

ADULT TRACK

DIABETES COMPLICATIONS



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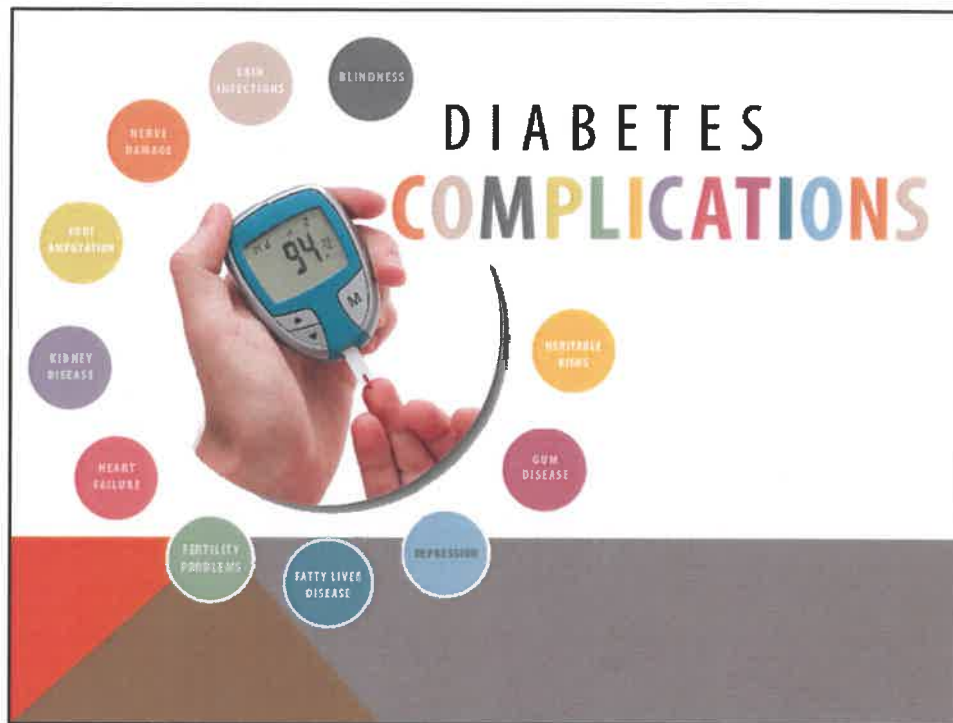
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Why We care so much about glycemic control?

Glucose= 146	A1c=9.2%	Glucose= 61
A1c= 6.7%	Glucose= 81	A1c=10.1%
A1c= 8.3%	A1c= 8.5%	Glucose= 123
A1c= 8.5%	Glucose= 231	Glucose= 240
A1c= 12.3%	A1c= 9.7%	A1c= 7.7%



Diabetes complications

1. Relations between glycemic control and diabetes complications
 - Why glucose control is important?
 - Brief summary of UKPDS and DSST trials?
2. What are complications of diabetes?
3. Prevention and management of Diabetes complications.

Glycemic control



Glycemic control

“The attempt to keep the blood sugar constantly normal may be ideal in theory, but in practice it is very difficult to achieve and makes the diabetic life unnecessarily hard without adequate benefit”

R.D. “Robin” Lawrence, the preeminent diabetologist of his time and who had type 1 diabetes himself



Lawrence RD. *The Diabetic Life: It's Control by Diet and Insulin*. 13th ed. J&A Churchill, 1944

