Managing diabetes as an acute and long term condition

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Aims of the session

1. Describe the different metabolic disorders of glucose metabolism, the pathogenesis of these & their clinical characteristics
2. Discuss the differences between type 1 diabetes and type 2 diabetes in terms of clinical presentation, patient characteristics and diagnostic criteria.
3. Discuss treatment pathways for type 1 and type 2 diabetes.
4. Discuss acute complications and emergencies.
5. Discuss chronic complications of diabetes.
6. Explore Nursing interventions.
7. Explore principles of patient centred care and self-management.

Key Knowledge Sources used in this session

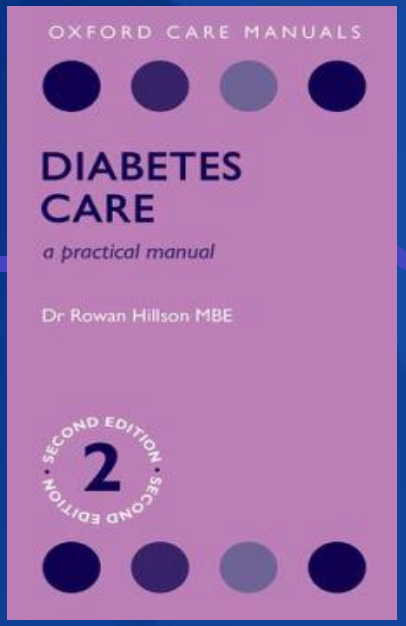
- NICE:
- **Type 1 diabetes in adults: diagnosis and management (NG17) (Last update 2016)**

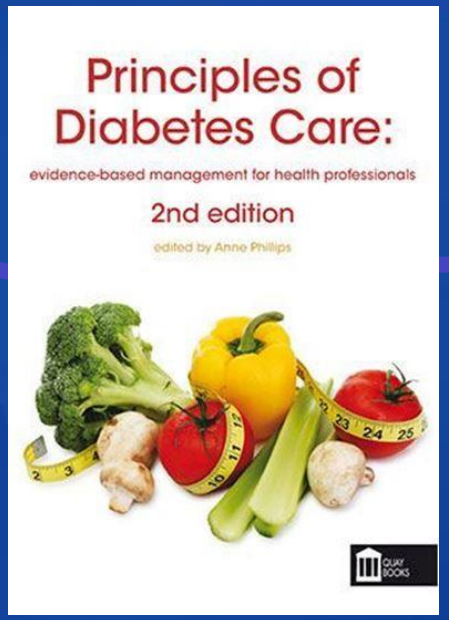
  https://www.nice.org.uk/guidance/ng17

- **Type 2 diabetes in adults: management (NG28) (Last Update May 2017)**

  https://www.nice.org.uk/guidance/ng28

Knowledge Sources continued…





- **National Diabetes Audit**
  http://content.digital.nhs.uk/nda
- **Research @Hudd**

Kitchanapaibul, S., Gillibrand, W. and Burton, R. (2017) 'Self-Management among the Ethnic Groups with Type 2 Diabetes Mellitus in Thailand' *World Academy of Science, Engineering and Technology: International Journal of Social, Management, Economics and Business Engineering* . ISSN 2010-376X

Rahman, R., Marler, J., Stephenson, J. and Gillibrand, W. (2017) 'Risk Factors for Elevated Intraocular Pressure on First Day Postoperative Review following Pars Plana Vitrectomy' *Journal of Vitreoretinal Diseases* . ISSN 2474-1264

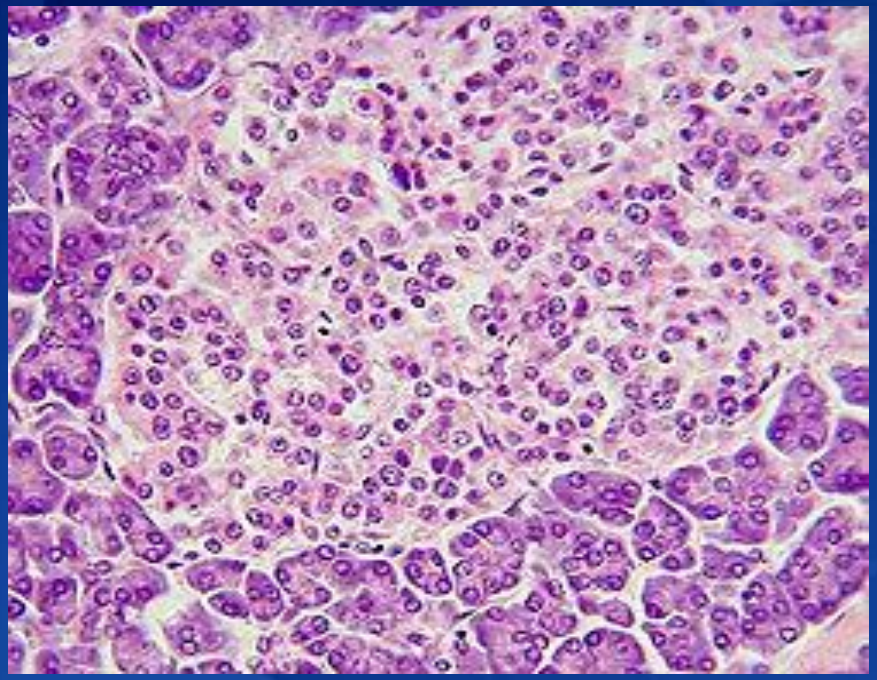
Gillibrand, W. and Holdich, P. (2017) 'Assessment of retinopathy'. *In: Principles of Diabetes Care: evidence-based management for health professionals*. Bournemouth, UK: Quay Books. pp. 217-226. ISBN 9781856425100

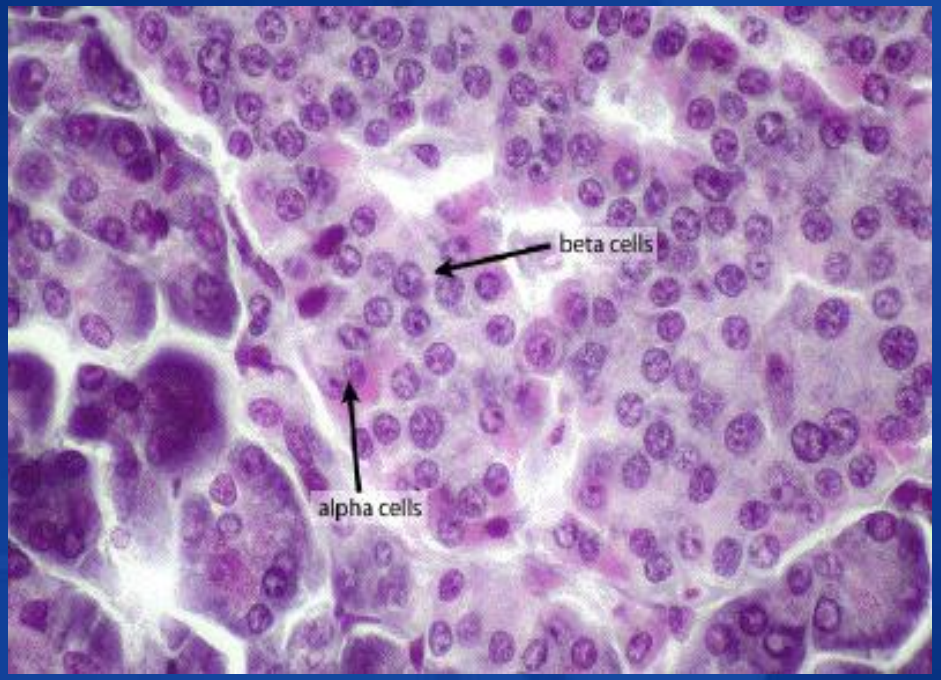
Levy, N., Gillibrand, W. and Kola-Palmer, S. (2017) 'Minor Amputation and Quality of Life: Is it Time to Give the Patient a Voice?' *The Diabetic Foot Journal* , 20 (4), pp. 228-234. ISSN 1462-2041

Youngs, W., Gillibrand, W. and Phillips, S. (2016) 'The impact of pre-diabetes diagnosis on behaviour change: an integrative literature review' *Practical Diabetes International* , 33 (5), pp. 171-175. ISSN 1357-8170

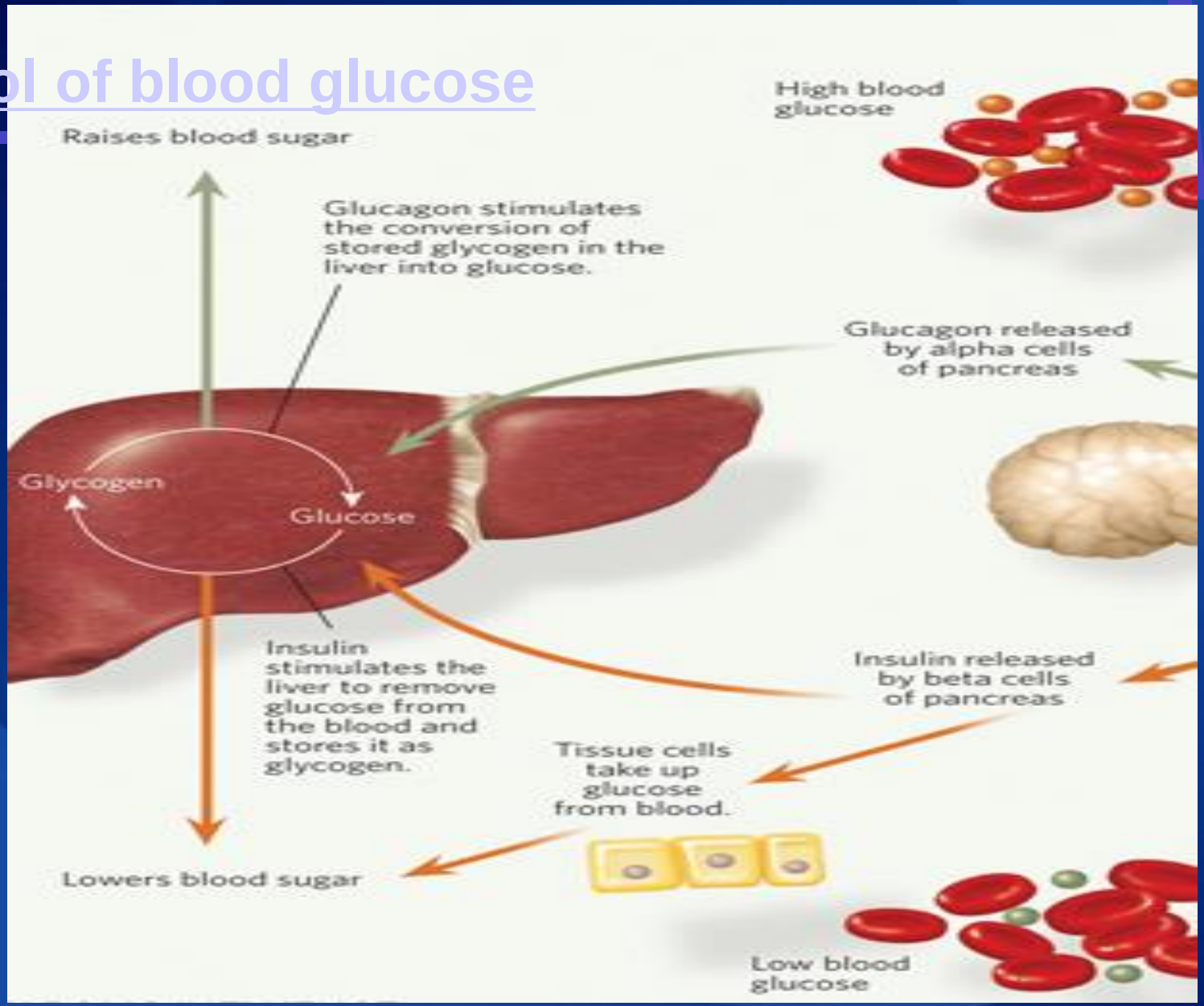
Brooks, J., Kime, N., King, N., Wearden, A., Gillibrand, W. and Campbell, F. (2015) 'Exploring how young people think about and respond to diabetes in their peers' *Diabetes Care for Children & Young People* , 4 (1), pp. 14-18. ISSN 2050-1528

What is this?

