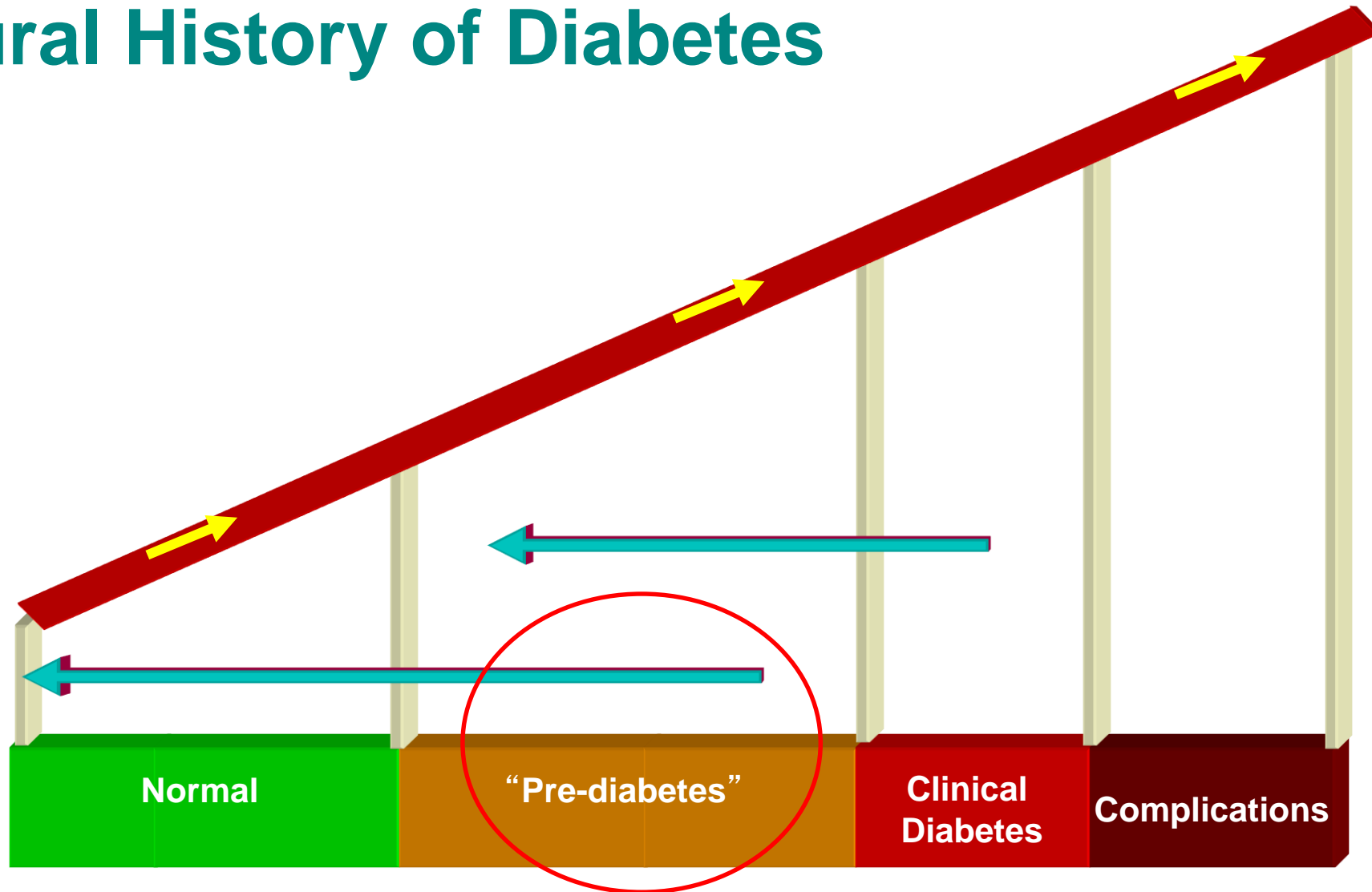
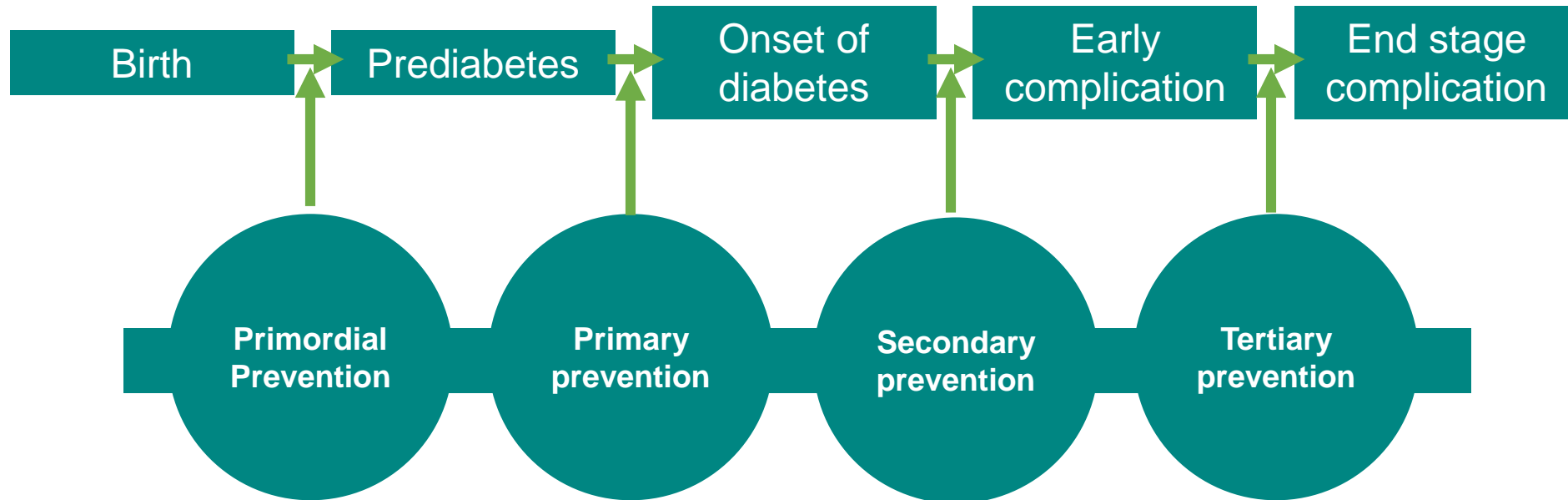


