Diabetes Mellitus in Family Practice

Screening and management of diabetes mellitus in primary care

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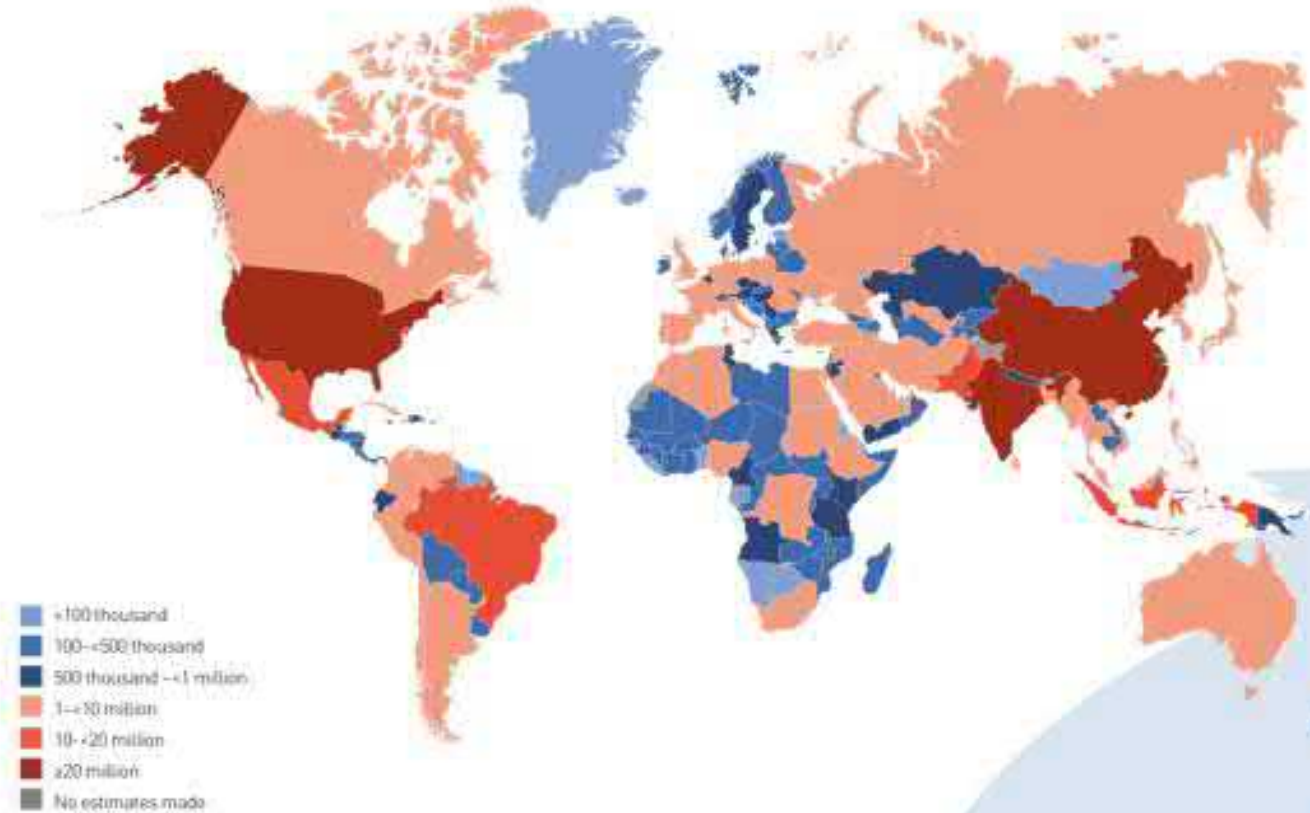
2020

250 years of EXCELLENCE in medical education, research & innovation and healthcare

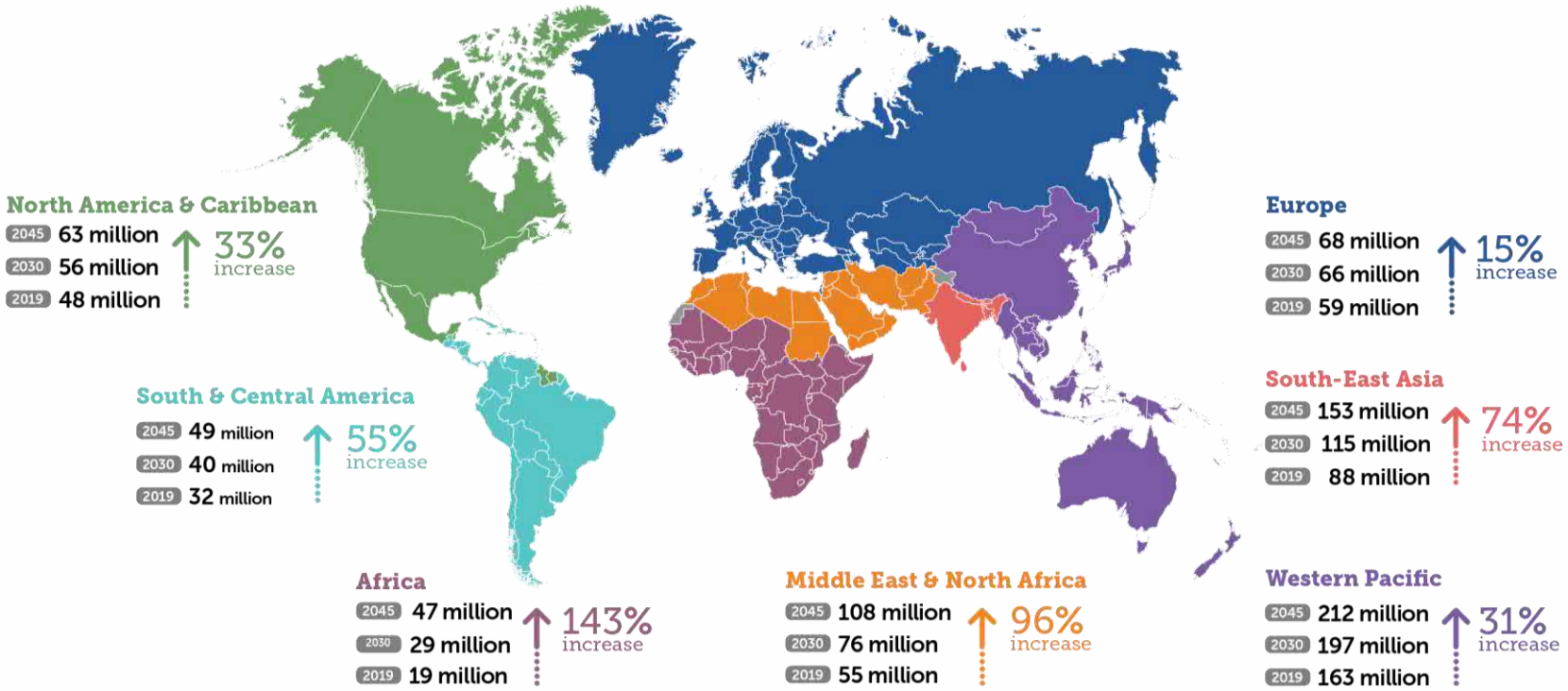
Number of people (20-79 years) with diabetes, 2019