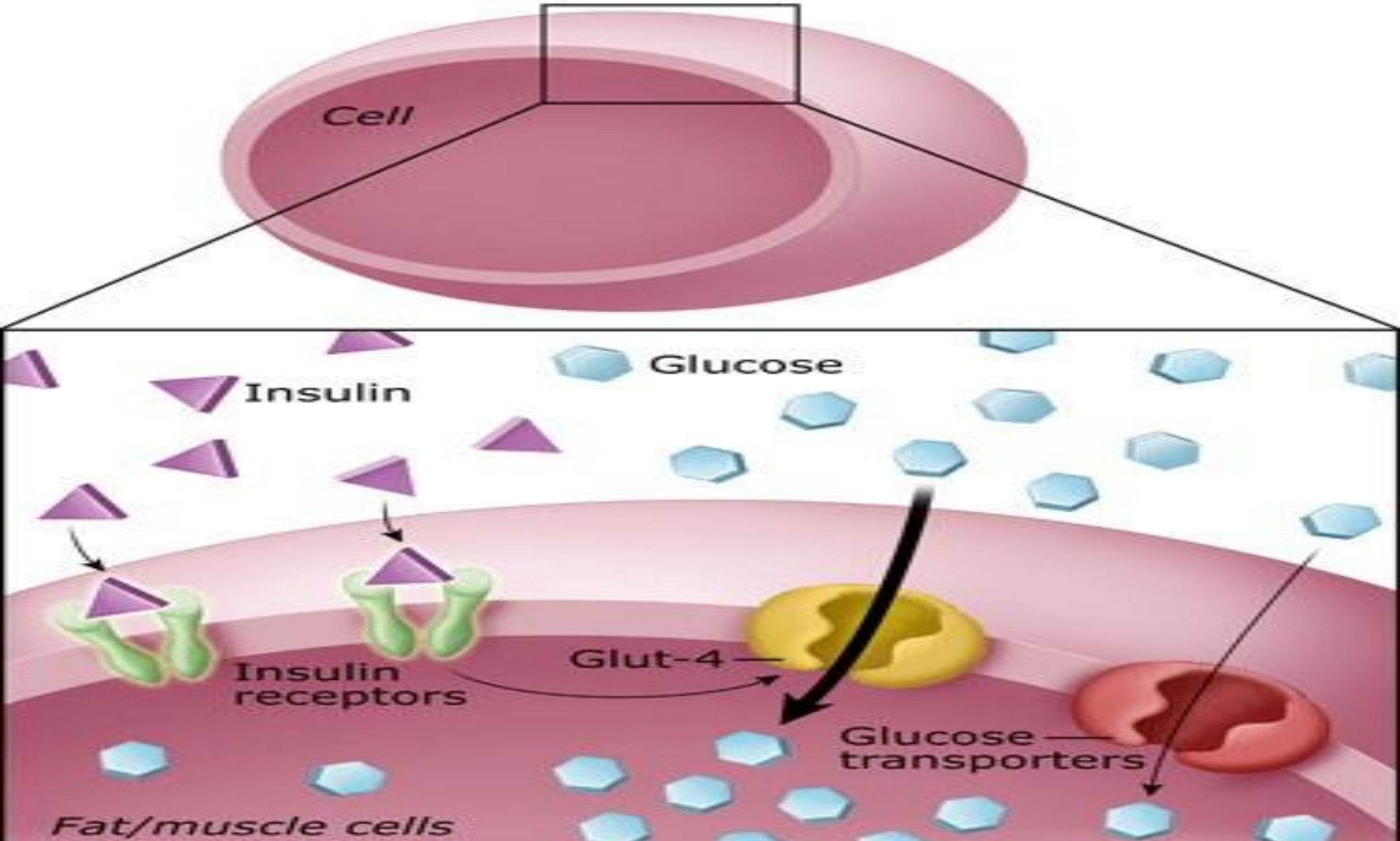


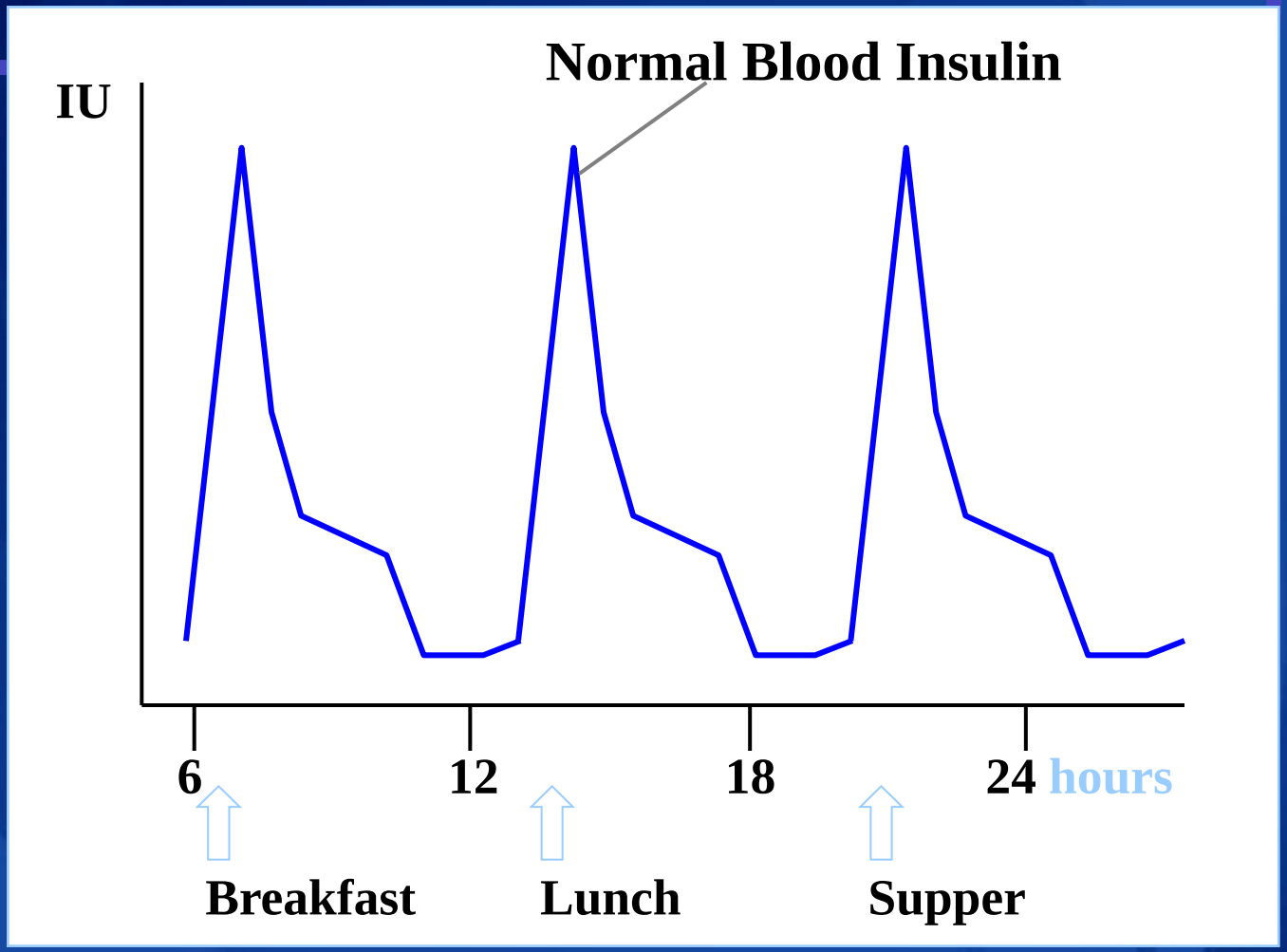


Control of blood glucose



The Effect of Insulin




Normal Blood Insulin
IU
6
12
18
24 hours
Breakfast
Lunch
Supper

- **What is diabetes?**
- Diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin, or when the body cannot effectively use the insulin it produces. Hyperglycaemia, or raised blood sugar, is a common effect of uncontrolled diabetes and over time leads to serious damage to many of the body's systems, especially the nerves and blood vessels.

WHO (2018) Diabetes Fact Sheet. http://www.who.int/mediacentre/factsheets/fs312/en/index.html Accessed 16th January 2018

Incidence and Prevalence

Globally: The estimated diabetes prevalence worldwide for 2011 was 366 million and it is expected to affect 552 million people by 2030

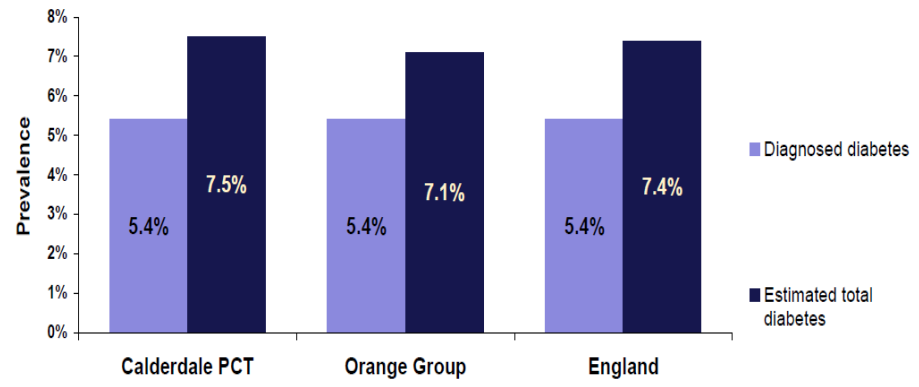
United Kingdom

- Prevalence % = England 5.5%; NI 3.8%; Scotland 4.3%; Wales 5.0%
- It is estimated that there are around 850,000 people in the UK who have diabetes but have not been diagnosed.
- 10% Type 1 – adults. (15% if include children)
- 90% Type 2 – adults. (85% including children)

Source - Diabetes in the UK (2018)

Local prevalence

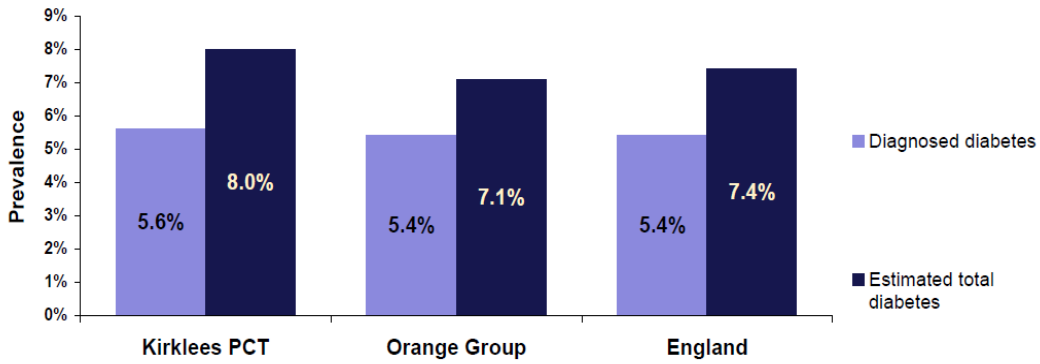
In 2009/10 there were 8866 people aged 17 years and older diagnosed with diabetes in Calderdale PCT. There is also an estimated 3379 adults with undiagnosed diabetes. The chart below compares the prevalence of diabetes in Calderdale PCT with the cluster group and England as a whole.



Source: Quality and Outcomes Framework, 2009/10 and APHO Diabetes Prevalence Model

Calderdale

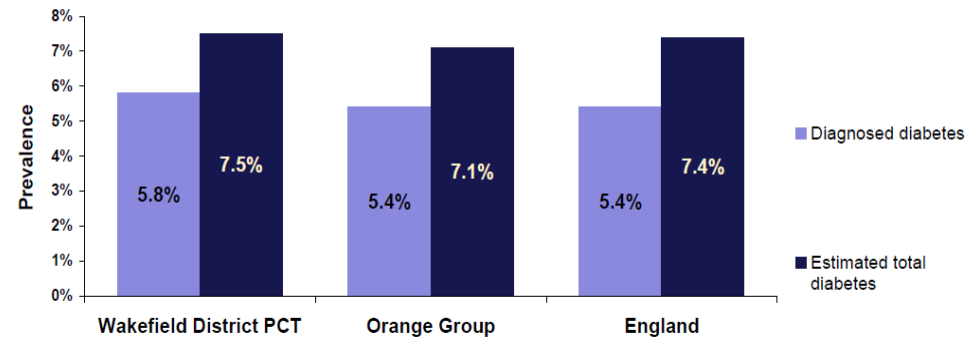
In 2009/10 there were 18059 people aged 17 years and older diagnosed with diabetes in Kirklees PCT. There is also an estimated 7292 adults with undiagnosed diabetes. The chart below compares the prevalence of diabetes in Kirklees PCT with the cluster group and England as a whole.



