational diabetes
• Hypertension
• Low HDL
• PCOS or acanthosis nigricans
• History of vascular disease
Prevalence of Diabetes by Age, US 2002

Pathophysiology of Type 2 DM

(From Centers for Disease Control and Prevention: National Diabetes Fact Sheet. Available at: http://www.cdc.gov/diabetes/pubs/factsheet.htm)

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Pathophysiology of Type 2 DM

Age-adjusted Percentage of U.S. Adults with Obesity or Diagnosed Diabetes

CDC’s Division of Diabetes Translation, National Diabetes Surveillance System available at http://www.cdc.gov/diabetes/statistics
Progression of Diabetes

- Genetic susceptibility
- Environmental factors
  - Nutrition
  - Obesity
  - Inactivity
- Insulin resistance
  - ↑ HDL-C
  - ↑ Triglycerides
  - Atherosclerosis
  - Hypertension
  - ↑ PPG levels

Diagnosis of Diabetes

Appearance of Complications

Ongoing Hyperglycemia

Disability

Death

Duration, Severity, and Microvascular Complications

End Stage Complications

Symptomatic

Detectable but Asymptomatic

Asymptomatic

YEARS

HbA1c

9 8 7 6

11

Brown WV. Diabetes Obes Metab. 2000;Suppl 2:51-10.
Duration, Severity, and Macrovascular Complications

- Asymptomatic
- Detectable but Asymptomatic
- Symptomatic
- End Stage Complications

HbA1c
- 9
- 8
- 7
- 6

YEARS
- 0
- 5
- 10
- 15
- 20
- 25
- 30
- 35

Percent of Persons Reporting Activity Limitations, by Age Group, U.S., 1989

Source: 1989 National Health Interview Survey
Blood Glucose Control Chart

HgA1c %

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Normal Good Fair Poor

|   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|
| 90| 120| 150| 180| 240| 300|

Intervention level HbA1c ≥6.5%

Monitor for deterioration (increase doses)

Lifestyle measures

Metformin

Metformin + sulfonylurea

A sulfonylurea may be considered if the person is not overweight or if glucose levels are particularly high

A thiazolidinedione may be considered if hypoglycaemia is a particular risk

Intervention level HbA1c ≥7.5%

Add thiazolidinedione or insulin

Insulin + metformin + sulfonylurea

Exenatide may be considered if BMI >35.0 kg/m², and obesity is a problem

Monitor for deterioration (increase doses)

Stop sulfonylurea if hypoglycaemia a problem

Increase insulin dose and intensity regmen with time

Pioglitazone may be useful (with caution) if very poor control on high insulin doses
Predictors of Risk for Hypoglycemia

- Duration of diabetes:
  - 3 fold increase in risk after 15 years of diabetes
  - Exogenous insulin
  - Decreased glucagon response to hypoglycemia
- Impaired Awareness of hypoglycemia
  - 20% Type 1 diabetes
  - 10% Type 2 diabetes treated with insulin
  - Defective activation of sympathoadrenal system
  - Those with impaired awareness have 5 fold risk of severe hypoglycemia

Predictors of Risk for Hypoglycemia 2

- Renal impairment
  - Impaired clearance of insulin and sulfonylureas
  - Impaired renal gluconeogenesis
  - Impaired reabsorption of filtered glucose

- Risk of hypoglycemia 2-3 fold greater with GFR less than 60
Predictors of Risk for Hypoglycemia 3

• Increasing age and cognitive impairment
  • Decreased sympathoadrenal response
  • Decreased ability to recognize hypoglycemia
  • Decreased ability to treat hypoglycemia
• Psychosocial factors
  • Overtreatment of hyperglycemia
  • Inability to respond to symptoms

Consequences of Hypoglycemia

• Falls
• Coma
• Seizure
• Emergency room visits
• [Cardiovascular risk]
• Automobile Accidents
• Employment
Symptoms of Hypoglycemia

- Nonspecific:
  - Malaise
  - Nausea
  - Headache
- Specific:
  - Autonomic: sweating, palpitations, tremor
  - Neuroglycopenic: confusion, inability to concentrate, perseveration, resistance, rage:
    in Elderly: incoordination, ataxia, altered vision

Symptoms of Hypoglycemia 2

- Glucagon release
- Epinephrine release

- 70
  - Sweating, tremor
- 55
  - Brain dysfunction
  - Confusion, ↓ concentration
- 35
  - Coma, seizure
- 25
  - Brain damage

Elderly: incoordination, ataxia, altered vision
Symptoms of Hypoglycemia
Hypoglycemic Unawareness

- Glucagon release
- Epinephrine release

[Brain dysfunction
- Confusion, ↓concentration
- Impaired Memory]

- Lethargy, Coma
- Seizure
- Brain damage

Prevalence and Incidence of Severe Hypoglycemia

Awareness of Hypoglycemia
Normal Impaired

- 100%
- 50%
- 0%

- 2.5
- 1.0
- 0

Events per year

- 0.38
- 2.4
Tenn. Bus Crash Kills Two

NASHVILLE, Tenn. (AP) _ A veteran city bus driver who police said was speeding to make up for lost time ran two red lights, hit the guardrails of a bridge, and then struck five cars. Two people were killed.