Glycemic control

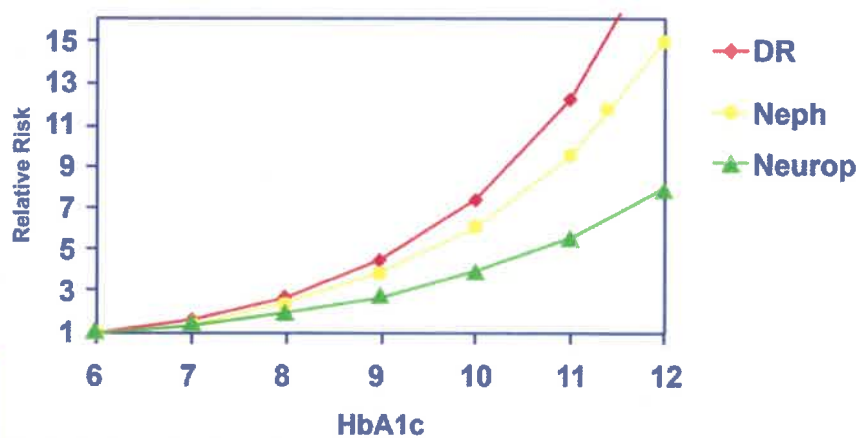
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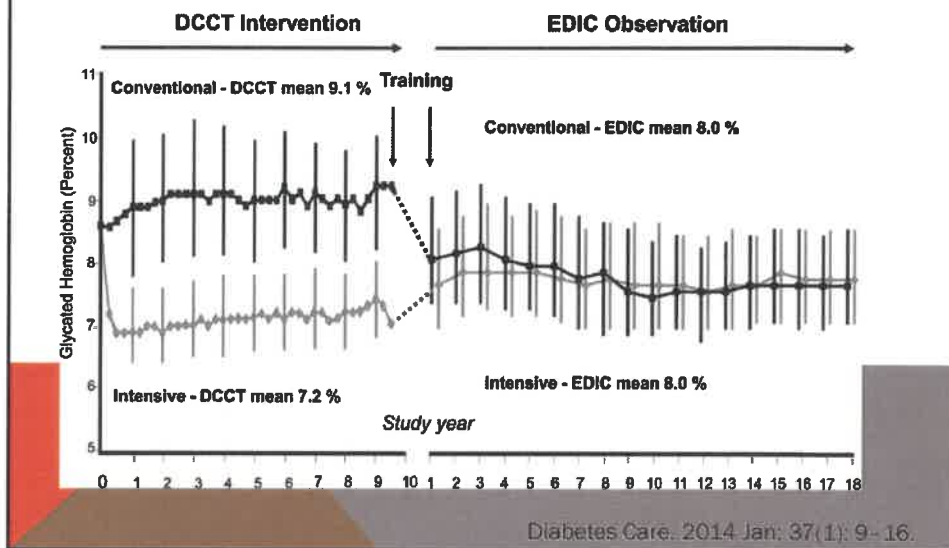
Lawrence RD. The Diabetic Life: It's Control by Diet and Insulin. 13th ed. J&A Churchill, 1944

DCCT: Relative Risk of Progression of Diabetic Complications by Mean HbA1c



Skyler JS. Endocrinol Metab Clin North Am. 1996;25:243-254.

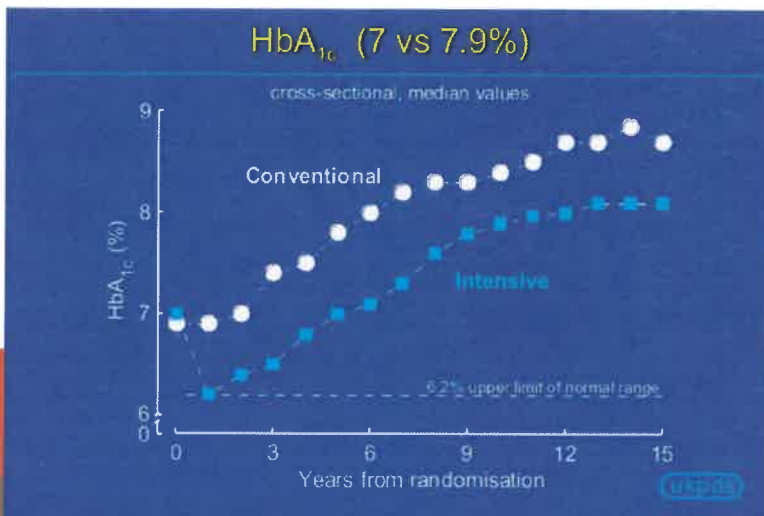
The Diabetes Control and Complications Trial/Epidemiology Of Diabetes Interventions And Complications



Glycemic Target

- HbA1c as close to normal as possible without causing hypoglycemia
- For most patients with diabetes, target HbA1c is less than 7% without hypoglycemia

The UK Prospective Diabetes Study (UKPDS) in Type 2 Diabetes



Rationale for near-normoglycemia Lessons from UKPDS: Better control means fewer complications