International Diabetes Federation

Number of people with diabetes worldwide 2019-2030-2045

Number of people (20-79 years) with diabetes globally and by IDF Region



International Diabetes Federation

Diabetes in Hungary

IDF DIABETES ATLAS

9th edition 2019

At a glance	2010	2019	2030	2045
Diabetes estimates (20-79 y)				
People with diabetes, in 1,000s	658.9	684.5	697.1	676.5
Age-adjusted comparative prevalence of diabetes, %	6.4	6.9	7.8	8.3
People with undiagnosed diabetes, in 1,000s	-	114.1	-	-
Proportion of people with undiagnosed diabetes, %	-	16.7	-	-
Impaired glucose tolerance (IGT) estimates (20-79 y)				
People with IGT, in 1,000s	1,315.3	177.1	168.7	148.4
Age-adjusted comparative prevalence of IGT, %	15.3	2.4	2.7	2.9
Mortality attributable to diabetes (20-79 y)				
Deaths attributable to diabetes	9,824.0	8,338.2	-	-

Definition

Diabetes mellitus is characterized by
metabolic diseases that result in hyperglycemia.

Diabetes mellitus is a **chronic disease** caused by inherited and/or acquired deficiency in production of insulin by the pancreas, or by the ineffectiveness of the insulin produced.

Such a deficiency results in increased concentrations of glucose in the blood, which in turn **damage many of the body's systems**, in particular the blood vessels and nerves.

(https://www.who.int/mediacentre/factsheets/fs138/en/)

Symptoms

The symptoms of diabetes may be pronounced, subdued, or even absent.

- In Type 1 diabetes, the **classic symptoms** are excessive secretion of urine (**polyuria**), thirst (**polydipsia**), **weight loss** (and **tiredness, slow wound healing)**.
- These symptoms may be less marked in Type 2 diabetes. In this form, it can also happen that no early symptoms appear and the disease is only diagnosed several years after its onset, when complications are already present.

Classification

Diabetes mellitus can be categorized into 4 classifications:

- Type 1 diabetes (T1D) mellitus
- Type 2 diabetes (T2D) mellitus
- Gestational diabetes mellitus (GDM)
- Diabetes mellitus due to other causes

Classification

- Diabetes mellitus due to other causes:

monogenic diabetes syndromes (such as neonatal diabetes and maturity-onset diabetes of the young [MODY]),

diseases of the exocrine pancreas (such as cystic fibrosis and pancreatitis),

and drug- or chemical-induced diabetes (such as with glucocorticoid use, in the treatment of HIV/AIDS, or after organ transplantation)

Type 1 Diabetes mellitus

Plasma blood glucose rather than A1C should be used to diagnose the acute onset of type 1 diabetes in individuals with symptoms of hyperglycemia.

Screening for type 1 diabetes risk with a panel of autoantibodies is currently recommended only in the setting of a research trial or in first-degree family members of a proband with type 1 diabetes.

Persistence of two or more autoantibodies predicts clinical diabetes and may serve as an indication for intervention in the setting of a clinical trial.

Standards of Medical Care in Diabetes - 2019. Diabetes Care 2019;42(Suppl. 1):S1-S2

American Diabetes Association.

Management of Type 1 DM

Management of Type 1 DM is done by an **endocrinologists/diabetologist**.

Role of Primary Care in Type 1 DM management:

- Diagnosis
- Documentation
- Motivate and support the patient
- Treatment of comorbidities

Gestational diabetes mellitus (GDM)

The rise in GDM and type 2 diabetes in parallel with obesity worldwide is of particular concern.

- **Specific risks of uncontrolled diabetes in pregnancy include**:

spontaneous abortion, preeclampsia,

fetal demise, macrosomia, fetal anomalies,

neonatal hypoglycemia and neonatal hyperbilirubinemia.

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Sreening of GDM

Screening during early pregnancy: 1st laboratory control

Preferred method: testing fasting plasma glucose or casual check

Diagnostic criteria:

- FPG ≥7.0 mmol/l and/or
- casual sample PG: ≥11.1 mmol/l

Risk factors: advanced age (≥35 yrs.), overweight or obesity, excessive gestational weight gain, excessive central body fat deposition, family history of diabetes, short stature (<1.50 m), excessive fetal growth, polyhydramnios, hypertension or preeclampsia in the current pregnancy, history of recurrent miscarriage, offspring malformation, fetal or neonatal death, macrosomia, GDM during prior pregnancies and polycystic ovary syndrome.