Source: Quality and Outcomes Framework, 2009/10 and APHO Diabetes Prevalence Model

Kirklees

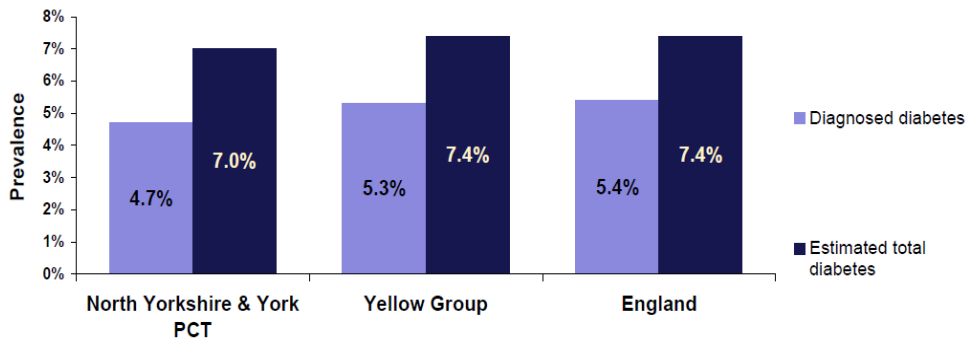
In 2009/10 there were 16148 people aged 17 years and older diagnosed with diabetes in Wakefield District PCT. There is also an estimated 3646 adults with undiagnosed diabetes. The chart below compares the prevalence of diabetes in Wakefield District PCT with the cluster group and England as a whole.



Source: Quality and Outcomes Framework, 2009/10 and APHO Diabetes Prevalence Model

Wakefield

In 2009/10 there were 30350 people aged 17 years and older diagnosed with diabetes in North Yorkshire & York PCT. There is also an estimated 16744 adults with undiagnosed diabetes. The chart below compares the prevalence of diabetes in North Yorkshire & York PCT with the cluster group and England as a whole.



Source: Quality and Outcomes Framework, 2009/10 and APHO Diabetes Prevalence Model

North Yorkshire

Pathology & Classification of Diabetes

Case Study One

Ben is 15 years old, complaining of increased urination, weakness and weight loss over 3 months.

Looks dehydrated and his random plasma glucose is 13.8mmol/L.

What is his diagnosis?

What leads you to suspect this?

Are there any tests or investigations you might carry out?

Case Study Two

Mrs Sarah Palin is a 56 year old lady with a BMI of 31.

She presents with a UTI.

Her fasting glucose is 6.9mmol/L.

She has a sister with diabetes.

What is her likely diagnosis?

What would you do with her?

Why?

Type 1 diabetes

- Auto-immune elimination of beta-cells (beta-cell antibodies)
- Genetic

- Clinical picture:
  - Absolute requirement for insulin
  - (without it: hyperglycaemia wasting, ketoacidosis)
  - Otherwise healthy
- Incidence
  - Two peaks:
    a) infancy (1-4y)
    b) early adolescence (8-12y)
  - May present at any time in life (if ~ type 2: LADA)

Development of type 1 diabetes

Causes - multifactorial

Genetic predisposition

↓

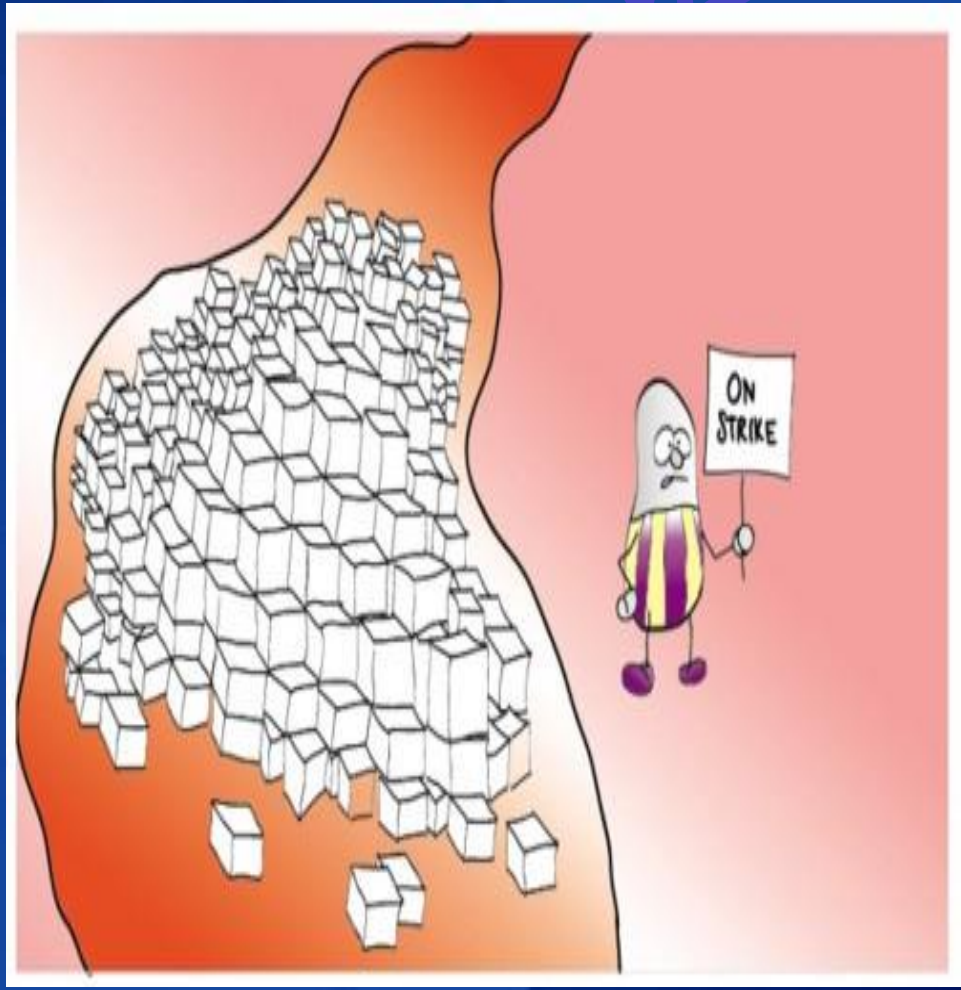
Diabetogenic trigger (environment)

↓

Immune response (islet cell antibodies)

↓

Destruction of beta cells



Type 2 Diabetes

- Decline in insulin production
- Insulin resistance

Environment/Lifestyle factors:

- Weight – central (50-70%)
- Calorie dense diet
- Inactivity
- Thrifty gene
- Drug induced

- Key study UKPDS

Age: peak 60 yrs

Prevalence: 85% PWD have type 2

Genetic susceptibility:

Family history = 40% patients

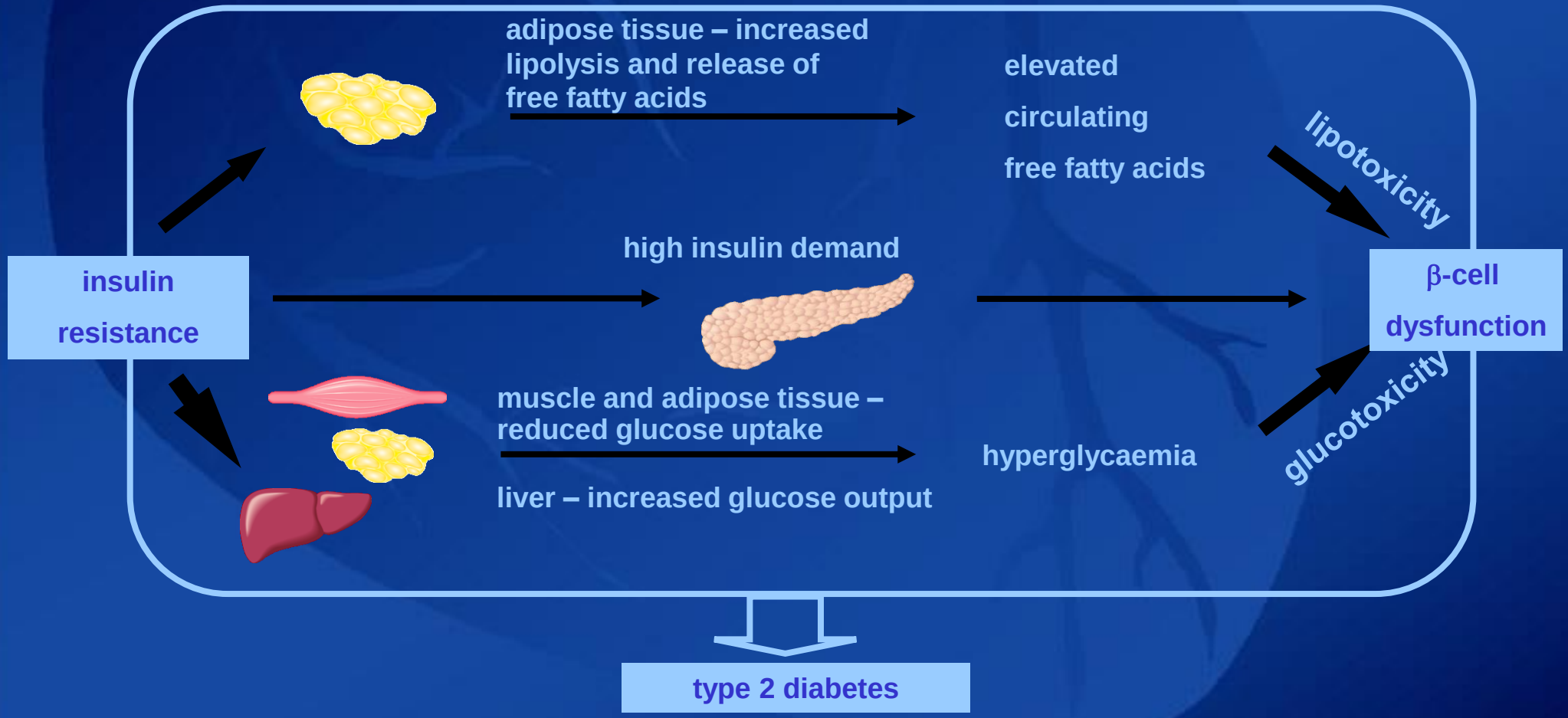
Twin = 60-90% concordance

Lifetime risk first degree relative with diabetes = five-fold

In-utero/infant malnutrition

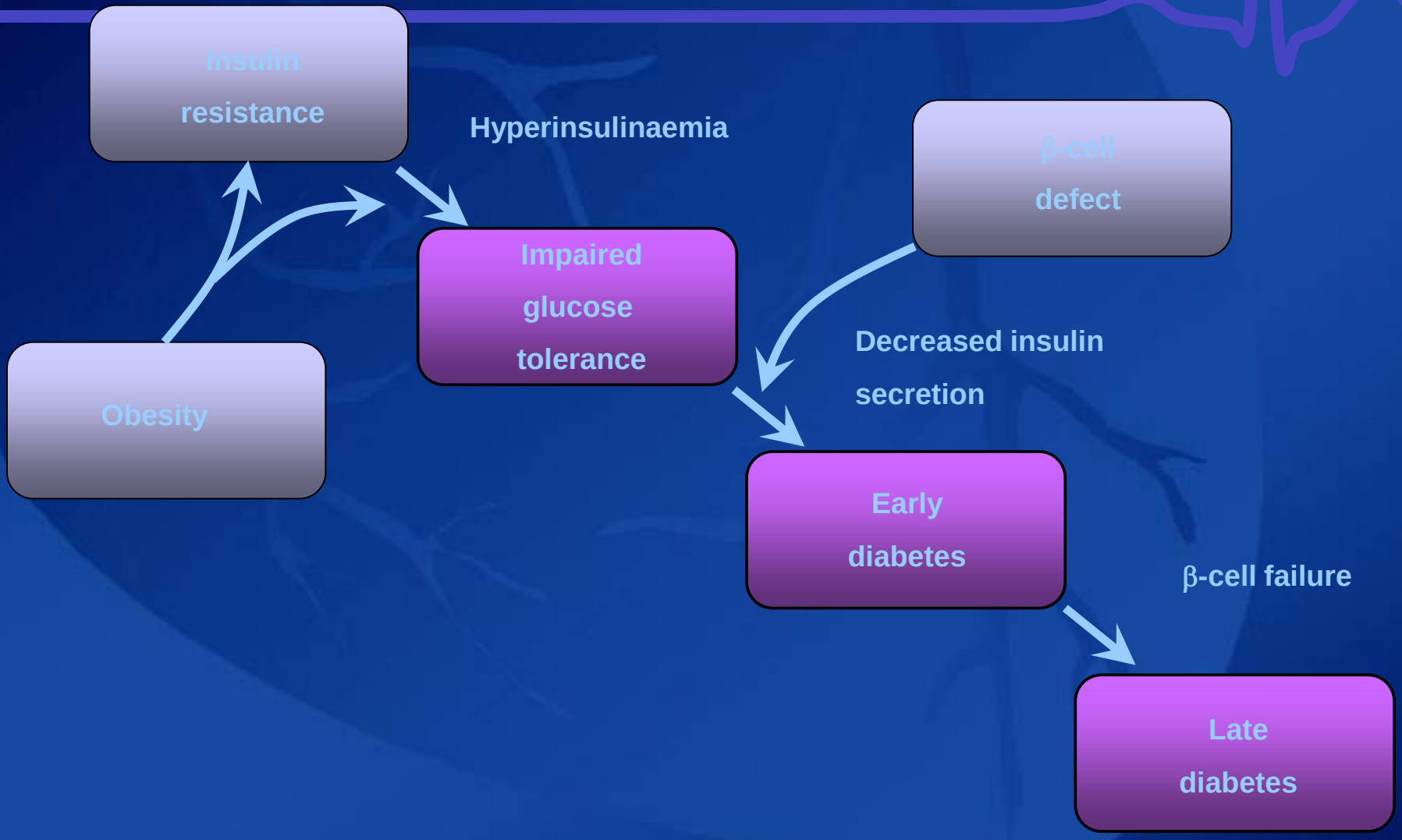
Black (9%) & Asian (11%) compared to 1-3% UK white population