EVERY 1% reduction in HbA_{1c}

REDUCED RISK*



Deaths from diabetes

-21%

Heartattacks

-14%

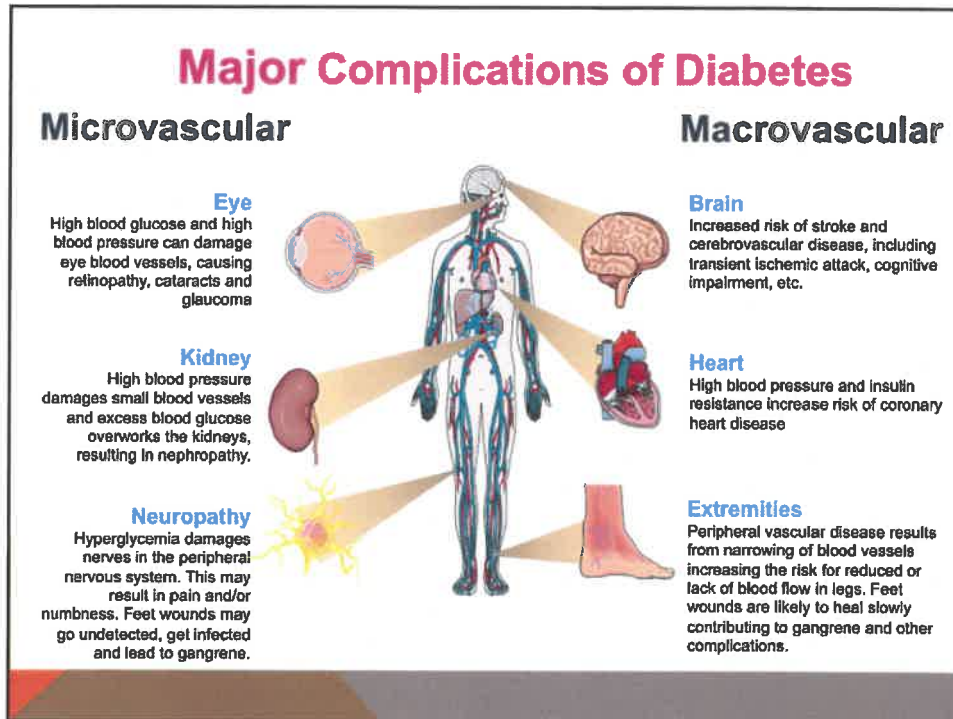
Microvascular complications

-37%

Peripheral vascular disorders

-43%

UKPDS 35, BMJ 2000; 321: 405-12



What Is The Leading Cause Of Blindness In The United States?