If risk of GDM is increased

- During **16-18 pregnancy week**: 75 g Oral Glucose Tolerance Test (OGTT)

  Gestational hyperglycemia:

  - FPG ≥5.6 mmol/l and/or
  - 2h PG: ≥7.8 mmol/l
- If risk is increased, but OGTT negative, repeat test during **24–28 pregancy week**.
- **Postpartum OGTT: 6 weeks** after delivery to rule out impared glucose tolerance (IGT)
- **Continued prolonged follow-up** is indicated to
  - offer and apply treatment in women with IGT designed to delay or prevent development of type 2 diabetes,
  - follow women with IFG or normal OGTT to detect later conversion to IGT or type 2 diabetes
  - identify diabetes for intensified treatment before a subsequent pregnancy to lower the risk of major congenital malformations in their infants.

MANAGEMENT of Gestational Diabetes Mellitus (GDM)

Teamwork:

General Practitioner

Nurse

Diabetologist

Midewife

Gynecologist

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Type 2 diabetes (T2D) mellitus

Non-communicable diseases (NCMs):
CVD, diabetes, cancer, multi-sceletal disorders,
neurological disorders, depression etc.
are major cause of health problems in Europe.

Chronic diseases are largely preventable.

Prevention

- Many of the health risks associated with **increasing body weight first appear in children and young people**.
- To help prevent type 2 diabetes and its complications, people of all ages should achieve and maintain **healthy body weight**; **be physically active, eat a healthy diet and avoid tobacco use** (smoking increases the risk of cardiovascular diseases).
- Individuals with impaired glucose tolerance **IGT**, or impaired fasting glycaemia **IFG** are in the intermediate stage between normality and diabetes and are at **high risk of developing type 2 diabetes**.
  This risk can be drastically reduced through **intensive lifestyle modification and pharmacological intervention**.
- **The public and private sectors** also have an important role to play in developing and implementing policies and programmes that **increase knowledge about diabetes, its prevalence and consequences, encourage and provide greater opportunities for greater physical activity, and improve the availability and accessibility of healthy foods**.

Goals of the primary care

- The main goals of primary care is to screen and diagnose diabetes mellitus early
- In order to prevent and mitigate late complications
- Improve life expectancy and quality of life.

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 (≥130/80 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 ≥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.

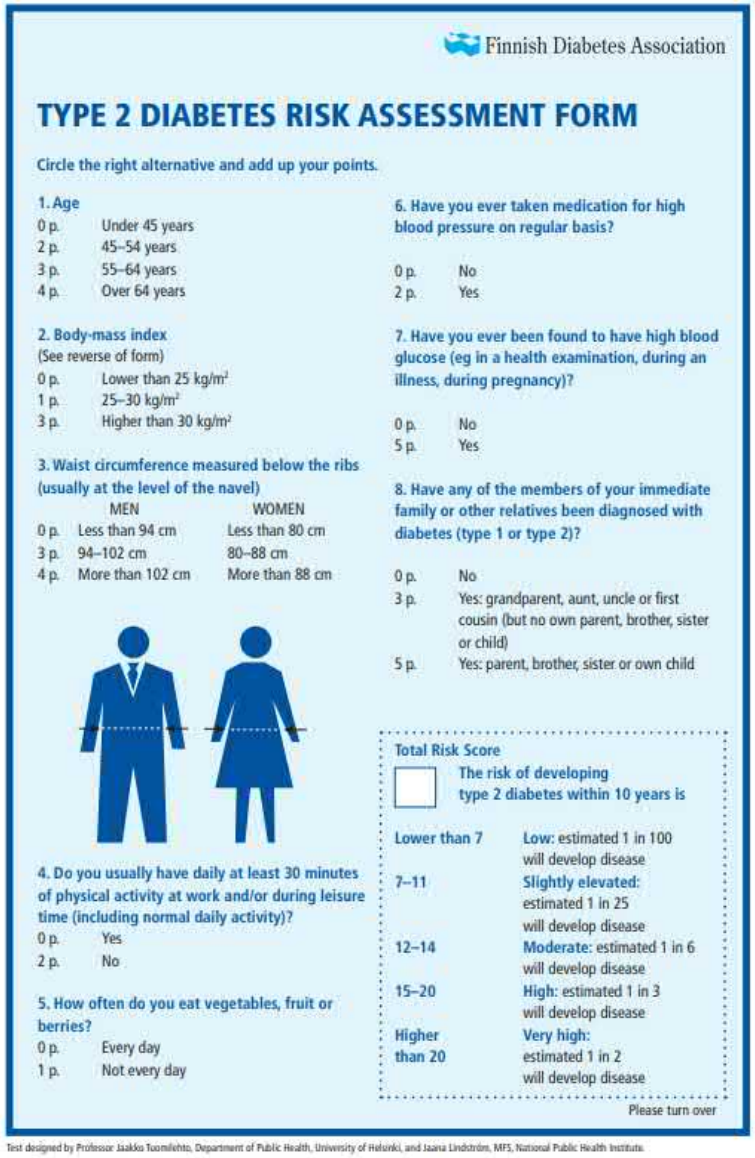
!4. For all other patients, testing should begin at age 45 years.

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.

FINDRISC

FINDRISC	Risk	10-year risk of developing T2DM	
		Men	Women
0-3	Very low	0.3%	0.1%
4-8	Low	0.8%	0.4%
9-12	Moderate	2.6%	2.2%
13-20	High	23.1%	14.1%
>21	Very high	~50%	~50%

Hungary: >12 points OGTT



Finnish Diabetes Association

TYPE 2 DIABETES RISK ASSESSMENT FORM

Circle the right alternative and add up your points.