CAN WE PREVENT TYPE 2 DIABETES ?

Natural History of Diabetes



Prevention Strategies Do Not End Once The Person Develops Diabetes!



Risk-Based Screening in Asymptomatic Children and Adolescents

Table 2.5—Risk-based screening for type 2 diabetes or prediabetes in asymptomatic children and adolescents in a clinical setting*

Criteria

- Overweight (BMI >85th percentile for age and sex, weight for height >85th percentile, or weight >120% of ideal for height) **A**

Plus one or more additional risk factors based on the strength of their association with diabetes as indicated by evidence grades:

- Maternal history of diabetes or GDM during the child's gestation **A**
 - Family history of type 2 diabetes in first- or second-degree relative **A**
 - Race/ethnicity (Native American, African American, Latino, Asian American, Pacific Islander) **A**
 - Signs of insulin resistance or conditions associated with insulin resistance (acanthosis nigricans, hypertension, dyslipidemia, polycystic ovary syndrome, or small-for-gestational-age birth weight) **B**
-

*Persons aged <18 years.

ARE YOU AT RISK FOR TYPE 2 DIABETES?



Diabetes Risk Test

- 1 How old are you?**
 Less than 40 years (0 points)
 40—49 years (1 point)
 50—59 years (2 points)
 60 years or older (3 points)
- 2 Are you a man or a woman?**
 Man (1 point) Woman (0 points)
- 3 If you are a woman, have you ever been diagnosed with gestational diabetes?**
 Yes (1 point) No (0 points)
- 4 Do you have a mother, father, sister, or brother with diabetes?**
 Yes (1 point) No (0 points)
- 5 Have you ever been diagnosed with high blood pressure?**
 Yes (1 point) No (0 points)
- 6 Are you physically active?**
 Yes (0 points) No (1 point)
- 7 What is your weight status? (see chart at right)**
- Write your score in the box.

Write your score in the box.

Add up your score.

