Diagnosing Diabetes

Screening is indicated when there are risk factors such as an elevated BMI, hypertension, or advanced age. Different screening tools exist, each with their own advantages.

The **random glucose** is convenient – it can be obtained at any time without preparation and it's a one-time test. The diagnosis is made if the random glucose is **> 200** and there **are symptoms** of diabetes (polyuria, polydipsia). No repeat confirmatory test is necessary. The random glucose can be affected by acute stress, such as illness or steroid use, and does not reflect the long-term impact on the body.

The **fasting glucose** is a better screen but requires preparation. The patient must have an overnight fast. It also needs a **second confirmatory check**. A **bG > 125** on the fasting check is indicative of diabetes. < 100 is normal and between 100-125 is termed prediabetes or insulin insensitivity.

The **oral glucose tolerance test** accurately reflects the pathophysiology of diabetes but is time-intensive. The patient has a fasting check, then consumes an oral glucose load of 75g. Two hours later the glucose is tested (effectively the post-prandial glucose). A value of < 140 is normal, 140-199 is prediabetes, and **> 200** is diabetes.

The **HgbA1c** is the preferred method in the United States because it reflects the past 3 months of blood glucose and is a more accurate reflection of what's happened rather than what's going on in the body immediately (it isn't influenced by stress or infection like a one-time glucose check is). However, it may miss early glucose abnormalities and requires 3 months of hyperglycemia to turn positive (thus it's NOT used to screen for gestational diabetes). A **normal A1c** is < **5.7**. **Prediabetes** is between **5.7 and 6.4**, and **diabetes A1c** is **> 6.5**.

When considering Type I diabetes (even if the onset is in adult age ranges) measurement of **autoantibodies** are recommended. If the patient has rapidly progressive diabetes refractory to oral medications or has a high insulin requirement despite being relatively normal weight, assess **GAD65** and **IA-2** antibodies. Those who have slowly progressive type II diabetes shouldn't have antibodies checked. "Type I" should be considered instead "autoimmune destruction" and can occur at any age or BMI range.

Treating Prediabetes

Early intervention can delay or prevent th onset of diabetes. When in the pre-diabetic range **metformin** and **lifestyle adjustment** (diet and exercise) are absolutely indicated and can prevent diabetes onset.

Screening and Diagnosing Diabetes

Random Glucose
Normal	< 200
Diabetes	> 200

Must have symptoms of diabetes

Fasting Glucose
Normal	< 100
Prediabetes	100-124
Diabetes	> 125

Must have two readings to confirm

2-Hour Glucose Tolerance Test
Normal	< 140
Prediabetes	140-199
Diabetes	> 200

Indicated when prediabetes is found on fasting

A1c
Normal	< 5.7
Prediabetes	5.7-6.4
Diabetes	> 6.5

May miss early disease, do not use in gestational

Type I = Autoimmune Destruction

Usual	Juvenile Onset Type I Diabetes Type I Physiology, Antibodies Positive Childhood
LADA	Late Autoimmune Diabetes in Adults Type I Physiology, Antibodies Positive Adult Age
Idiopathic	Type I just because (rare) Type I Physiology, Antibodies negative Adult Age

Treatment of Pre-Diabetes

Diet and Exercise	(Start both at the same
Metformin	time)

OnlineMedEd

Treatment of Type I Diabetes

Type I diabetics will require **life-long insulin therapy**. Insulins are discussed in the subsequent lecture. If they can maintain adequate glycemic control on multiple injections per day therapy, they should continue that. If they can't, they should be considered for **insulin pumps** and/or **continuous monitor glucose** devices.

Treatment of Diabetes – Non Insulins
Lifestyle is always the first step.

Metformin is the by far the best pharmacologic therapy and is **always first line** unless contraindicated. Metformin can't be used in **CKD**, **CHF**, or liver disease because of the risk of lactic acidosis. It should **always be held** when hospitalized.

The **second-line agent** is chosen based on patient preference and side effect profile.

The combination of **three of more oral agents** is **NOT SUPERIOR** compared to **two agents.** Failure of two oral agents should prompt insulin.

In general, initiation of lifestyle modifications can reduce the A1c by about 1%. Oral agents reduce the A1c by 3%. If the patient has an A1c >9%, insulin should be started.

Ongoing Assessment of Diabetes

Self-monitoring of blood sugar is a means of controlling blood glucose for those with insulin. **Pre-prandial** glucose checks are used for all-comers. Once the pre-prandial glucoses are at goal but the A1c is not, **post-prandial** glucose checks can be added. Those patients who do NOT use insulin should NOT use self-monitoring of blood glucose.

The **A1c** is assessed every **three months** for all patients with prediabetes, diabetes, and insulin-dependent diabetes. The goal A1c is <7.

Preventative Care in Diabetes

Diabetes takes the eyes, the kidneys, and the nerves. Long-standing diabetes and the microvascular changes it brings can lead to amputations, blindness, and dialysis. Diabetic wounds are difficult to heal due to the microvascular damage. Diabetic wounds form because of the peripheral neuropathy that develops. So, screening becomes important.

A **physician** needs to screen for **retinopathy every year** with a retinal examination**, nephropathy every year** with a urinalysis and microalbumin/creatinine ratio, and **neuropathy every year** with a monofilament wire examination.

Patients should be educated to exam their feet periodically for wounds and to ensure that shoes are not too tight.

Type	Name	Mechanism	SE
Biguanides	Metformin	↑Insulin sensitivity	Diarrhea
Sulfonylurea	Glyburide Glipizide	↑Insulin secretion	Hypoglycemia
TZDs	Pioglitazone ~~Rosiglitazone~~	↑Insulin Sensitivity	Weight Gain
DDP-4-i (liptins)	Sitagliptin Saxagliptin	DDP-4-i	Weight Neutral
GLP-1 analogs	Exenatide Liraglutide	↑GLP-1	Weight Loss
Meglitinides	Repaglinide Nateglinide	↑Insulin Secretion	Hypoglycemia
SGLT2-i	Canagliflozin Dapagliflozin	Block glucose absorption in kidneys	Euglycemic DKA
Alpha-Glucosidase inhibitors	Acarbose Miglitol	Block intestinal absorption	Diarrhea, Gas

Don't ever use SGLT2-inhibitors. You're giving your type II diabetic a medication that has the same mechanism of action as DKA.

Do What	When
Self-Monitoring of Blood Glucose	On insulin
Pre-Prandial Checks	On insulin
Post-Prandial Checks	Pre-prandials are controlled by A1c is not
A1c	Every 3 months

Complication	Screen	Treatment
Retinopathy	Retina Exam	Laser
Nephropathy	Microalb/Crea	Ace-inhibitor
Neuropathy	Monofilament	Gabapentin