1. Age
0 p. Under 45 years
2 p. 45–54 years
3 p. 55–64 years
4 p. Over 64 years

2. Body-mass index
(See reverse of form)
0 p. Lower than 25 kg/m²
1 p. 25–30 kg/m²
3 p. Higher than 30 kg/m²

3. Waist circumference measured below the ribs (usually at the level of the navel)

	MEN	WOMEN
0 p.	Less than 94 cm	Less than 80 cm
3 p.	94–102 cm	80–88 cm
4 p.	More than 102 cm	More than 88 cm

4. Do you usually have daily at least 30 minutes of physical activity at work and/or during leisure time (including normal daily activity)?
0 p. Yes
2 p. No

5. How often do you eat vegetables, fruit or berries?
0 p. Every day
1 p. Not every day

6. Have you ever taken medication for high blood pressure on regular basis?
0 p. No
2 p. Yes

7. Have you ever been found to have high blood glucose (eg in a health examination, during an illness, during pregnancy)?
0 p. No
5 p. Yes

8. Have any of the members of your immediate family or other relatives been diagnosed with diabetes (type 1 or type 2)?
0 p. No
3 p. Yes: grandparent, aunt, uncle or first cousin (but no own parent, brother, sister or child)
5 p. Yes: parent, brother, sister or own child

Total Risk Score

The risk of developing type 2 diabetes within 10 years is

Lower than 7	Low: estimated 1 in 100 will develop disease
7–11	Slightly elevated: estimated 1 in 25 will develop disease
12–14	Moderate: estimated 1 in 6 will develop disease
15–20	High: estimated 1 in 3 will develop disease
Higher than 20	Very high: estimated 1 in 2 will develop disease

Please turn over

Test designed by Professor Jaakko Tuomilehto, Department of Public Health, University of Helsinki, and Jaana Lindström, MFS, National Public Health Institute.

Criteria defining 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.

Criteria for the diagnosis of diabetes

FPG ≥126 mg/dL (7.0 mmol/L).
Fasting is defined as no caloric intake for at least 8 h.*
OR
2-h PG ≥200 mg/dL (11.1 mmol/L) during OGTT.
The test should be performed as described by the WHO, using a glucose load containing the equivalent of 75-g anhydrous glucose dissolved in water.*
OR
A1C ≥6.5% (48 mmol/mol).
The test should be performed in a laboratory using a method that is NGSP certified and standardized to the DCCT assay.*
OR
In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose ≥200 mg/dL (11.1 mmol/L).

* In the absence of unequivocal hyperglycemia, diagnosis requires two abnormal test results from the same sample or in two separate test samples.

Tasks of primary care recognition of type 2 DM

Assess key patient characteristics:
current lifestyle, comorbidities,
clinical characteristics, current medications

Physical examination:

- BMI, waist-to-hip,
- Foot examination (deformations, ulcerations, vascular assessment)
- Assessment for distal symmetric polyneuropathy (temperature, pinprick, vibration, 10-g monofilament testing)
- Assessment of peripherial vascular status (pulse inspection, Doppler, ankle-brachial index [normal range: 0.91-1.39])

Tasks of primary care recognition of type 2 DM

- Blood pressure measurement (during sitting, standing), ABPM
- ECG (normally R-R time decrease during inspiration)
- Laboratory:
  - ➥ FPG & PPG
  - ➥ HbA1c
  - ➥ Lipids
  - ➥ Kidney functions (creatinine, eGFR, blood urea nitrogen)
  - ➥ Urine test (ketones, sediment, sugar, albumin)
- Cardio-metabolic risk assessment
- Refer for ocular fundus exam
- Begin patient engagement in the formulation of a care management plan, initiate treatment.

According to current regulation in Hungary, primary care is entitled only to prescribe Metformin for Type 2 DM patients. All other reimbursed DM drugs are to be prescribed by an endocrinologist or internist.

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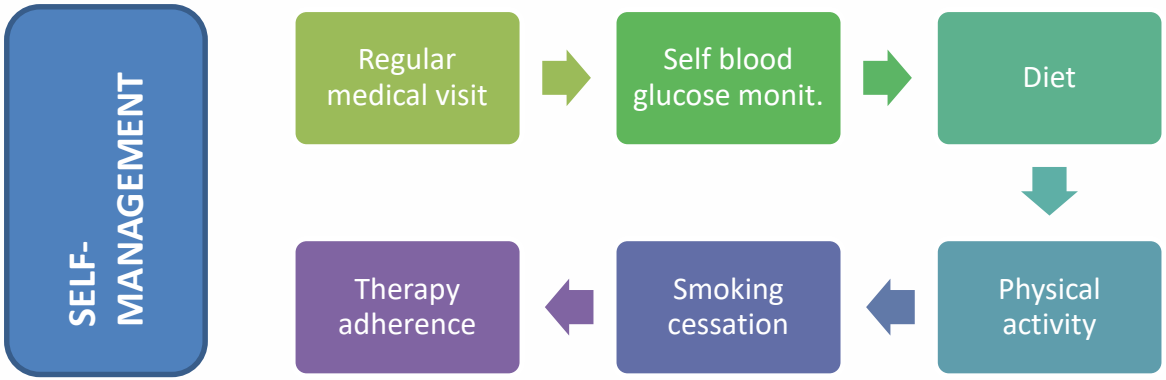
Management of diabetes

ROLE OF THE PRIMARY CARE

Diagnose early → Prevent complications → Delay progression

SELF-MANAGEMENT OF THE PATIENT



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Lifestyle management

- All people with type 2 diabetes should be offered access to ongoing **DSMES - Diabetes self-management education and support programmes**.
- Facilitating **medication adheren**ce should be specifically considered when selecting glucose-lowering medications.
- An individualised programme of MNT- **Medical nutrition therapy** should be offered to all patients
- **All overweight and obese patients with diabetes should be advised** of the health benefits of weight loss and encouraged to engage in a programme of intensive lifestyle management, which may include food substitution.
- **Increasing physical activity** improves glycaemic control and should be encouraged in all people with type 2 diabetes.