Mr. X, 57, a Metro Transit Authority bus driver since 1968, was charged Tuesday with two counts of vehicular homicide. Mr. X, who suffered a back injury, was held at the infirmary at the county jail, said Aileen Johnson, second shift supervisor.

`It was just driver error," said police Lt. Paul Burris. `He was in a hurry to make up for lost time."'

Burris wouldn't say how fast the bus was going before the crash Monday night, but witnesses said it was speeding.

`He was going interstate speed," said Chance Blackwell.

`It looked like an explosion, like someone had thrown a hand grenade into the middle of the cars," said Fire Chief Buck Dozier.

Bus passenger Tracy Easley said that when the vehicle finally stopped, he kicked out a window and ran. `We all smelled gas and we got off in a hurry," he said.

Ten people besides Mr. X were injured, most of them on the bus.

Mr. X has had other accidents but `nothing that would lead you to anticipate this," said Bob Babbitt, MTA executive director
Sentencing Memorandum
IN THE CIRCUIT COURT OF DAVIDSON COUNTY, TENNESSEE

• Lewis: In fact what really surprised me is during this whole thing everybody else was sweating up a storm and here’s Mr. X just sitting there and not breaking a sweat and I said there’s something wrong with this guy.
• Wells: Uh-huh. Did you see him personally face to face?
• Lewis: Yeah. Yeah. He was sitting in his bus ah pulled over to the side of the road almost in the ditch and ah I told him, I said can you call your supervisor and ah, and, I think we have a problem here and he acted like he didn’t know anything and I assume he didn’t.
• Wells: So he was incoherent?
• Lewis: Yeah cause he tried to start his bus up and pull on out.
• Wells: So he was incoherent then?
• Lewis: Yeah.”

Moving back to the medical documentation, the Court will find that after the visit of June 30, 1998 Mr. X returned several times to Dr. Y since there was some alteration and modification of his medication. There was another visit to the doctor’s office on July 8, 1998, another on July 16, 1998, and another on July 22, 1998. Mr. X was seen yet again on August 21, 1998. Dr. Y’s final office note is as follows:

“Because of the low sugar, even though he has had no hypoglycemia symptoms, we are cutting his glucotrol back to 5mg twice a day. Phone call and message to him about [this], together with asking him to have a follow up sugar this week. He is to report to me immediately any symptoms of hypoglycemia.”

The fatal bus collision occurs just ten days later.
Pond Crash Driver In Previous Fatal Wreck
Doctors Say Diabetes Disoriented Man
Reported By Nancy Amons March 25, 2009

NASHVILLE, Tenn. -- The driver of an SUV who died when his SUV landed in a Bellevue pond was the former MTA bus driver who killed two teenagers in a 1998 wreck.

It appears the same medical condition that caused that wreck 11 years ago proved fatal Monday for Mr. X.

His family said he was on his way to the doctor to get his blood sugar checked Monday when he crashed into the pond. They think his diabetes made him disoriented.

Just moments earlier, a motorist had called 911 to say Simmons almost took out two gas pumps and two people at a Dailey's market on Charlotte Pike.

"He's all over the place," said a 911 caller.

The caller, still on the phone, was following Mr. X on Old Hickory Boulevard when he hit the curb and went airborne.

"Uh-oh. Uh-oh. He crashed," said the 911 caller. "He's in the lake. Doggone-it ... He's in the lake. He went in. He went in."

Rescuers tried to reach him, but the water was too cold.

In 1998, Mr. X was in another fatal crash: He was driving an MTA bus that ran two red lights on Broadway. Thirteen were injured, and two teenagers died inside a Volkswagen that was crushed by the bus.

Z was Mr. X's attorney. He blamed the wreck on Simmons' low blood sugar.

"It was a tragic case," Z said. "He was a war hero. He'd gotten a medal saving people's lives in Vietnam, and the problem was his (condition) was an unregulated diabetic condition."
Diabetes Control
What are the Problems???