Height	Weight (lbs.)		
4' 10"	119-142	143-190	191+
4' 11"	124-147	148-197	198+
5' 0"	128-152	153-203	204+
5' 1"	132-157	158-210	211+
5' 2"	136-163	164-217	218+
5' 3"	141-168	169-224	225+
5' 4"	145-173	174-231	232+
5' 5"	150-179	180-239	240+
5' 6"	155-185	186-246	247+
5' 7"	159-190	191-254	255+
5' 8"	164-196	197-261	262+
5' 9"	169-202	203-269	270+
5' 10"	174-208	209-277	278+
5' 11"	179-214	215-285	286+
6' 0"	184-220	221-293	294+
6' 1"	189-226	227-301	302+
6' 2"	194-232	233-310	311+
6' 3"	200-239	240-318	319+
6' 4"	205-245	246-327	328+
	(1 Point)	(2 Points)	(3 Points)

You weigh less than the amount in the left column (0 points)

Adapted from Bang et al., Ann Intern Med 151:775-783, 2009. Original algorithm was validated without gestational diabetes as part of the model.

If you scored 5 or higher:
 You are at increased risk for having type 2 diabetes. However, only your doctor can tell for sure if you do have type 2 diabetes or prediabetes (a condition that precedes type 2 diabetes in which blood glucose levels are higher than normal). Talk to your doctor to see if additional testing is needed.

Type 2 diabetes is more common in African Americans, Hispanics/Latinos, American Indians, and Asian Americans and Pacific Islanders.

Higher body weights increase diabetes risk for everyone. Asian Americans are at increased diabetes risk at lower body weights than the rest of the general public (about 15 pounds lower).

For more information, visit us at diabetes.org or call 1-800-DIABETES (1-800-342-2383)

Lower Your Risk

The good news is that you can manage your risk for type 2 diabetes. Small steps make a big difference and can help you live a longer, healthier life. If you are at high risk, your first step is to see your doctor to see if additional testing is needed. Visit diabetes.org or call 1-800-DIABETES (1-800-342-2383) for information, tips on getting started, and ideas for simple, small steps you can take to help lower your risk.

Visit us on Facebook
[Facebook.com/AmericanDiabetesAssociation](https://www.facebook.com/AmericanDiabetesAssociation)

Figure 2.1—ADA risk test.

Testing for Diabetes or Prediabetes in Asymptomatic Adults

Table 2.3—Criteria for testing for diabetes or prediabetes in asymptomatic adults

1. Testing should be considered in overweight or obese (BMI ≥ 25 kg/m² or ≥ 23 kg/m² in Asian Americans) adults who have one or more of the following risk factors:
 - First-degree relative with diabetes
 - High-risk race/ethnicity (e.g., African American, Latino, Native American, Asian American, Pacific Islander)
 - History of CVD
 - Hypertension ($\geq 140/90$ mmHg or on therapy for hypertension)
 - HDL cholesterol level < 35 mg/dL (0.90 mmol/L) and/or a triglyceride level > 250 mg/dL (2.82 mmol/L)
 - Women with polycystic ovary syndrome
 - Physical inactivity
 - Other clinical conditions associated with insulin resistance (e.g., severe obesity, acanthosis nigricans)
2. Patients with prediabetes (A1C $\geq 5.7\%$ [39 mmol/mol], IGT, or IFG) should be tested yearly.
3. Women who were diagnosed with GDM should have lifelong testing at least every 3 years.
4. For all other patients, testing should begin at age 45 years.
5. If results are normal, testing should be repeated at a minimum of 3-year intervals, with consideration of more frequent testing depending on initial results and risk status.

Categories of Increased Risk for Diabetes (Prediabetes)

Table 2.4—Categories of increased risk for diabetes (prediabetes)*

FPG 100 mg/dL (5.6 mmol/L) to 125 mg/dL (6.9 mmol/L) (IFG)

OR

2-h PG during 75-g OGTT 140 mg/dL (7.8 mmol/L) to 199 mg/dL (11.0 mmol/L) (IGT)

OR

A1C 5.7–6.4% (39–47 mmol/mol)

*For all three tests, risk is continuous, extending below the lower limit of the range and becoming disproportionately greater at the higher end of the range.

To Whom Should Prevention Strategies Be Aimed?