Model of underlying factors in type 2 diabetes: insulin resistance and β-cell dysfunction



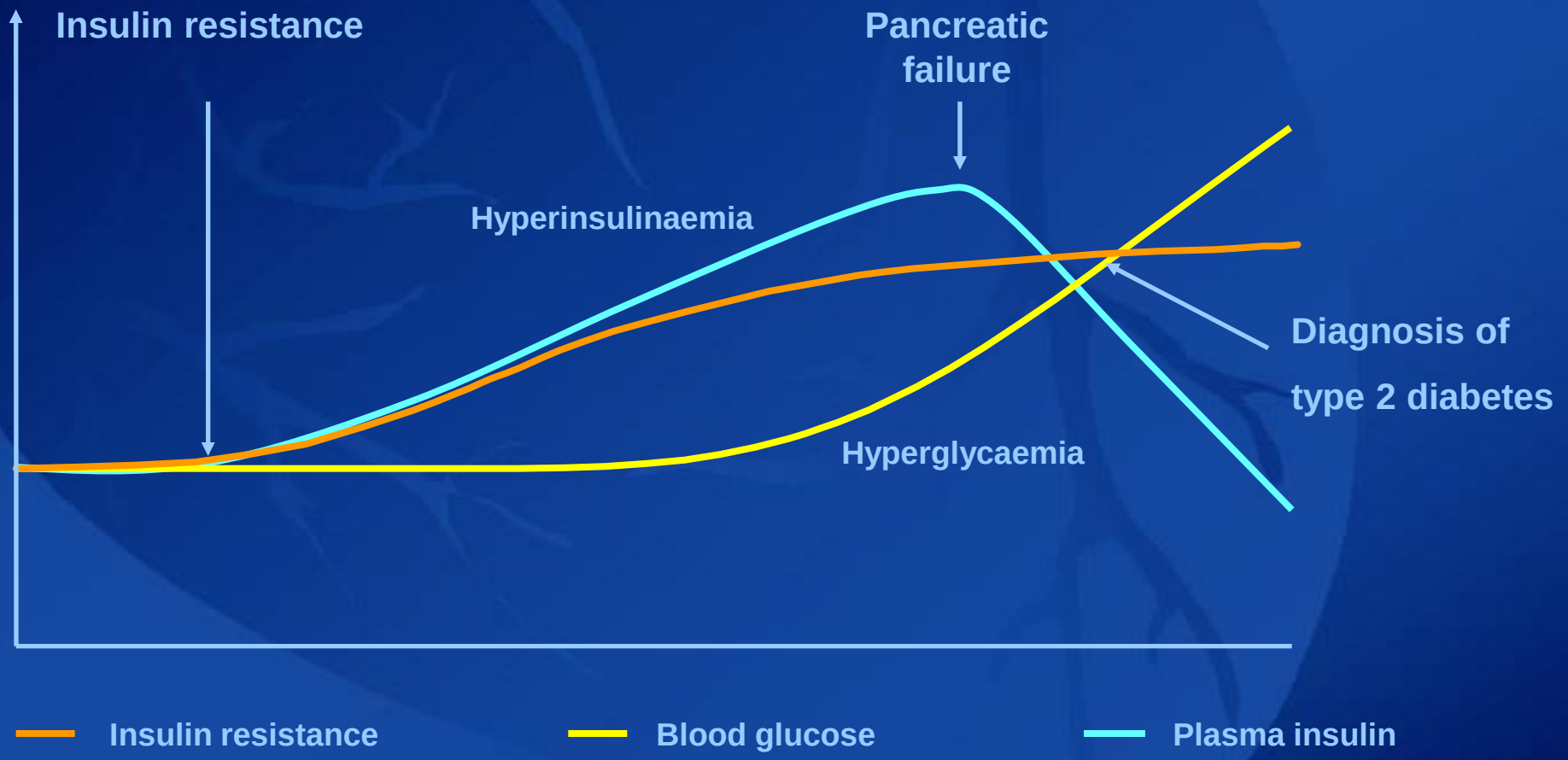
Adapted from Turner RC. *Baill Clin End Met* 1988; 2:327–333.
Adapted from DeFronzo RA. *Med Clin N Am* 2004; 88:787–835.

Underlying causes of Type 2 Diabetes



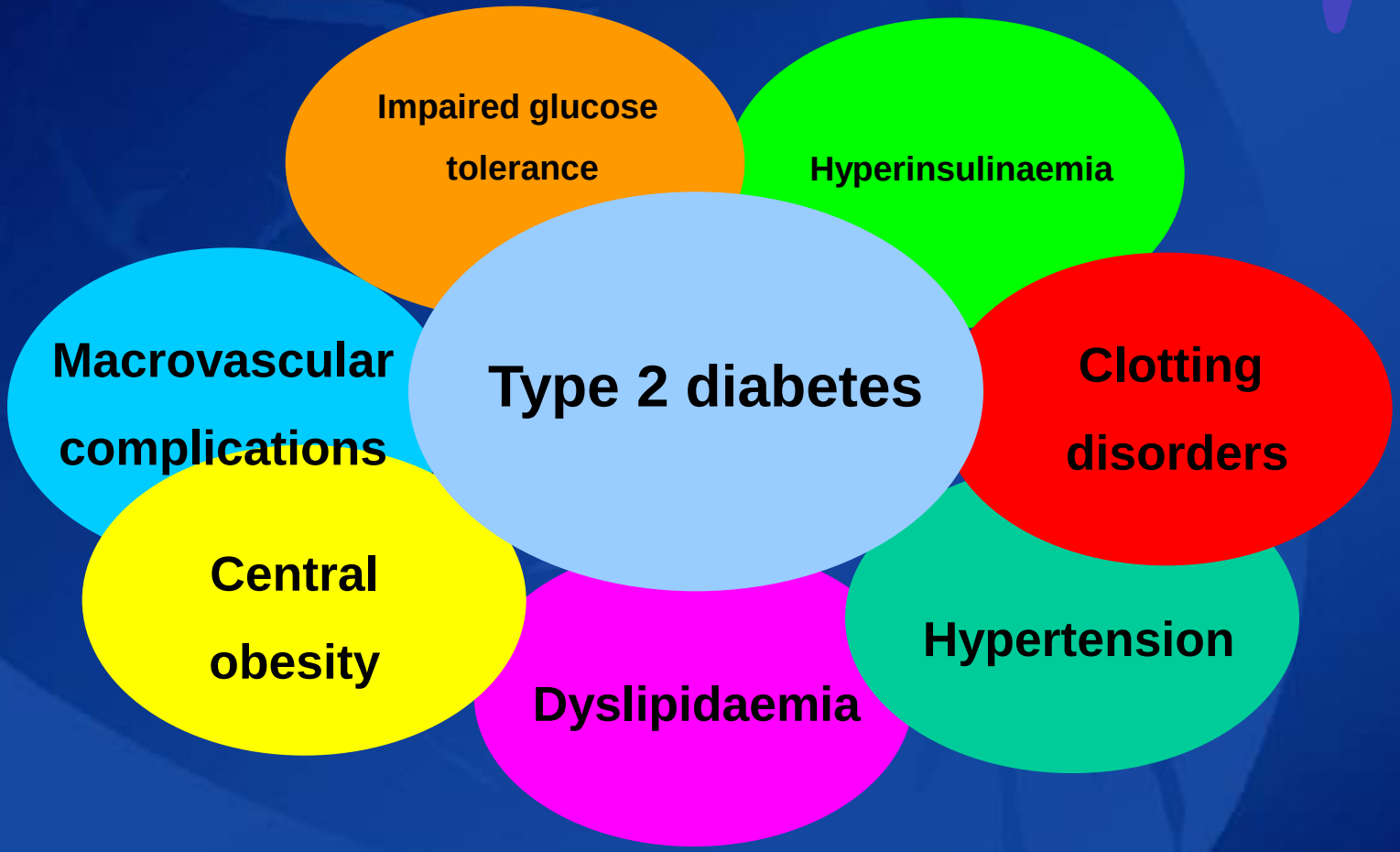
Saltiel AR. *J Clin Invest* 2000;106:163–164.

Underlying factors in type 2 diabetes are insulin resistance and β-cell dysfunction



Edelman SV. Type II diabetes mellitus. *Adv Int Med* 1998; 43:449–500.

Type 2 Diabetes: A Complex Disease



Expert Committee on the Diagnosis & Classification of Diabetes Mellitus. Diabetes Care 1997;20(7):1183–1203

Other types of diabetes

- Genetic defects: effect on beta cell function or insulin action – MODY, type A insulin resistance, leprechaunism, LADA
- Diseases of the pancreas: pancreatitis, trauma & infection, cancer, pancreatectomy
- Endocrinopathies: e.g.Cushing Syndrome (adrenal tumour)/Acromegaly antagonist effect of hormones - GH, glucagon, cortisol, adrenaline. Above syndromes may cause diabetes but typically when hormone levels reduced return to normoglycaemia
- Polycystic Ovarian Syndrome: ovary secretes high levels of oestregens and testosterone contributing to insulin resistance & weight gain (central) which may contribute to risk of type 2 DM
- Gestational Diabetes: type 2 diabetes in pregnancy – carbohydrate intolerance leading to hyperglycaemia – OGTT @ 24-28 weeks (third trimester) - classification to type 2 diabetes 6 weeks after delivery with OGTT. Screen for those with higher risk
- Drug induced:

DRUGS CAUSING DIABETES

Drugs That Affect Insulin Secretion

- Anticonvulsant
  - Phenytoin
- Diuretics
  - Thiazides
  - Furosemide
  - Ethacrynic acid
- Cations
  - Barium
  - Cadmium
  - Lithium
  - Potassium
  - Zinc
- Hormones
  - Somatostatin
- Pesticides
  - DDT
  - Fluoride
  - Pyriminil (Vacor)
- Antihelminthics
  - Pentamidine
- Antineoplastics
  - L-Asparaginase
  - Mithramycin

Drugs that affect insulin action

- Hormones
  - Growth hormone

Drugs that affect both insulin secretion and insulin action

- Hormones/Hormone Antagonists
  - Glucagon
  - Glucocorticoids
  - Octreotide
- Adrenergic compounds
  - Epinephrine
  - Norepinephrine
- Antihypertensive
  - Clonidine
  - Diazoxide
  - Prazosin
- Blocking agents
  - β-Adrenergic blockers
  - Calcium-channel blockers
  - Histaminergic blockers
- Psychopharmacologic agents
  - Benzodiazepines
  - Ethanol
  - Opiates
  - Phenothiazines

What are the likely presenting symptoms of diabetes?

Presenting symptoms of type 1and type 2 diabetes

- Thirst
- Hunger
- Fatigue — Lethargic type 2
- Polyuria (type 1) — Nocturia type 2
- Weight loss (type 1) — May be less evident type 2
- Blurred Vision — Less so in type 2
- Candidal infections
- Sores (ulcers) fail to heal or delayed
- May be no symptoms with type 2
- May present with complication related to diabetes e.g. retinopathy, CVD, foot problems

Diagnosis- WHO (2018)

Methods and criteria for diagnosing diabetes

1.Diabetes symptoms (e.g. polyuria, polydipsia and unexplained weight loss for Type 1) plus:

1. a random venous plasma glucose concentration ≥ 11.1 mmol/l or
2. a fasting plasma glucose concentration ≥ 7.0 mmol/l (whole blood ≥ 6.1 mmol/l) or
3. two hour plasma glucose concentration ≥ 11.1 mmol/l two hours after 75g anhydrous glucose in an oral glucose tolerance test (OGTT).

2.With no symptoms diagnosis should not be based on a single glucose determination but requires confirmatory plasma venous determination. At least one additional glucose test result on another day with a value in the diabetic range is essential, either fasting, from a random sample or from the two hour post glucose load. If the fasting random values are not diagnostic the two hour value should be used.

Consider further investigation in adults that involves measurement of C-peptide and/or diabetes-specific autoantibody titres (Type 1).

Diagnosis of diabetes

For type 1 diagnosis likely to be based on presence of ketones and presenting symptoms especially in child. For type 2 tests on separate days if no symptoms.