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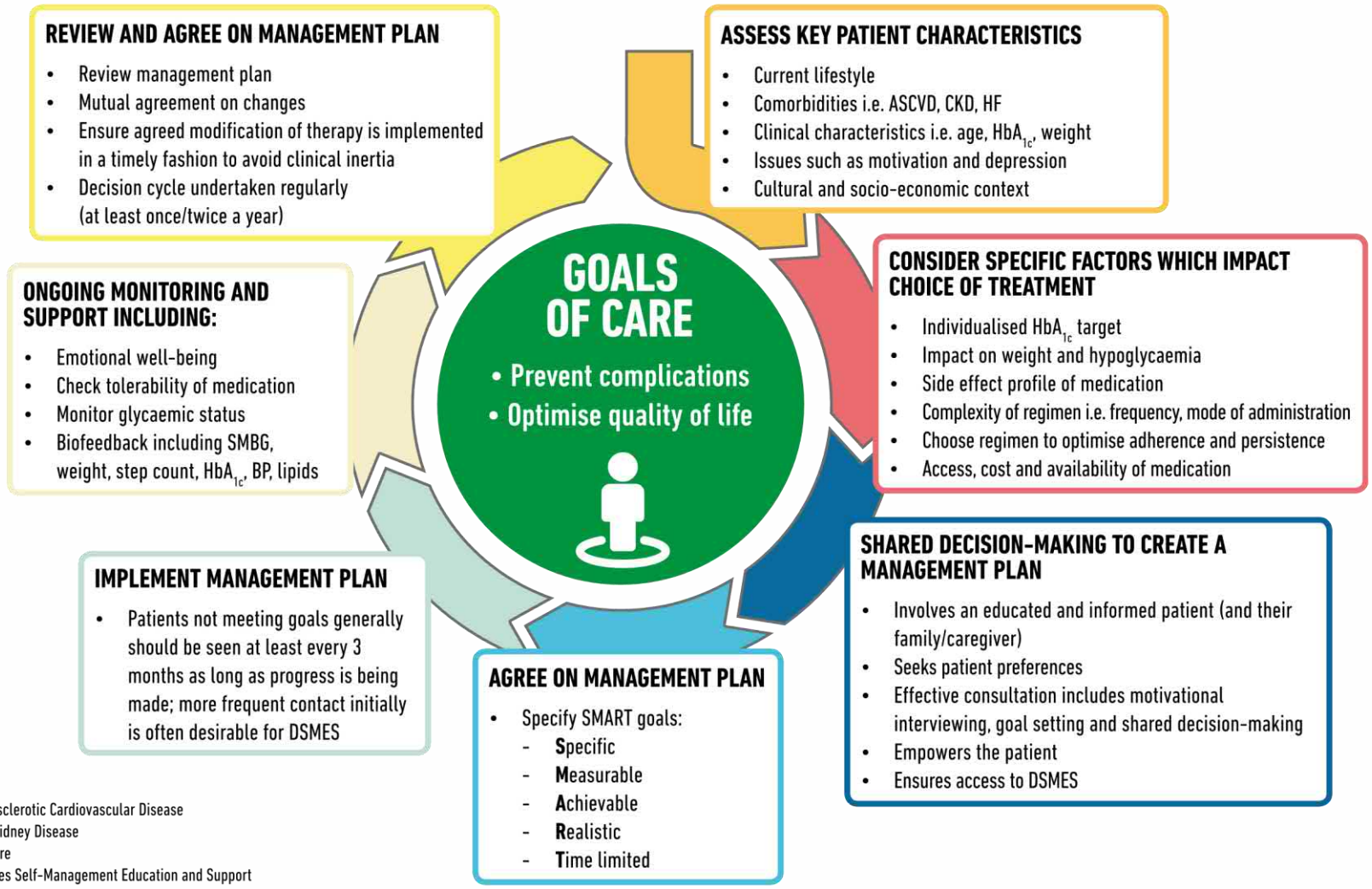
DECISION CYCLE FOR PATIENT-CENTRED GLYCAEMIC MANAGEMENT IN TYPE 2 DIABETES



ASCVD = Atherosclerotic Cardiovascular Disease
CKD = Chronic Kidney Disease
HF = Heart Failure
DSMES = Diabetes Self-Management Education and Support
SMBG = Self-Monitored Blood Glucose

Fig. 1 Decision cycle for patient-centred glycaemic management in type 2 diabetes

Annual lab control type 2 DM

- HbA1c – (every 3 months)
- FPG & PPG (OGTT)
- Se Cholesterol,
- HDL-cholesterol,
- LDL-cholesterol
- Triglyceride
- Creatinine
- eGFR
- Urine sugar, ketones, sediment
- Urine culture (if needed)
- Quantitative albumin measurement (24h urine sample or Albumin to Creatinine Ratio).

Annual control type 2 DM

Control of the complications, comorbidities

Control of the self-management

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METABOLIC **TARGETS**

- Fasting plasma glucose (FPG): ≤ 6.0 mmol/l
- Post prandial plasma glucose (PPG): < 7.5 mmol/l
- **HbA1c < 7 % (target range: 6.0 - 8.0%, should be personalized)**
- Blood pressure: <130/80 Hgmm
  - In case of albuminuria: <130 Hgmm systolic BP
- Lipids: according to cardiovascular risk
- Target BMI and waist to hip ratio

Proper metabolic control help prevent serious complications that can arise from diabetes.