“Pre-diabetic” states viz. IGT and IFG are known to be associated with an increased risk of progression to diabetes

Hence these individuals are ideal candidates for application of prevention strategies

A fasting plasma glucose or an oral glucose tolerance test can be used to detect these individuals

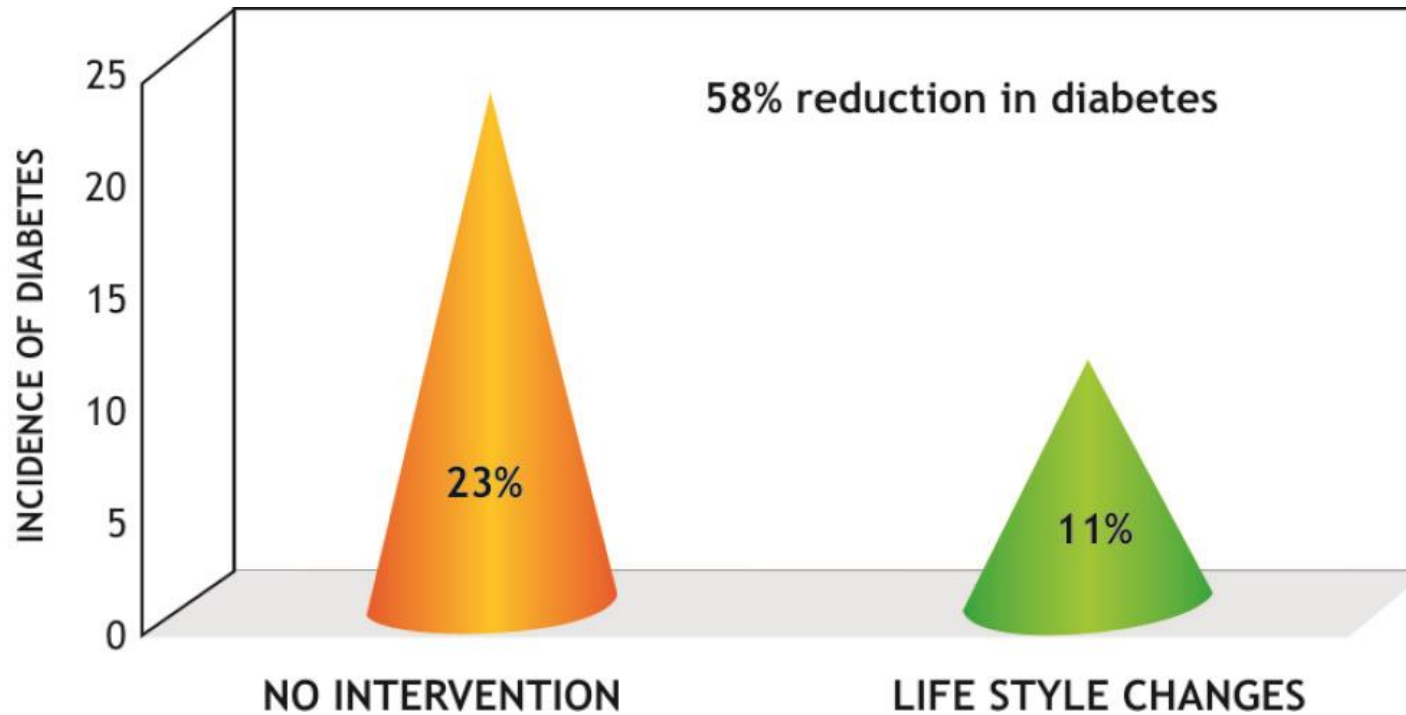
How Best Can Diabetes Prevention Be Achieved?

- Dietary modification
- Increasing physical activity
- Drugs
- A combination of the above

Finnish Diabetes Prevention Study

STUDY SUBJECTS - 522

FOUR YEARS OF FOLLOW-UP OF PROGRESSION TO DIABETES



Lifestyle Modification

Found to be more effective than metformin in the DPP

Recommendations:

- Modest weight loss (5 to 10% of weight)
- Modest physical activity (30 minutes per day)

- Higher intakes of nuts ,berries,yogurt ,coffee, and tea are associated with reduced diabetes risk.
- Conversely, red meats and sugar-sweetened beverages are associated with an increased risk of type 2 diabetes