Diagnostic Guidelines

Symptoms eg thirst, polyuria, weight loss, fatigue, visual disturbances

Diagnostic tests

- **HbA1c > 48 mmol/mol (6.5%)**
- **Plasma Glucose (Laboratory Test)**
- **Random ≥ 11.1 mmol/l**
- **Fasting ≥ 7.0 mmol/l**

If asymptomatic, confirm diagnosis with repeat test on another day

TEST URINE FOR KETONES

Impaired Fasting Glucose & Impaired Glucose Tolerance

- IFG = elevated fasting glucose levels
  6.1-6.9 mmol/L
- IGT = Impaired Glucose tolerance
  7.8 mmol/L – 11.1mmol/L

In an adult with both tests abnormal the risk of developing diabetes after 10 years is 50%

Type 1 vs. type 2 diabetes

Lambert P, et al. Medicine 2006; 34(2): 47-51
Nolan JJ. Medicine 2006; 34(2): 52-56

Features of type 1 diabetes

- Onset in childhood/adolescence
- Lean body habitus
- Acute onset of osmotic symptoms
- Ketosis-prone
- High levels of islet autoantibodies
- High prevalence of genetic susceptibility
- Diagnosis on symptoms, history and presence of hyperglycaemia & ketones

Features of type 2 diabetes

- *Usually* presents in over-30s (but also seen increasingly in younger people)
- Associated with overweight/obesity
- Onset is gradual and diagnosis often missed (up to 50% of cases)
- Not associated with ketoacidosis, though ketosis can occur
- Immune markers in only 10%
- Family history is often positive with almost 100% concordance in identical twins
- Diagnosis typically HbA1c, FPG or OGTT with one or more symptoms

Treatment of Adults with type 1 diabetes

- At the time of diagnosis (or if necessary after the management of critically decompensated metabolism), the diabetes professional team should develop with and explain to the adult with type 1 diabetes a plan for their early care.

- Offer all adults with type 1 diabetes a structured education programme of proven benefit, for example the DAFNE (dose-adjustment for normal eating) programme. Offer this programme 6–12 months after diagnosis.

- **Dietary management**

- **Physical activity**

- **Blood glucose management**
- Support adults with type 1 diabetes to aim for a target HbA1c level of 48 mmol/mol (6.5%) or lower, to minimise the risk of long-term vascular complications
- Advise routine self-monitoring of blood glucose levels for all adults with type 1 diabetes, and recommend testing at least 4 times a day, including before each meal and before bed
- Consider real-time continuous glucose monitoring for adults with type 1 diabetes who are willing to commit to using it at least 70% of the time and to calibrate it as needed,

Treatment of Adults with type 1 diabetes

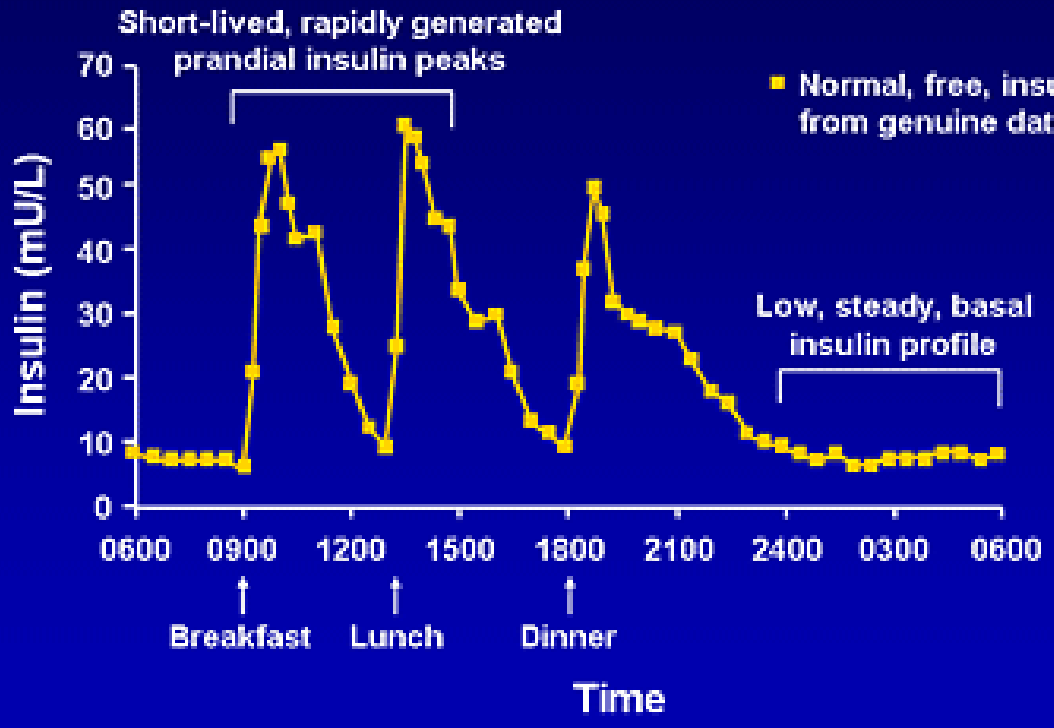
- **Insulin therapy**

- **Insulin regimens**
- Offer multiple daily injection basal–bolus insulin regimens, rather than twice-daily mixed insulin regimens, as the insulin injection regimen of choice for all adults with type 1 diabetes. Provide the person with guidance on using multiple daily injection basal–bolus insulin regimens. **[new 2015]**
- Do not offer adults newly diagnosed with type 1 diabetes non-basal–bolus insulin regimens (that is, twice-daily mixed, basal only or bolus only). **[new 2015]**

Type of Insulin	Brand Name	Generic Name	Onset	Peak	Duration
Rapid-acting	__ NovoLog	__ Insulin aspart	15 minutes	30 to 90 minutes	3 to 5 hours
	__ Apidra	__ Insulin glulisine	15 minutes	30 to 90 minutes	3 to 5 hours
	__ Humalog	__ Insulin lispro	15 minutes	30 to 90 minutes	3 to 5 hours
Short-acting	__ Humulin R	__ Regular (R)	30 to 60 minutes	2 to 4 hours	5 to 8 hours
	__ Novolin R				
Intermediate-acting	__ Humulin N	__ NPH (N)	1 to 3 hours	8 hours	12 to 16 hours
	__ Novolin N				
Long-acting	__ Levemir	__ Insulin detemir	1 hour	Peakless	20 to 26 hours
	__ Lantus	__ Insulin glargine			
Pre-mixed NPH (intermediate-acting) and regular (short-acting)	__ Humulin 70/30 __ Novolin 70/30	__ 70% NPH and 30% regular	30 to 60 minutes	Varies	10 to 16 hours
	__ Humulin 50/50	__ 50% NPH and 50% regular	30 to 60 minutes	Varies	10 to 16 hours
Pre-mixed insulin lispro protamine suspension (intermediate-acting) and insulin lispro (rapid-acting	__ Humalog Mix 75/25	__ 75% insulin lispro protamine and 25% insulin lispro	10 to 15 minutes	Varies	10 to 16 hours
	__ Humalog Mix 50/50	__ 50% insulin lispro protamine and 50% insulin lispro	10 to 15 minutes	Varies	10 to 16 hours
Pre-mixed insulin aspart protamine suspension (intermediate-acting) and insulin aspart (rapid-acting)	__ NovoLog Mix 70/30	__ 70% insulin aspart protamine and 30% insulin aspart	5 to 15 minutes	Varies	10 to 16 hours

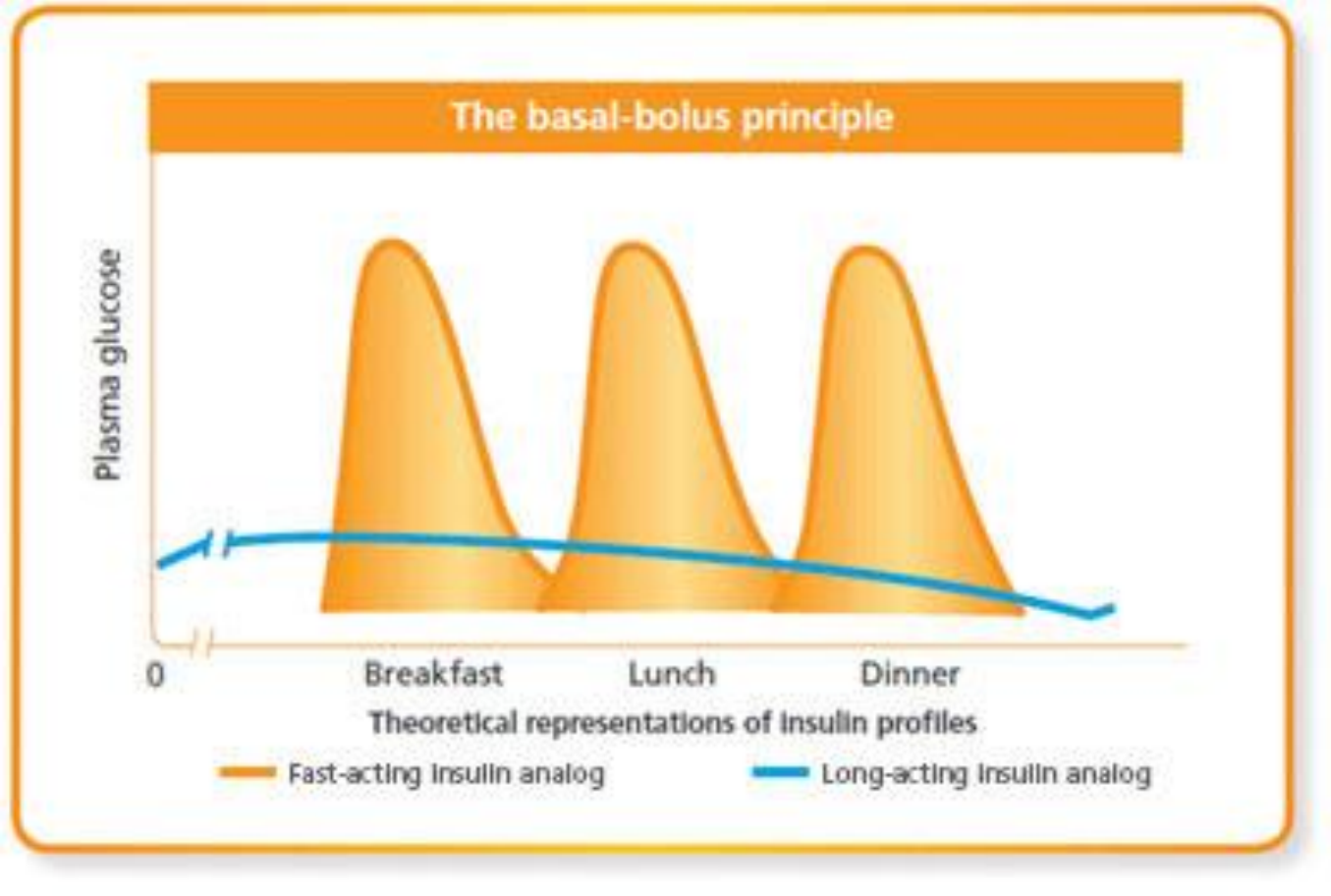
Insulin Action

The Physiologic Insulin Profile



Adapted with permission from Polonsky KS. *N Engl J Med*. 1968;318:1231-1239.