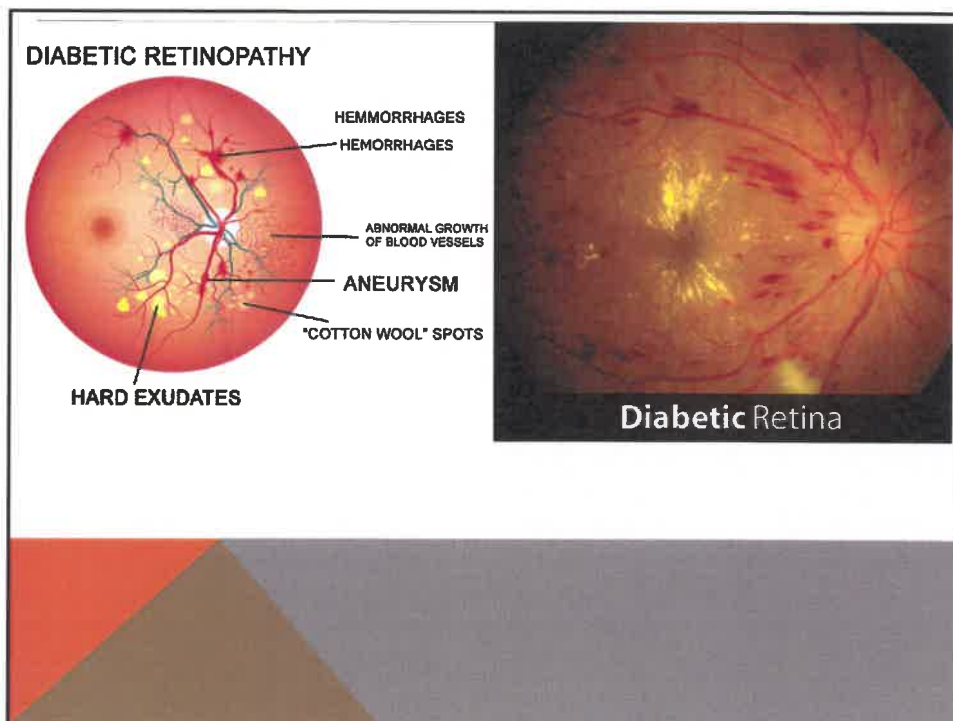
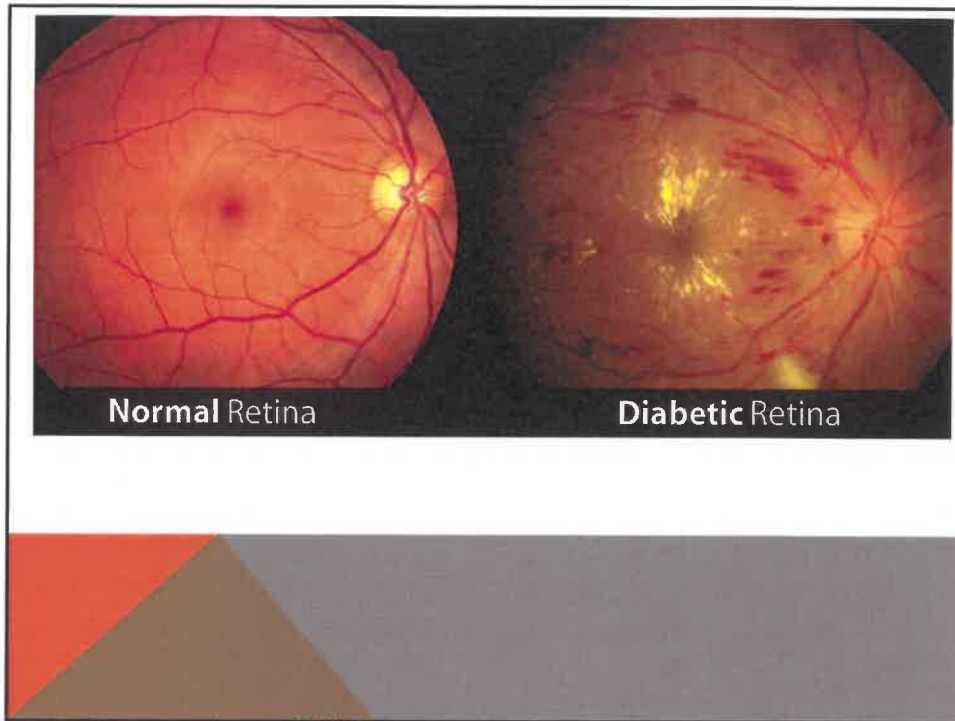
- a. Cataracts
- b. Glaucoma
- c. Diabetic Retinopathy
- d. Eye injuries

What Is The Leading Cause Of Blindness In The United States?

- a. Cataracts
- b. Glaucoma
- c. **Diabetic Retinopathy**
- d. Eye injuries

Retinopathy (Eye problems)

- Damage to the vessels in the back part of the eye (called the retina). Symptoms include blurry vision and poorer daytime and nighttime vision. If left untreated, diabetic retinopathy causes vision loss.
- Lowering HbA1c by 1% decreases the risk of retinopathy by 30%



EYE EXAMS

Annual comprehensive vision evaluations with a dilated retinal examination is recommended.