Lifestyle Modification – Advantages

Advantages

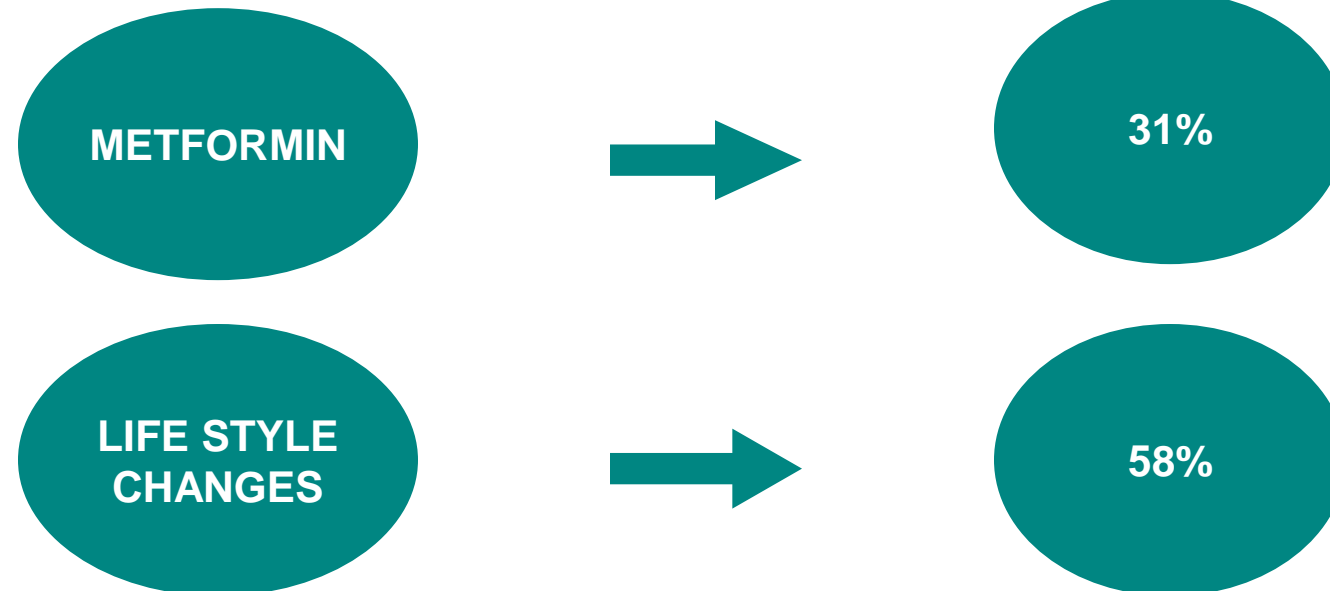
- Safe
- Effective
- Inexpensive
- Can be advised for almost anyone
- Has additional benefits - on lipids, BP, CV health etc

Evidence For Effectiveness of Pharmacological Interventions In Prevention of Diabetes

DIABETES PREVENTION PROGRAM (DPP)

STUDY SUBJECTS – 3234
THREE YEARS OF FOLLOW-UP

The risk for diabetes
reduced by



Pharmacologic Interventions for Prevention: Recommendations

- Metformin therapy for prevention of type 2 diabetes should be considered in those with prediabetes, especially for those with BMI ≥ 35 kg/m², those aged <60 years, and women with prior GDM. **A**
- Long-term use of metformin may be associated with biochemical vitamin B12 deficiency, and periodic measurement of vitamin B12 levels should be considered in metformin-treated patients, especially in those with anemia or peripheral neuropathy. **B**

Prevention of Diabetes – Major Trials

Study	Results (Risk Reduction)	Year
DIABETES PREVENTION PROGRAM Life style modifications & drugs (n=3200)	Metformin – 31% Life style changes – 58%	1996
FINNISH DIABETES PREVENTION STUDY Life style modifications (n=522)	Diet + exercise – 58%	1993
DA QING IGT AND DIABETES STUDY Life style modifications (n=577)	Diet – 31% Exercise – 46%	1986
STOP NIDDM Acarbose (n=1429)	Acarbose – 36%	1998
INDIAN DIABETES PREVENTION PROGRAM Life style modifications & drugs (n=531)	Metformin – 26.4% Lifestyle – 28.5% Met + Lifestyle – 28.2%	2006
DREAM Rosiglitazone & Ramipril (n=5269)	Rosiglitazone – 70% (IFG) 55% (IGT) Ramipril – NS	2006
NAVIGATOR Nateglinide & Valsartan (n=9306)	Nateglinide – NS Valsartan – 14%	2010