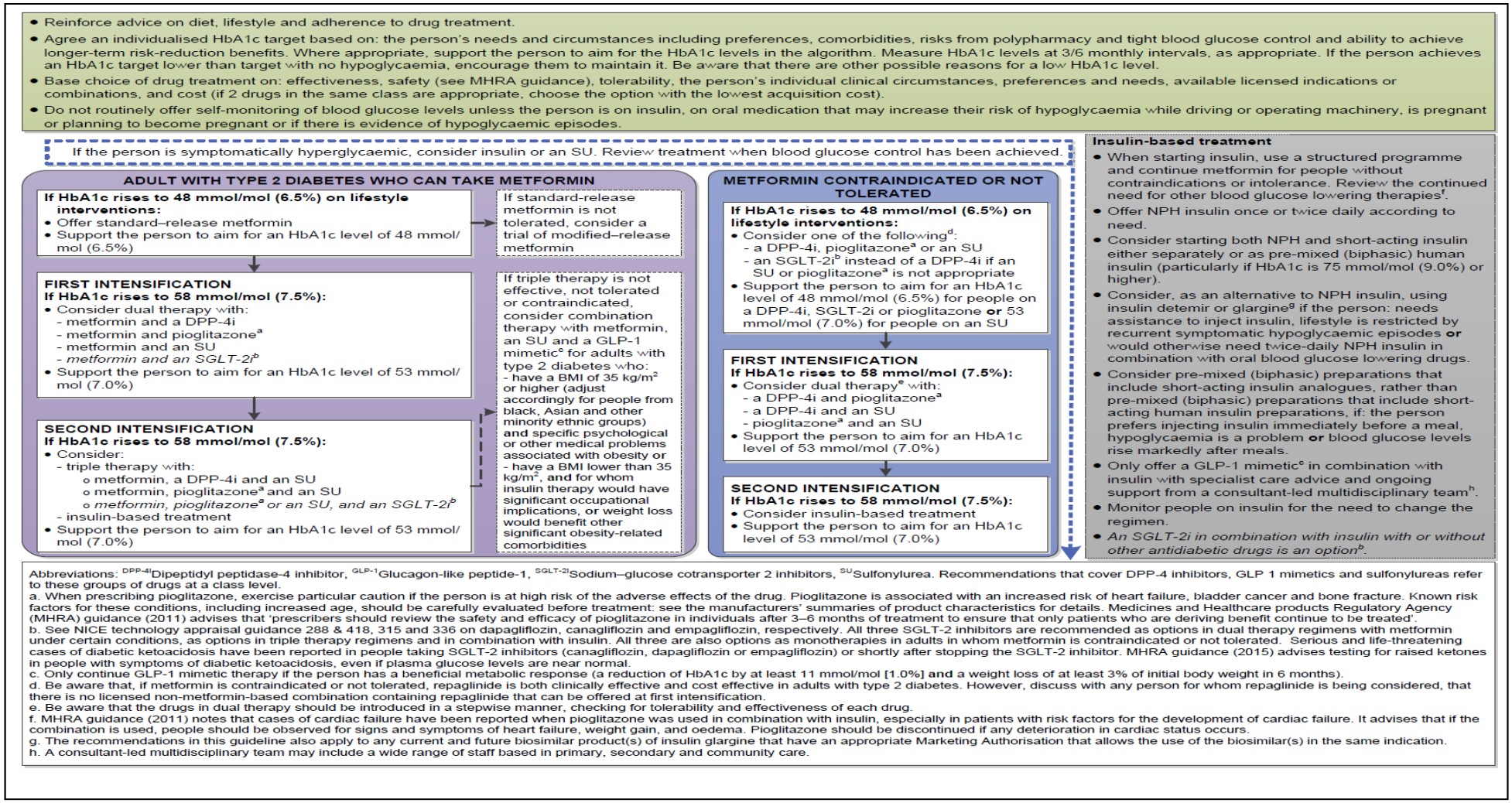
Basal-Bolus principle



Treatment of adults with type 2 diabetes

NICE National Institute for Health and Care Excellence

Algorithm for blood glucose lowering therapy in adults with type 2 diabetes



Abbreviations: [DPP-4i]Dipeptidyl peptidase-4 inhibitor, [GLP-1]Glucagon-like peptide-1, [SGLT-2i]Sodium–glucose cotransporter 2 inhibitors, [SU]Sulfonylurea. Recommendations that cover DPP-4 inhibitors, GLP 1 mimetics and sulfonylureas refer to these groups of drugs at a class level.

a. When prescribing pioglitazone, exercise particular caution if the person is at high risk of the adverse effects of the drug. Pioglitazone is associated with an increased risk of heart failure, bladder cancer and bone fracture. Known risk factors for these conditions, including increased age, should be carefully evaluated before treatment: see the manufacturers' summaries of product characteristics for details. Medicines and Healthcare products Regulatory Agency (MHRA) guidance (2011) advises that 'prescribers should review the safety and efficacy of pioglitazone in individuals after 3–6 months of treatment to ensure that only patients who are deriving benefit continue to be treated'.

b. See NICE technology appraisal guidance 288 & 418, 315 and 336 on dapagliflozin, canagliflozin and empagliflozin, respectively. All three SGLT-2 inhibitors are recommended as options in dual therapy regimens with metformin under certain conditions, as options in triple therapy regimens and in combination with insulin. All three are also options as monotherapies in adults in whom metformin is contraindicated or not tolerated. Serious and life-threatening cases of diabetic ketoacidosis have been reported in people taking SGLT-2 inhibitors (canagliflozin, dapagliflozin or empagliflozin) or shortly after stopping the SGLT-2 inhibitor. MHRA guidance (2015) advises testing for raised ketones in people with symptoms of diabetic ketoacidosis, even if plasma glucose levels are near normal.

c. Only continue GLP-1 mimetic therapy if the person has a beneficial metabolic response (a reduction of HbA1c by at least 11 mmol/mol [1.0%] and a weight loss of at least 3% of initial body weight in 6 months).

d. Be aware that, if metformin is contraindicated or not tolerated, repaglinide is both clinically effective and cost effective in adults with type 2 diabetes. However, discuss with any person for whom repaglinide is being considered, that there is no licensed non-metformin-based combination containing repaglinide that can be offered at first intensification.

e. Be aware that the drugs in dual therapy should be introduced in a stepwise manner, checking for tolerability and effectiveness of each drug.

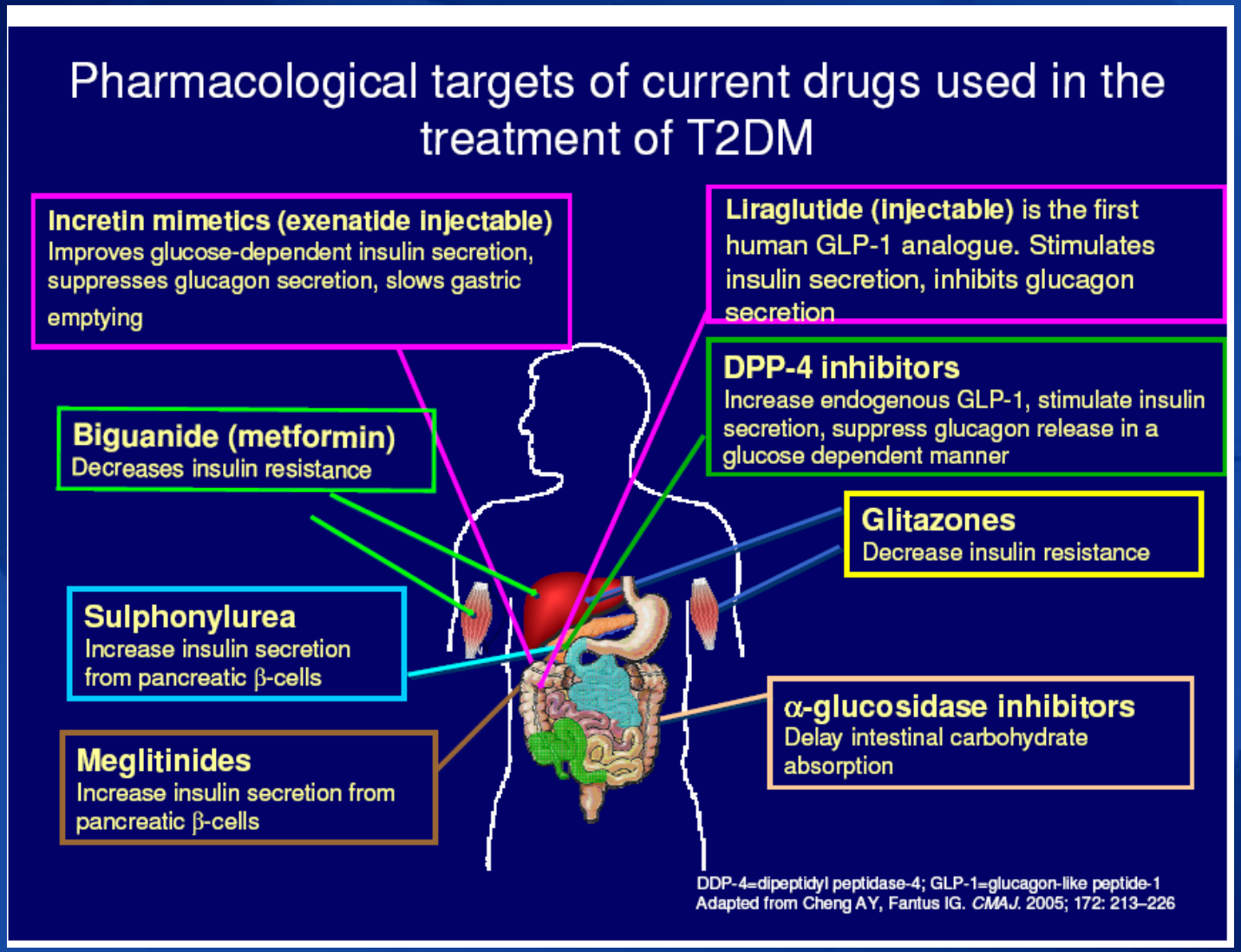
f. MHRA guidance (2011) notes that cases of cardiac failure have been reported when pioglitazone was used in combination with insulin, especially in patients with risk factors for the development of cardiac failure. It advises that if the combination is used, people should be observed for signs and symptoms of heart failure, weight gain, and oedema. Pioglitazone should be discontinued if any deterioration in cardiac status occurs.

g. The recommendations in this guideline also apply to any current and future biosimilar product(s) of insulin glargine that have an appropriate Marketing Authorisation that allows the use of the biosimilar(s) in the same indication.

h. A consultant-led multidisciplinary team may include a wide range of staff based in primary, secondary and community care.

'Type 2 diabetes in adults: management', NICE guideline NG28. Published December 2015, last updated April 2017.

Type 2 Diabetes Treatment



Initial Management

- History - FBC – lipids, FPG, U & E's
- Examination - complications
- Explanation
- Explore current lifestyle
- Diet
- Activity
- ? Medications – oral/injectable
- ? Monitoring – glucose/ketones
- ? Follow up
- Education for self-management

Diabetes Emergencies (Acute Complications)

- Hypoglycaemia

- “low blood glucose level : <3.5 mmols/l
- Can affect people treated with insulin (type 1 and 2) and those taking sulphonylureas

Hospital management-
https://diabetes-resources-production.s3-eu-west-1.amazonaws.com/diabetes-storage/migration/pdf/JBDS%2520hypoglycaemia%2520position%2520%282013%29.pdf

1. Oral Glucose (short acting CHO)
2. Glugagon IM
3. IV Glucose

Diabetes Emergencies

- ## Hypergylcaemia
  - Polydypsia (excessive thirst)/ dry mouth
  - Polyuria (passing urine frequently)/ incontinence
  - Tiredness
  - Blurred vision
- ## Diabetic Ketoacidosis
  - Usually type 1
  - ? Infection
  - Rapid onset (hours to a few days)
  - Polydypsia
  - Weakness/lethargy
  - Urine output high or low
  - Deep and rapid respirations
  - Ketonuria
  - Ketone smell to breath
  - Nausea, vomiting, abdo pain

Dehydrated – Tachycardia, hypotensive, flushed, dry mucous membranes)
Alert or unconscious
Weight loss
Electrolyte imbalance

Diabetic Ketoacidosis

- **Ketone self-monitoring for prevention of DKA**
- 1.11.1 Consider ketone monitoring (blood or urine) as part of 'sick-day rules' for adults with type 1 diabetes, to facilitate self-management of an episode of hyperglycaemia. **[new 2015]**
- **Ketone monitoring in hospital**
- 1.11.2 In adults with type 1 diabetes presenting to emergency services, consider capillary blood ketone testing if:
- DKA is suspected **or**
- the person has uncontrolled diabetes with a period of illness, and urine ketone testing is positive. **[new 2015]**
- 1.11.3 Consider capillary blood ketone testing for inpatient management of DKA in adults with type 1 diabetes that is incorporated into a formal protocol. **[new 2015]**

- **Management of DKA**
- 1.11.4 Professionals managing DKA in adults should be adequately trained, including regular updating, and be familiar with all aspects of its management which are associated with mortality and morbidity. These topics should include:
- fluid balance
- acidosis
- cerebral oedema
- electrolyte imbalance
- disturbed interpretation of familiar diagnostic tests (white cell count, body temperature, ECG)
- respiratory distress syndrome
- cardiac abnormalities
- precipitating causes
- infection management, including opportunistic infections
- gastroparesis
- use of high dependency and intensive care units

DKA treatment

- For primary fluid replacement in adults with DKA, use isotonic saline, not given too rapidly except in cases of circulatory collapse. **[2004]**
- 1.11.6 Do not generally use bicarbonate in the management of DKA in adults. **[2004, amended 2015]**
- 1.11.7 Give intravenous insulin by infusion to adults with DKA. **[2004]**
- 1.11.8 In the management of DKA in adults, once the plasma glucose concentration has fallen to 10–15 mmol/litre, give glucose-containing fluids (not more than 2 litres in 24 hours) in order to allow continued infusion of insulin at a sufficient rate to clear ketones (for example, 6 units/hour monitored for effect). **[2004, amended 2015]**
- 1.11.9 Begin potassium replacement early in DKA in adults, with frequent monitoring for the development of hypokalaemia. **[2004]**
- 1.11.10 Do not generally use phosphate replacement in the management of DKA in adults. **[2004, amended 2015]**
- 1.11.11 In adults with DKA whose conscious level is impaired, consideration should be given to inserting a nasogastric tube, monitoring urine production using a urinary catheter and giving heparin. **[2004]**
- 1.11.12 To reduce the risk of catastrophic outcomes in adults with DKA, ensure that monitoring is continuous and that review covers all aspects of clinical management at frequent intervals. **[2004, amended 2015]**

Diabetes as a long term condition

- Principle- Individualised Shared Care Plan

- - Self –management/ self care.
- - Service level interventions.
- -Surveillance.
- -Screening.
- -Education

Via- Primary Care Led Services.