• Self-indulgence: diet and exercise
• Short-sightedness
• Fatalism
• Lack of education: readin’ and ‘rithmetic
• Poverty
  • Diet
  • Access
  • Medicines

Standards of Care for Diabetes Mellitus Across the Continuum of Care

Johnny O. Wyatt, DNP, RN, BC-ADM

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Ambulatory Care

DCCT: Diabetes Control and Complications Trial

• 1983-1993
• 1441 volunteers ages 13-39 with T1DM
• Tight vs Normal Control (A1c ~6%)
• 76% reduced risk eye disease
• 50% reduced risk kidney disease
• 60% reduced risk nerve disease
• Follow-up study: EDIC
American Diabetes Association

• A1c <7% (<6.5%)
• Fasting 70-130
• 2 hour post-prandial <180
• Systolic BP <140 (ACE/ARB)
• LDL <100 (Statin) or <70 with CVD
• HDL >50
• ASA 81mg

Monitoring

• A1c every 3-6 months
• Dilated eye exam yearly
• Lipids every 3-6 months
• Urine for microalbumin yearly
• Foot exam (every visit but at least annually)
Hospital Care

Blood Sugar Goals

• Med/Surg
• ICU
• NICE-SUGAR Study
• Special Populations
Long Term Care

Patient Specific Therapy

- Individualized care
- Sliding-scale insulin use
- Physiologic insulin
- Blood sugar goals
- Falls risk
- Hypoglycemia
Items to consider

- Research studies contrasting patient outcomes with optimal A1c level standards.
- Medication issues: pancreatitis and tumor genesis.
- Adherence for older adults living at home alone.
- Foot care in people with diabetes and other self care needs.
Control blood glucose?

• Where is the data in 1986-7 for tight management?
• What proof is present, and what treatment regimen is most effective?
• Of course, the DCCT comes along in 1993!

HbA$_1C$ and Microvascular Complications: DCCT

UKPDS- Glycemic Control Reduces Risk of Complications

Risk Reduction per 0.9% Decrease in HbA$_1C$

- Any diabetes related endpoint
- Microvascular endpoint
- MI
- Cataract extraction
- Retinopathy
- Albuminuria at 12 years

25% Overall Reduction in Microvascular Endpoints


Progressive Hyperglycemia: Secondary to Beta Cell Failure

EDIC Findings: Cardiovascular Events

Cumulative Incidence of First of Any Event

Risk reduction 42%
95% CI: 9% to 63%
P = 0.02

Clinical Care Functions

- Assessment
- Nutrition
- Physical activity
- Education
- Monitoring
- Drug therapy
- Follow-up and plan adjustment

Current Therapy Choices

Medical Nutrition Therapy + Physical Activity

Secretagogues
- Biguanide
  - Metformin
- α-Glucosidase Inhibitors
  - Acarbose
  - Miglitol
- Thiazolidinedione
  - Pioglitazone
  - Rosiglitazone
- Combo Therapy
  - Many options
- Insulin
  - Aspart
  - Lispro
  - Glulisine
  - Glargine
  - Detemir
  - Others

Drug Therapy

- Diabetes medications and pancreatitis?
  - Medications that impact pancreatic function can induce change in pancreatic homeostasis
- Diabetes medications and links to tumor genesis or prevalence?
  - What causal links have been demonstrated to date versus potential and need for study
- What data exists?
The “E” Word - Exercise Benefits

• Improves
  – Glycemic control and insulin sensitivity
  – Lipid concentrations
  – Blood pressure
  – Bone, joint, and muscle function
  – Psychological well-being

• Reduces
  – Abdominal fat
  – Risk of coronary disease
  – Risk of colon cancer
  – Risk of osteoporosis
  – Stress

Screening recommendations

• Frequency
  – All persons with type 2 diabetes should be screened at diagnosis of diabetes and annually
  – All persons with type 1 diabetes should be screened 5 year after diagnosis and annually thereafter

• Method
  – Sensory examination of the feet and ankle reflexes
  – One or more of:
    • Pinprick (monofilament)
    • Temperature
    • Vibration perception (using 128-Hz tuning fork)
    • 10 Gm monofilament pressure perception
Monofilament Testing

Visual foot inspection

- Inspect the foot between the toes and from toe to heel
- Check the skin for injury, calluses, blisters, fissure, ulcers
- Look for thin, fragile, shiny and hairless skin – Vascular supply reduction
- Inspect nails for thickening, ingrown corners, length, and fungal infection
- Feel the feet for warmth and dryness
- Inspect socks or hose for blood or other discharge
- Examine footwear for torn linings, foreign objects, abnormal wear patterns, and proper fit
- If any abnormality is found, patient referral
- Document findings
Drug therapy of diabetes

• Therapy advances have occurred over the years
• More categories and mechanisms for attacking the challenge of diabetes control are being developed
• This progression continues to provide options to care

Adherence issues

• Elderly individuals remembering medications the issues of complexity
• Habit forming steps
• Do people with diabetes
  — Remember?
  — Cheat?