Secondary Prevention

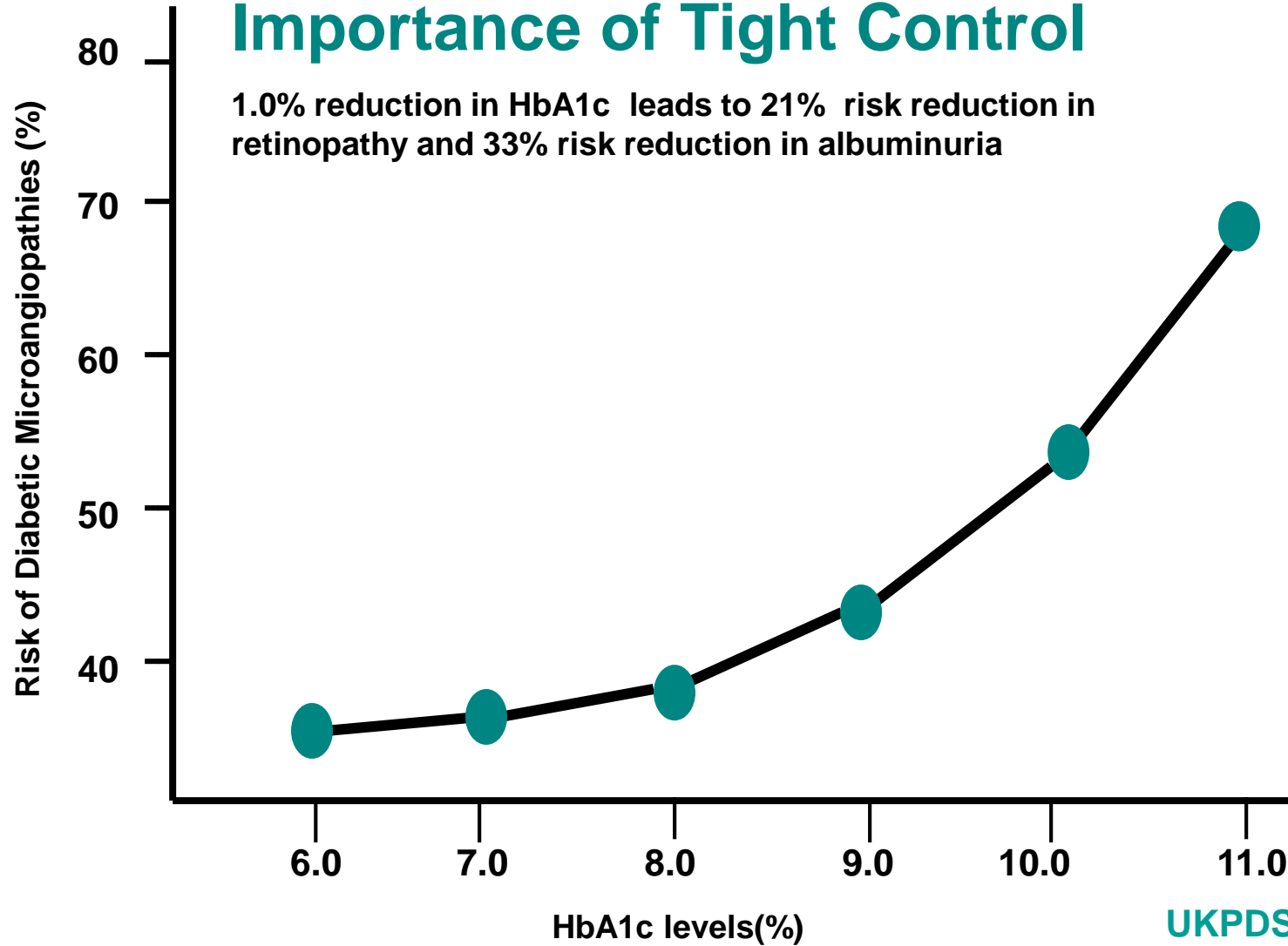
Preventing micro and macrovascular complications by good diabetes control

THREE MAIN APPROACHES

- Control of hyperglycaemia
- BP control
- Correction of hyperlipidemia

Importance of Tight Control

1.0% reduction in HbA1c leads to 21% risk reduction in retinopathy and 33% risk reduction in albuminuria