Education
http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD005268.pub2/full

Self-management
Self-management education programmes by lay leaders for people with chronic conditions
http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD005108.pub2/full
Service Interventions:
Interventions to improve the management of diabetes mellitus in primary care, outpatient and community settings
http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD001481/full
Cochrane Library 2017

Care Plan Mutual Goals

- Height and weight (BMI= kg/m^2)
- Blood pressure
- Blood glucose control
- HbA1c and cholesterol levels
- Discuss any issues
- Advise any change in regime, lifestyle or medication - including any side effects
- People who take insulin should also have their injection or infusion sites checked.
- Depression and sexual dysfunction questionnaire.

Care Plan Mutual Goals

- **HbA1c targets**
- People with diabetes are generally advised to keep their **HbA1c values below 48 mmol/mol (6.5%)**
- However, an individualised target should be set to take into account factors such as your daily activities, likelihood of developing complications and risks presented by hypoglycemia.
- Ideally, the lower the HbA1c value you can achieve without increasing instances or severity of hypoglycemia, the better.
- For comparison purposes, people without diabetes tend to get HbA1c readings in the 15 to 37 mmol/mol (3.5 to 5.5%) range.
- **Blood pressure (hypertension) guidelines**
- Blood pressure targets for type 1 diabetes:
- **Below 135/85 mmHg**
- Or **below 130/80 mmHg** if abnormal presence of albumin in the urine (a sign of diabetic kidney disease) or if there are signs of metabolic syndrome
- Blood pressure targets for type 2 diabetes:
- **Below 140/80 mmHg**
- Or below **130/80 mmHg** if you have kidney disease, retinopathy or have cerebrovascular disease (including stroke)
- **Total cholesterol:** under 4.0 mmol/l
- **LDL levels:** below 2.0 mmol/l
- **HDL levels:** at least 1.0 mmol/l (men) or 1.2 mmol/l (women)
- **Triglyceride levels:** less than (or equal to) 1.7 mmol/l
- Kidney function guidelines for diabetic patients are as follows:
- **Albumin/creatinine ratio:** less than or equal to 2.5 mg/mmol (men) or 3.5 mg/mmol (women)

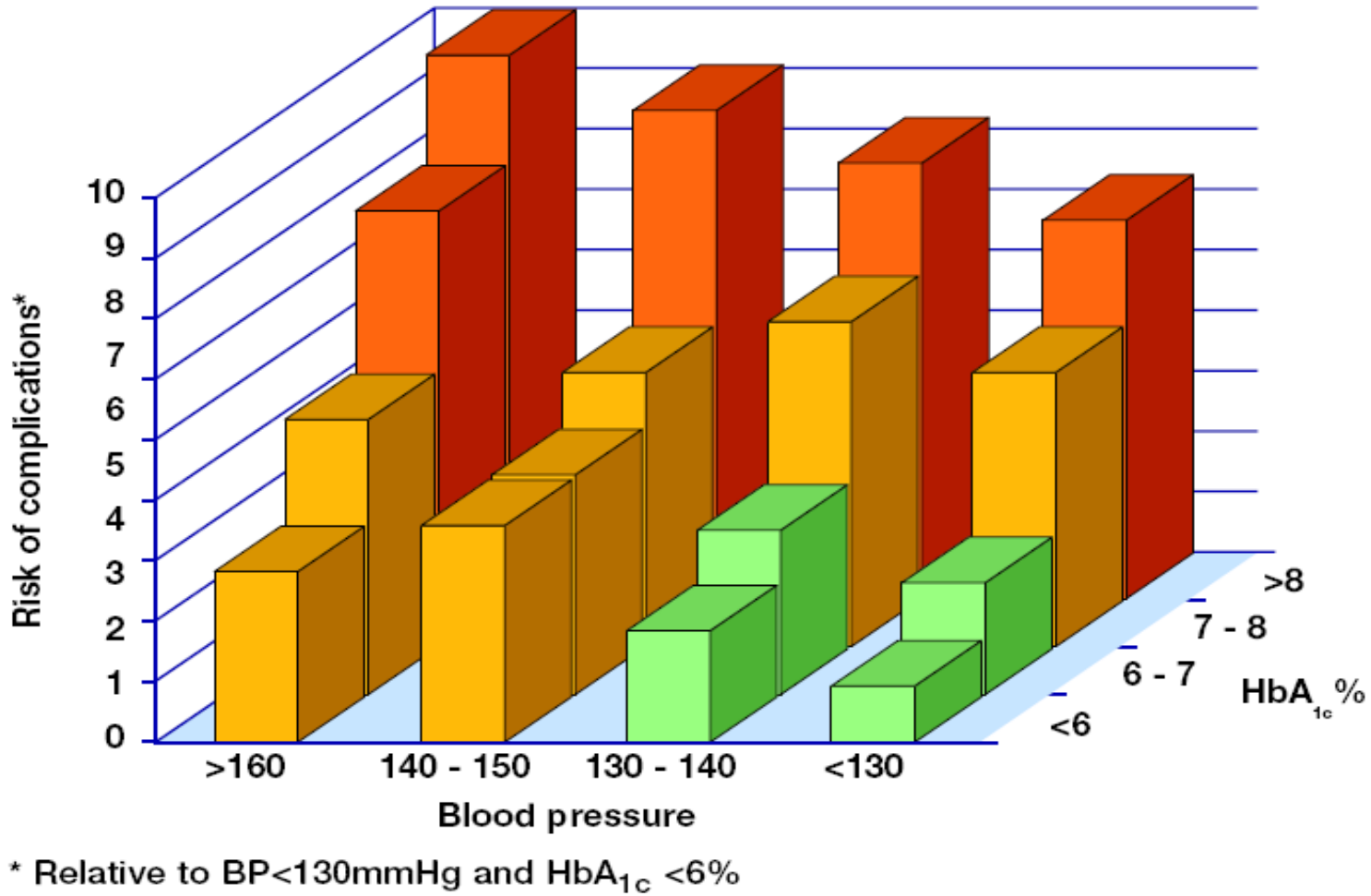
Self-Management

- Physical Activity/ Exercise.
- Dietary management.
- Mediation compliance.
- Psychological well-being.
- Control- (Blood Glucose Monitoring/ Dose adjustment/ Nutritional adjustment).
- Education

- - Dose Adjustment for Normal Eating (DAFNE)- Type 1http://www.dafne.uk.com/

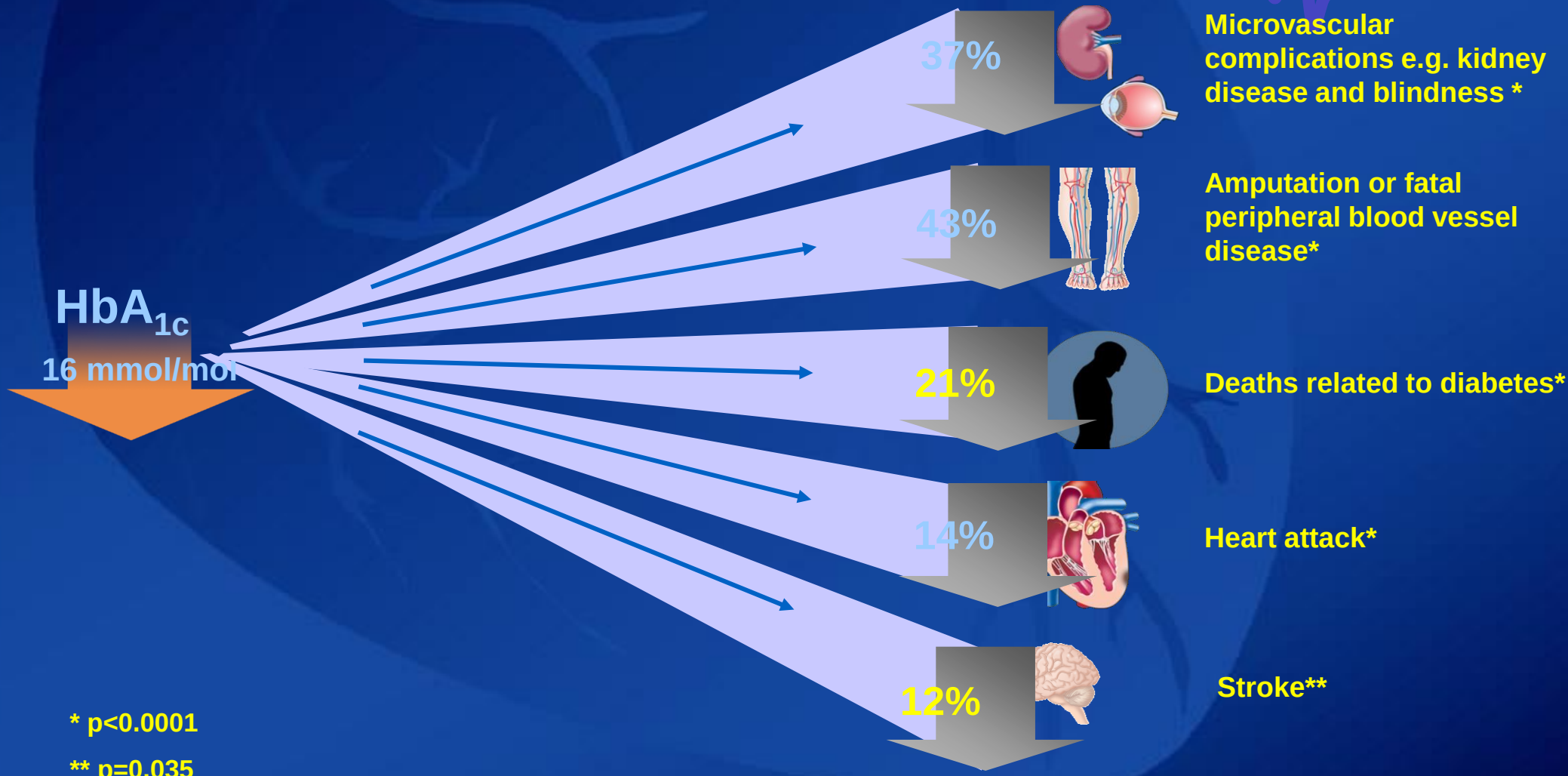
- -Diabetes Education and Self Management for Ongoing and Diagnosed (DESMOND)- Type 2
- http://www.desmond-project.org.uk/index.php

Risk of diabetes complications



The risk of diabetes complication based on the UKPDS Study. From Mogensten C-E . Diabetic nephropathy:evidence for renoprotection and practice. *Heart* 2000; 84(suppl): i26 -28 . Reproduced with permission from the BMJ Publishing Group.

UKPDS: 1% (16 mmol/mol) decrease in HbA_{1c} is associated with a reduction in complications

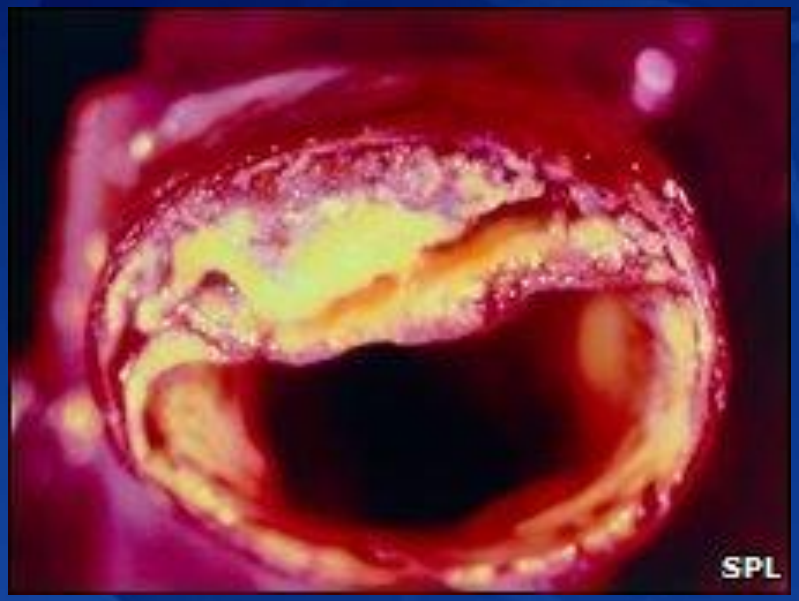


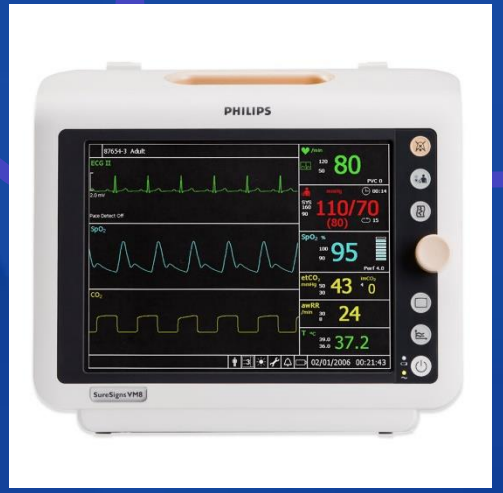
* p<0.0001

** p=0.035

Stratton IM *et al. BMJ* 2000; 321: 405–412.