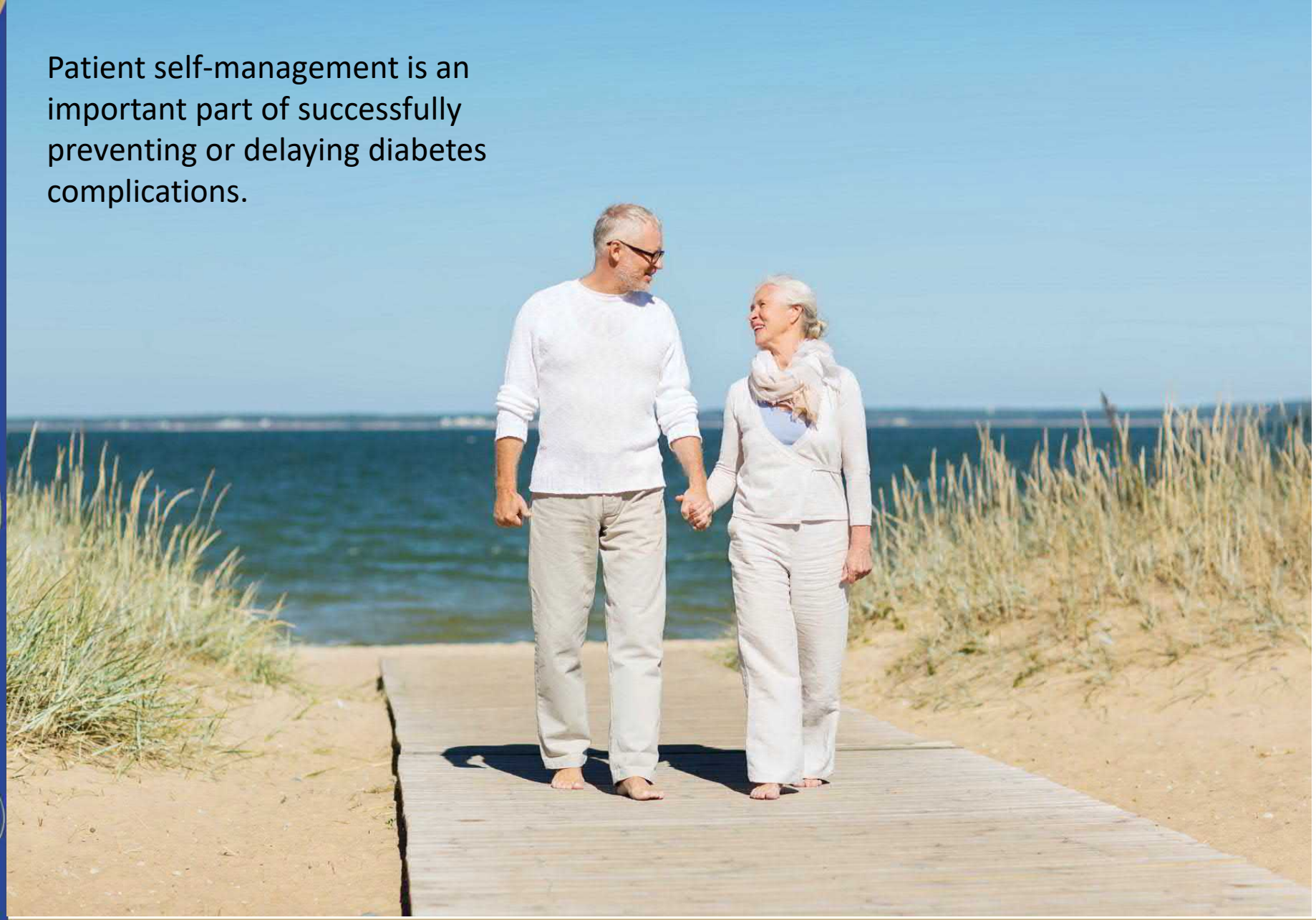
Treatment **TARGETS**

Table 9 **Summary of treatment targets for the management of patients with diabetes**

Risk factor	Target
BP	• Target SBP 130 mmHg for most adults, <130 mmHg if tolerated, but not <120 mmHg • Less-stringent targets, SBP 130–139 in older patients (aged >65 years)
Glycaemic control: HbA1c	• HbA1c target for most adults is <7.0% (<53 mmol/mol) • More-stringent HbA1c goals of <6.5% (48 mmol/mol) may be suggested on a personalized basis if this can be achieved without significant hypoglycaemia or other adverse effects of treatment • Less-stringent HbA1c goals of <8% (64 mmol/mol) or ≤9% (75 mmol/mol) may be adequate for elderly patients (see section 6.2.1)
Lipid profile: LDL-C	• In patients with DM at very high CV risk,[a] target LDL-C to <1.4 mmol/L (<55 mg/dL) • In patients with DM at high risk,[a] target LDL-C to <1.8 mmol/L (<70 mg/dL) • In patients with DM at moderate CV risk,[a] aim for an LDL-C target of <2.5 mmol/L (<100 mg/dL)
Platelet inhibition	In DM patients at high/very high CV risk
Smoking	Cessation obligatory
Physical activity	Moderate-to-vigorous, ≥150 min/week, combined aerobic and resistance training
Weight	Aim for weight stabilization in overweight or obese patients with DM, based on calorie balance, and weight reduction in subjects with IGT, to prevent the development of DM.
Dietary habits	Reduction of caloric intake is recommended in obese patients with T2DM to lower body weight; there is no ideal percentage of calories from carbohydrate, protein, and fat for all people with DM.