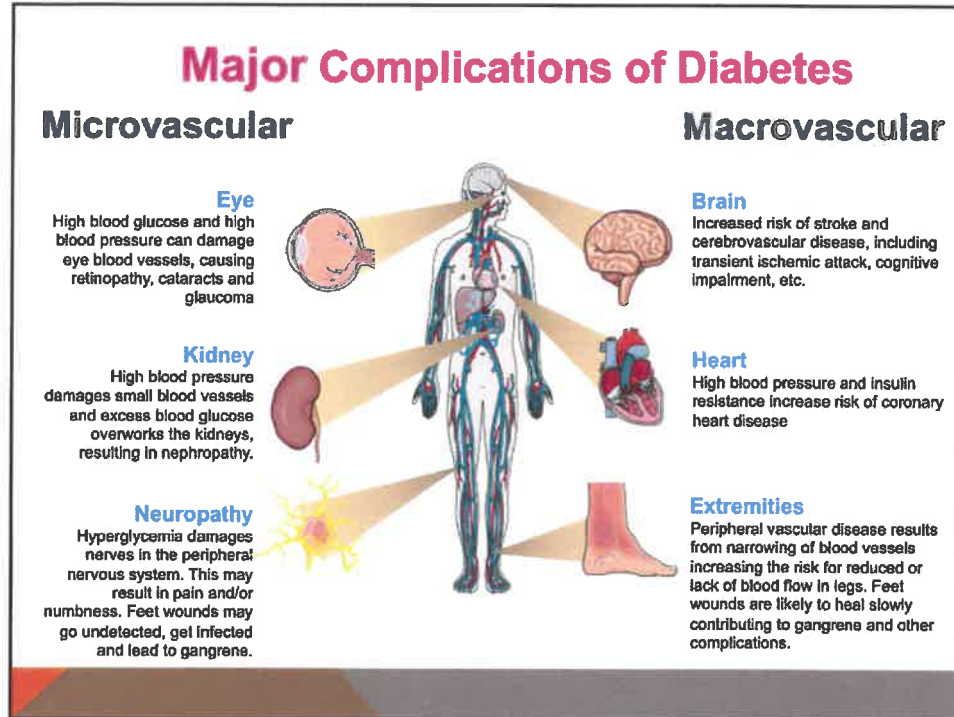
Goal:

- Educate high-risk patients on how to care for and monitor their eye health.
- Prevent low-risk patients from becoming high-risk.



Retinopathy Management

- Intensive glucose management
 - Lowering HbA1c by 1% decreases the risk of retinopathy by 30%
- Treatment
 - Injections of blood vessel growth inhibitor (prevents the growth of abnormal blood vessels.)
 - Laser coagulation
 - surgery



Nephropathy (kidney disease)

- Diabetes Nephropathy is progressive kidney diseases
- Most common cause of end stage renal disease

Different stages of diabetes nephropathy

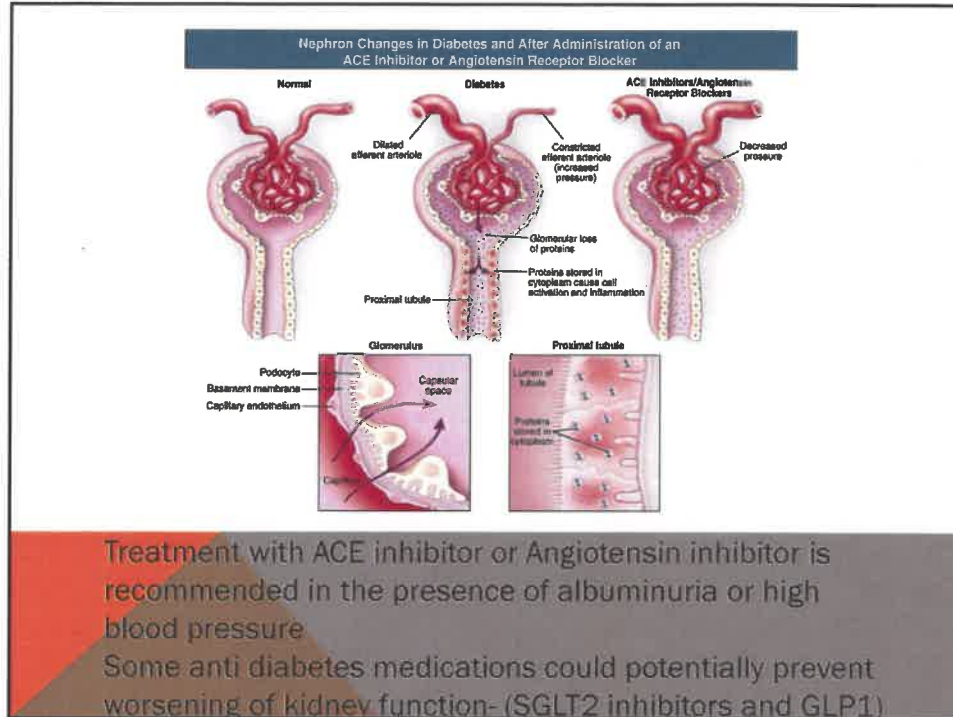
- Albuminuria- leaking protein in the urine (albuminuria)
- Kidney function impairment
- End stage renal disease
- Hemodialysis
- Kidney transplant