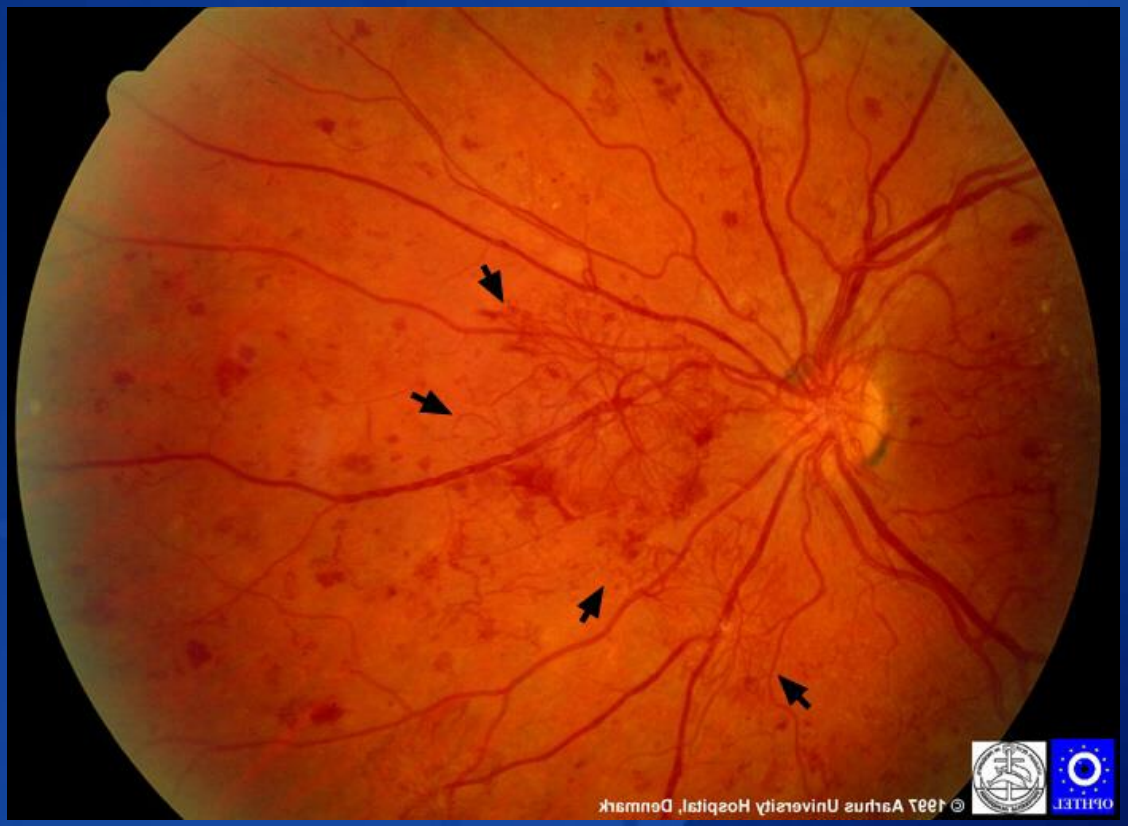
Macro-vascular complications of diabetes



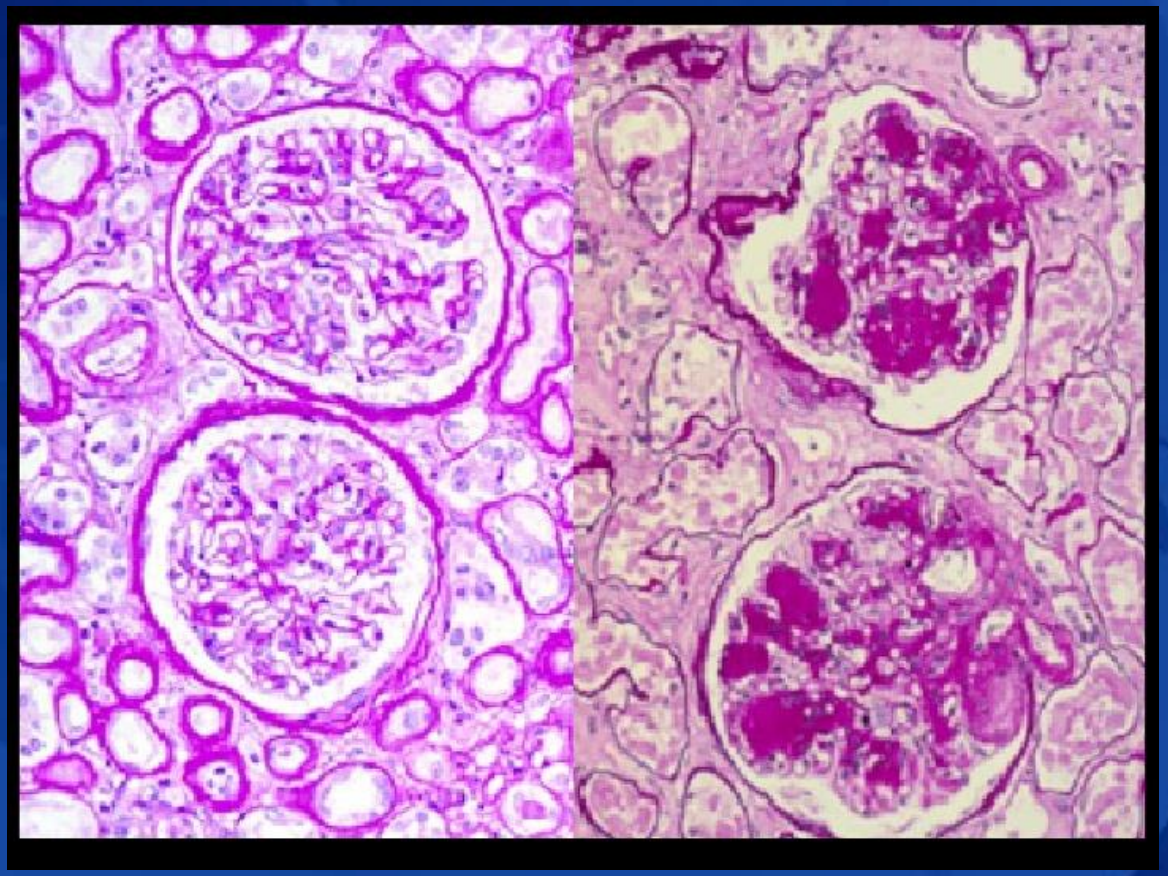


Micro-vascular complications

- Diabetic Retinopathy
- https://www.youtube.com/watch?v=mHBRxQD4ef4



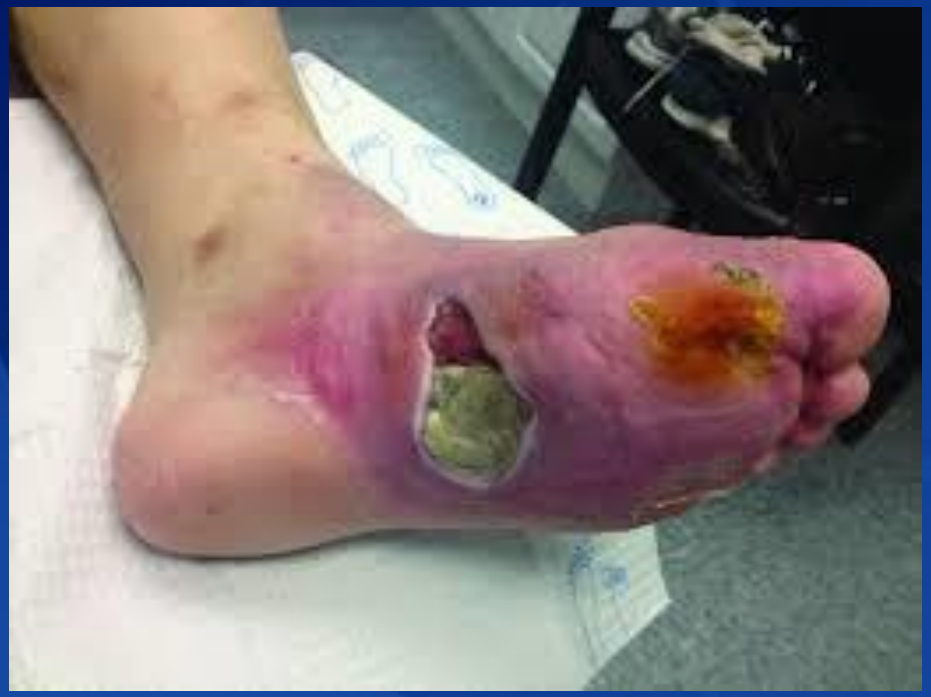
Micro-vascular complications



Kidney disease

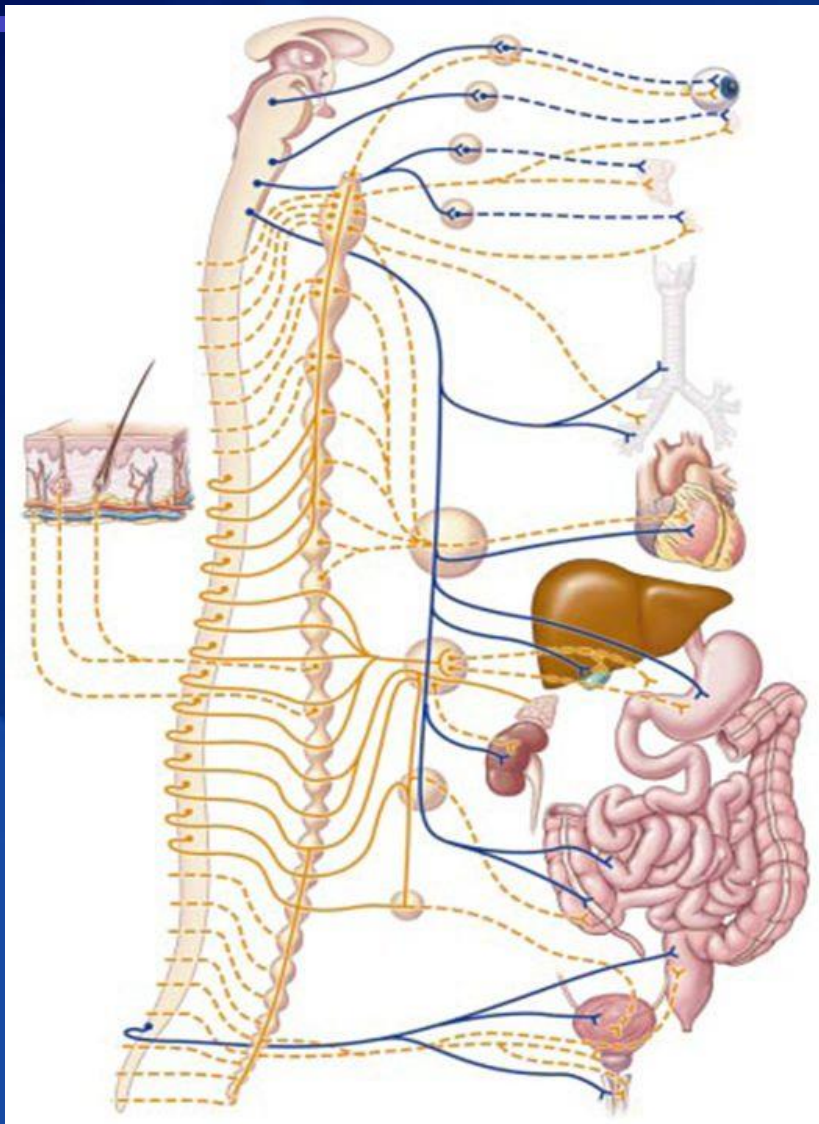
Diabetic Nephropathy

Micro-vascular complications



Diabetic
Neuropathy

Other complications



Diabetic autonomic neuropathy :

Pupillary
Decreased diameter of darkadapted pupil
Argyll-Robertson type pupil

Metabolic
Hypoglycemia unawareness
Hypoglycemia unresponsiveness

Cardiovascular
Tachycardia, exercise intolerance
Cardiac denervation
Orthostatic hypotension
Heat intolerance

Neurovascular
Areas of symmetrical anhydrosis
Gustatory sweating
Hyperhidrosis
Alterations in skin blood flow

Gastrointestinal
Constipation
Gastroparesis diabeticorum
Diarrhea and fecal incontinence
Esophageal dysfunction

Genitourinary
Erectile dysfunction
Retrograde ejaculation
Cystopathy
Neurogenic bladder
Defective vaginal lubrication