BP = blood pressure; CV = cardiovascular; DM = diabetes mellitus; HbA1c = haemoglobin A1c; IGT = impaired glucose tolerance; LDL-C = low-density lipoprotein cholesterol; SBP = systolic blood pressure; T2DM = type 2 diabetes mellitus.
[a]See *Table 7*.

Patient self-management is an important part of successfully preventing or delaying diabetes complications.



Glucose-lowering treatments

Lifestyle management, including medical nutrition therapy, physical activity, weight loss, counselling for smoking cessation, and psychological support,often delivered in the context of diabetes self-management education and support (DSMES), are fundamental aspects of diabetes care.

The expanding number of glucose-lowering treatments — from behavioural interventions to medications and surgery — and growing information about their benefits and risks provides more options for people with diabetes and providers, but can complicate decision making.

Treatment – Glucose lowering medication

- **The aim of blood glucose lowering management is to reduce long-term complications of diabetes.**
- Good glycaemic management yields substantial and enduring reductions in onset and progression of microvascular complications.
- The benefits of intensive glucose control emerge slowly, while the harms can be immediate, people with longer life expectancy have more to gain from intensive glucose control.

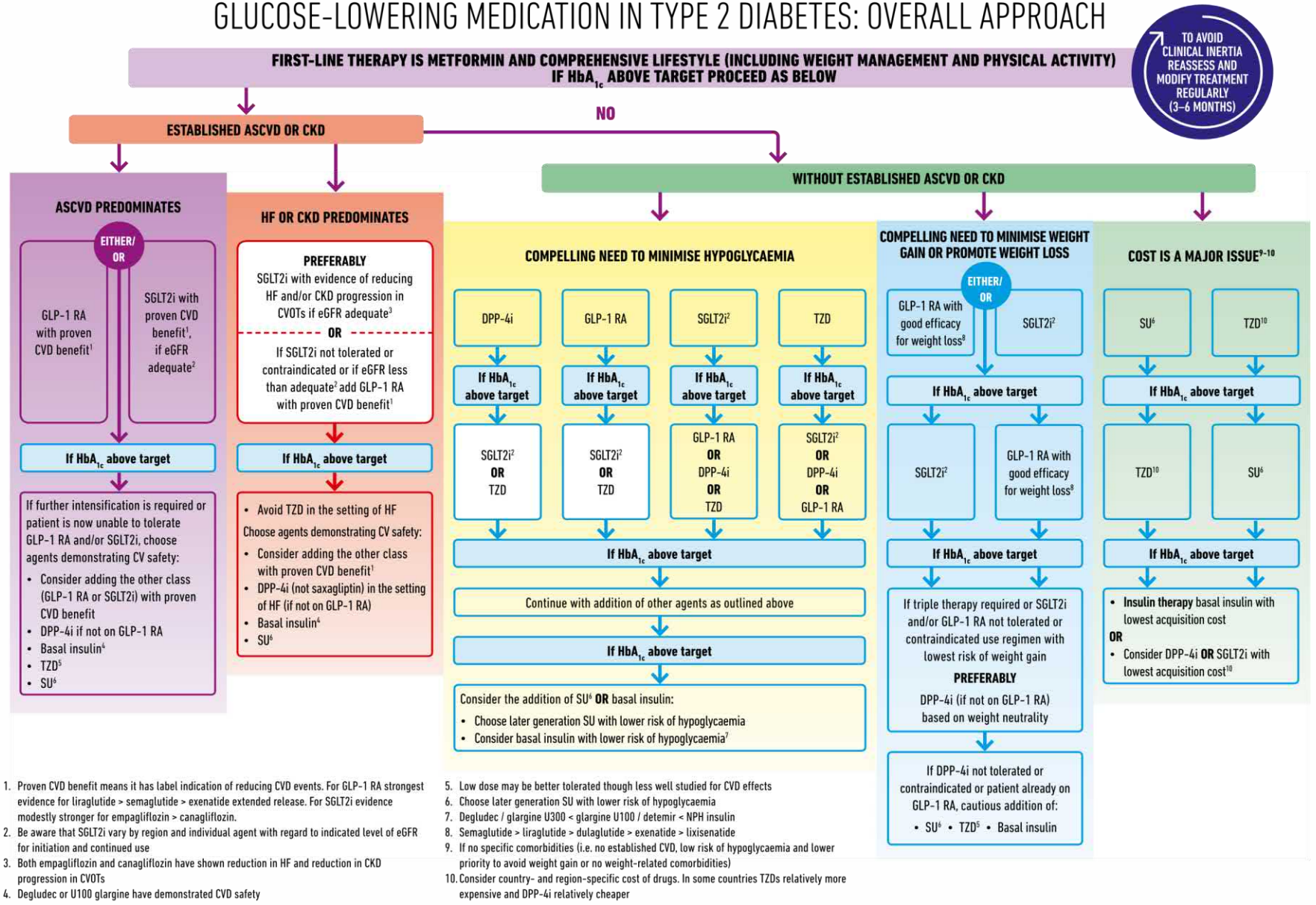
Treatment – Glucose lowering medication

Glycaemic treatment targets should be individualised based on patient preferences and goals, risk of adverse effects of therapy (e.g. hypoglycaemia and weight gain) and patient characteristics, including frailty and comorbid conditions, polypharmacy and cost .

Efficacy in reducing hyperglycaemia,

along with tolerability and safety were primary factors in glucose-lowering medication selection.