DIABETIC NEPHROPATHY

Annual urine test to measure Albumin/creatinine ratio is recommended

Nephron Changes in Diabetes and After Administration of an ACE Inhibitor or Angiotensin Receptor Blocker

Treatment with ACE inhibitor or Angiotensin inhibitor is recommended in the presence of albuminuria or high blood pressure.
Some anti diabetes medications could potentially prevent worsening of kidney function- (SGLT2 inhibitors and GLP1)



End Stage Renal Disease

- When kidneys are unable to get rid of body toxins

Management

- Hemodialysis
- Kidney transplant



Major Complications of Diabetes

Microvascular

Eye
High blood glucose and high blood pressure can damage eye blood vessels, causing retinopathy, cataracts and glaucoma

Kidney
High blood pressure damages small blood vessels and excess blood glucose overworks the kidneys, resulting in nephropathy.

Neuropathy
Hyperglycemia damages nerves in the peripheral nervous system. This may result in pain and/or numbness. Feet wounds may go undetected, get infected and lead to gangrene.

Macrovascular

Brain
Increased risk of stroke and cerebrovascular disease, including transient ischemic attack, cognitive impairment, etc.

Heart
High blood pressure and insulin resistance increase risk of coronary heart disease

Extremities
Peripheral vascular disease results from narrowing of blood vessels increasing the risk for reduced or lack of blood flow in legs. Feet wounds are likely to heal slowly contributing to gangrene and other complications.

Diabetes Neuropathy

- Diabetic peripheral neuropathy (DPN) is the most common complication of diabetes

Diabetic Neuropathies

Large-fiber neuropathy	Small-fiber neuropathy	Proximal motor neuropathy	Acute mono neuropathies	Entrapment
Sensory loss: 0 - +++ (touch/vibration) Pain: + - +++ Tendon reflex: N - ↓↓↓ Motor deficit: 0 - +++	Sensory loss: 0 - + (thermal allodynia) Pain: + - +++ Tendon reflex: N - ↓	Sensory loss: 0 - + Pain: + - +++ Tendon reflex: ↓↓	Sensory loss: 0 - + Pain: + - +++ Tendon reflex: N	Sensory loss in nerve distribution: + - +++ Pain: + - +++ Tendon reflex: N
	Motor deficit: 0	Proximal motor deficit: + - +++	Motor deficit: + - +++	Motor deficit: + - +++

N, normal

TYPICAL PERIPHERAL NEUROPATHY SYMPTOMS

Loss of Feeling

Freezing

Tingling

Hyper Sensitivity

Sharp Jabbing Pain

Burning Sensation

Numbness

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FOOT EXAMS

Annual comprehensive exams is recommended

- Help determine risk for developing foot complications.
- Educate high-risk patients on how to properly care for their feet.