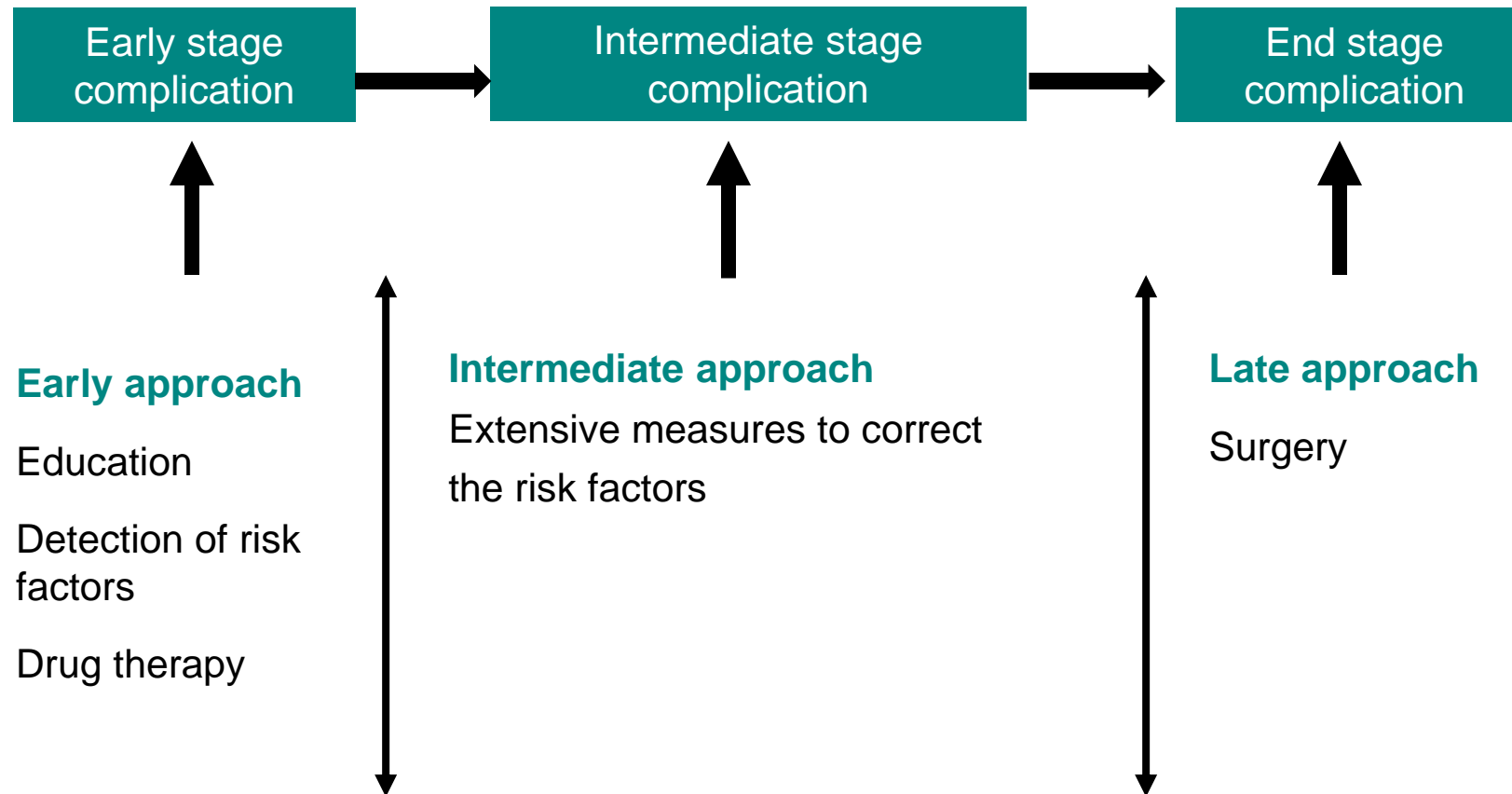
UKPDS, 1998

Strategies For Prevention of Diabetes Complications

Complication	Early approach	Intermediate approach	Late approach
Diabetic retinopathy	Glycemic control, Blood pressure control, Lipid control	Photocoagulation	In vitreo-retinal surgery
Diabetic nephropathy	Glycemic control, Blood pressure control, Lipid control	ACE inhibitors	Dialysis Transplantation
Peripheral neuropathy	Glycemic control, Foot wear	Management of neuropathic pain? neuroprotective agents	Prompt intervention (antibiotics, surgery), Custom made foot wear, Corrective surgery
Macrovascular disease	Glycemic control, Blood pressure control, Lipid control	Antiplatelet drugs	Revascularisation Surgery

Tertiary Prevention

Limiting physical disability and rehabilitation measures in those who have already developed diabetic complications



Conclusions

- Type 2 diabetes is preventable
- Detect individuals with IGT and IFG and direct prevention strategies to them
- Lifestyle modification is the key to prevent diabetes
- Drugs may have a role in some cases
- Even after diabetes develops, good control of glucose, lipids and BP can prevent complications