A) Semmes-Weinstein Monofilament Test

Place Monofilament Perpendicular to Skin

Apply Pressure Until Monofilament Buckles

Release

B) Testing Sites

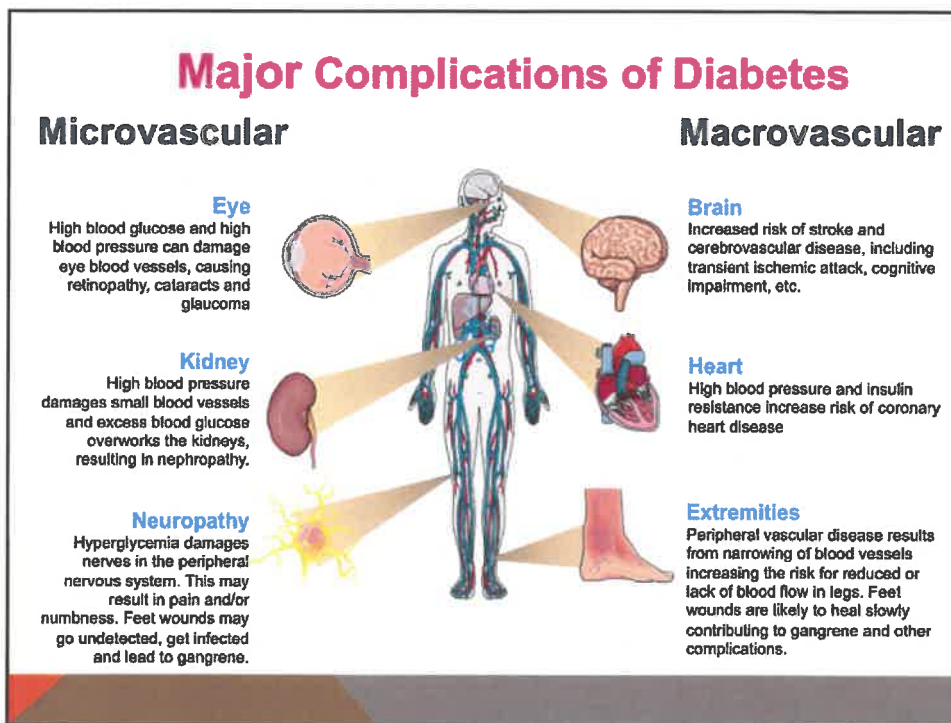
1st Metatarsal

3rd Metatarsal

5th Metatarsal

Sites Shown to Identify 80% of Patients With Abnormal Monofilament Test*

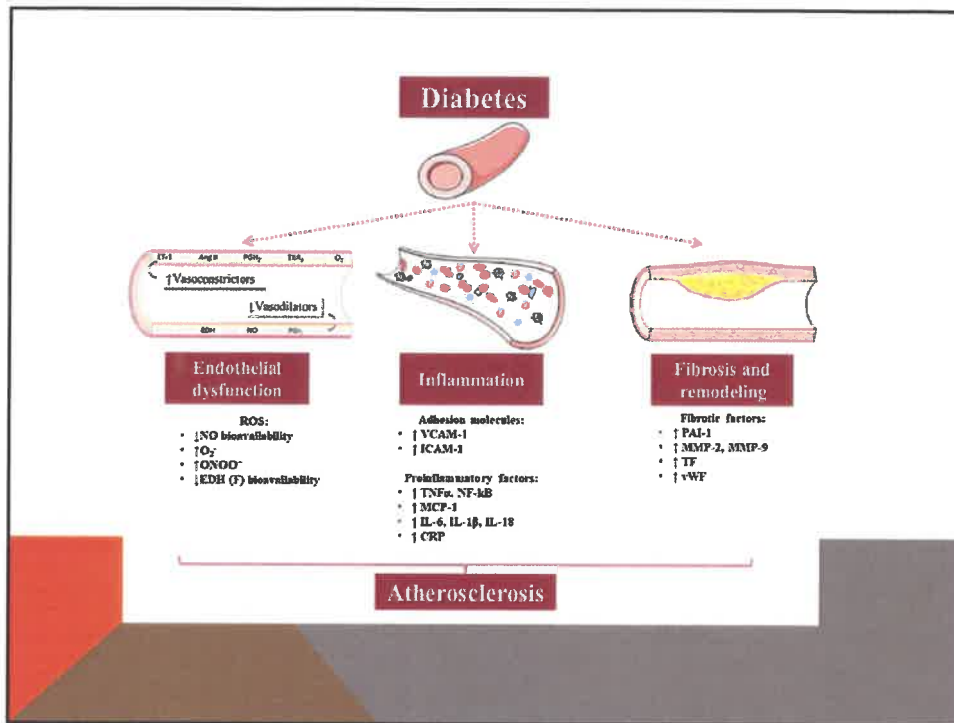
Other Recommended Sites



Macrovascular Complications Of Diabetes

AtheroSclerotic CardioVascular Disease (ASCVD) is the leading cause of morbidity and mortality in patients with diabetes

- **Coronary Artery Disease**
- **Peripheral Vascular Disease**
- **Stroke**



Diabetes Increases the Risk of Large Blood Vessel Damage

Healthy Artery

Atherosclerosis

Macrovascular complications:

- Stroke
- Heart attack
- Poor circulation

Over time, fatty deposits can clog large blood vessels

Prevention of Cardiovascular Disease

Risk factor modifications

- Physical activity
- Healthy diet
- BP control →
- Lipid management →
- Glucose management
- Smoking cessation

Target: 130/80
statins for all >40 y/o

ADA/ EASD Guideline Update on the Management of Type 2 Diabetes

- Medications from 2 different classes of glucose-lowering drugs have shown reduction in cardiovascular events in patients with established cardiovascular disease.
 - Sodium-glucose Cotransporter-2 (SGLT2) Inhibitors (Empagliflozin, Canagliflozin)
 - Glucagon-like peptide-1 (GLP-1) agonist (liraglutide).

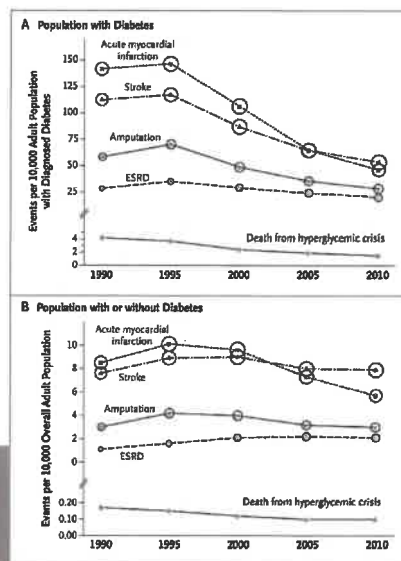
DIABETES COMPLICATIONS

- Diabetes increases your risk for many serious health problems
- Most of the complications are NOT reversible

The good news?

With the correct treatment and recommended lifestyle changes, many people with diabetes are able to prevent or delay the onset of complications

Trends in Age-Standardized Rates of Diabetes-Related Complications among U.S. Adults with and without Diagnosed Diabetes

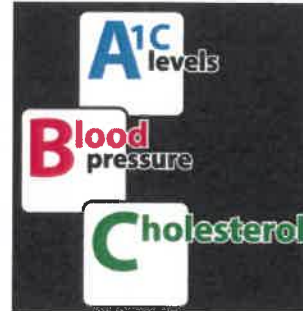


GREGG EW ET AL. N ENGL J MED 2014;370:1514-1523

THE NEW ENGLAND JOURNAL OF MEDICINE

KEY MESSAGE TO PREVENT DIABETES COMPLICATIONS: CONTROL THE ABCS

- A1c: Blood glucose control
- B: Blood pressure control
- C: Cholesterol (Blood lipid) control
- S: Smoking (and use of other tobacco products) cessation (and don't start)



© 2011 The Diabetes Council, Inc. All rights reserved. For more information on diabetes and prediabetes in the United States, 2011, Atlanta, GA, U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2011. Available at: <http://www.cdc.gov/diabetes/pubs/pdf/s12011a01.pdf>

KEEP YOUR HEATH ON TRACK

T **R** **A** **C** **K**

T: Take your medications as prescribed by your doctor. (Icon: A white pill bottle with a red cross on a red circle background.)

R: Reach and maintain a healthy weight. (Icon: A white scale with feet on a yellow circle background.)

A: Add more physical activity to your daily routine. (Icon: A person on a bicycle on a blue circle background.)

C: Control your ABC's A1C, blood pressure, and cholesterol levels. (Icon: A white heart with sound waves on a green circle background.)

K: Kick the smoking habit. (Icon: A red 'STOP' sign over a pack of cigarettes on a red circle background.)

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Diabetes increases your risk for many serious health problems.

Every 24 Hours...

4557 adults are diagnosed with diabetes.

136 people begin treatment for end-stage renal disease.

200 nontraumatic lower-limb amputations are performed.

641 people die from diabetes, or diabetes is a contributing cause of their death.



CDC. National Diabetes Statistics Report, 2014. Estimated of diabetes and prediabetes in the United States, 2014. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention; 2014. Available at: http://www.cdc.gov/diabetes/pubs/pdf/sr14_2014.pdf

Research Advancements >> Dramatic Drop in Diabetes-Related Complications



Heart Attack

-67.8%



Stroke

-52.7%



Amputation

-51.4%



Kidney Failure

-28.3%



Provided by the American Diabetes Association