GLUCOSE-LOWERING MEDICATION IN TYPE 2 DIABETES: OVERALL APPROACH



1. Proven CVD benefit means it has label indication of reducing CVD events. For GLP-1 RA strongest evidence for liraglutide > semaglutide > exenatide extended release. For SGLT2i evidence modestly stronger for empagliflozin > canagliflozin.
2. Be aware that SGLT2i vary by region and individual agent with regard to indicated level of eGFR for initiation and continued use
3. Both empagliflozin and canagliflozin have shown reduction in HF and reduction in CKD progression in CVOTs
4. Degludec or U100 glargine have demonstrated CVD safety
5. Low dose may be better tolerated though less well studied for CVD effects
6. Choose later generation SU with lower risk of hypoglycaemia
7. Degludec / glargine U300 < glargine U100 / detemir < NPH insulin
8. Semaglutide > liraglutide > dulaglutide > exenatide > lixisenatide
9. If no specific comorbidities (i.e. no established CVD, low risk of hypoglycaemia and lower priority to avoid weight gain or no weight-related comorbidities)
10. Consider country- and region-specific cost of drugs. In some countries TZDs relatively more expensive and DPP-4i relatively cheaper

Fig. 2 Glucose-lowering medication in type 2 diabetes: overall approach

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Treatment algorithm
in patiens with Type 2 DM

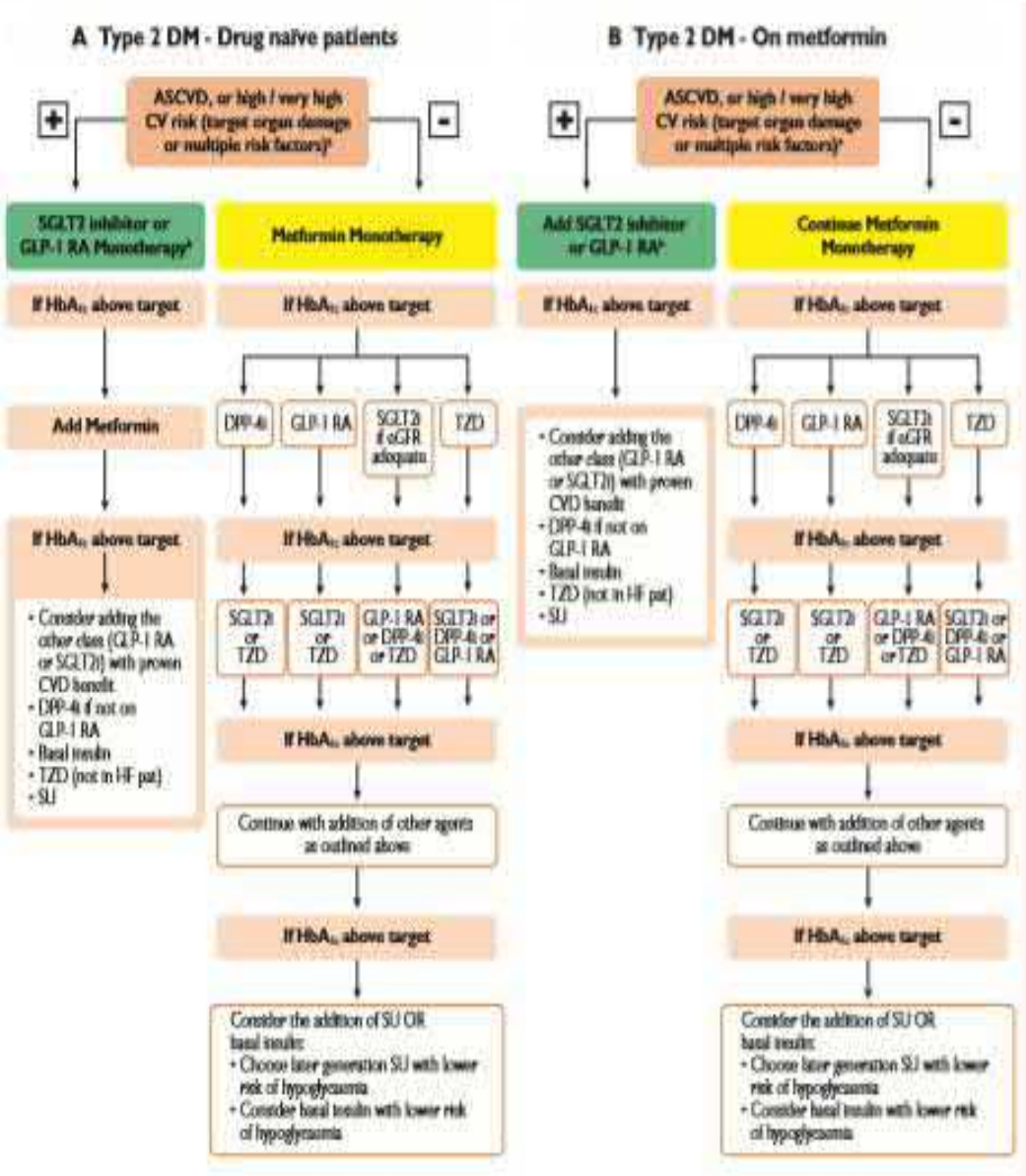

Figure 3 Treatment algorithm in patients with type 2 diabetes mellitus and atherosclerotic cardiovascular disease, or high/very high CV risk. Treat algorithms for (A) drug-naive and (B) metformin-treated patients with diabetes mellitus. ASCVD = atherosclerotic cardiovascular disease; CV = cardiovascular; CVD = cardiovascular disease; DM = diabetes mellitus; DPP4i = dipeptidyl peptidase-4 inhibitor; eGFR = estimated glomerular filtration rate; GLP-1 RA = glucagon-like peptide-1 receptor agonist; HbA1c = haemoglobin A1c; HF = heart failure; SGLT2i = sodium-glucose co-transporter 2 inhibitor; SU = sulphonylureas; T2DM = type 2 diabetes mellitus; TZD = thiazolidinedione. *See Table 7. †Use drugs with proven CVD benefit.

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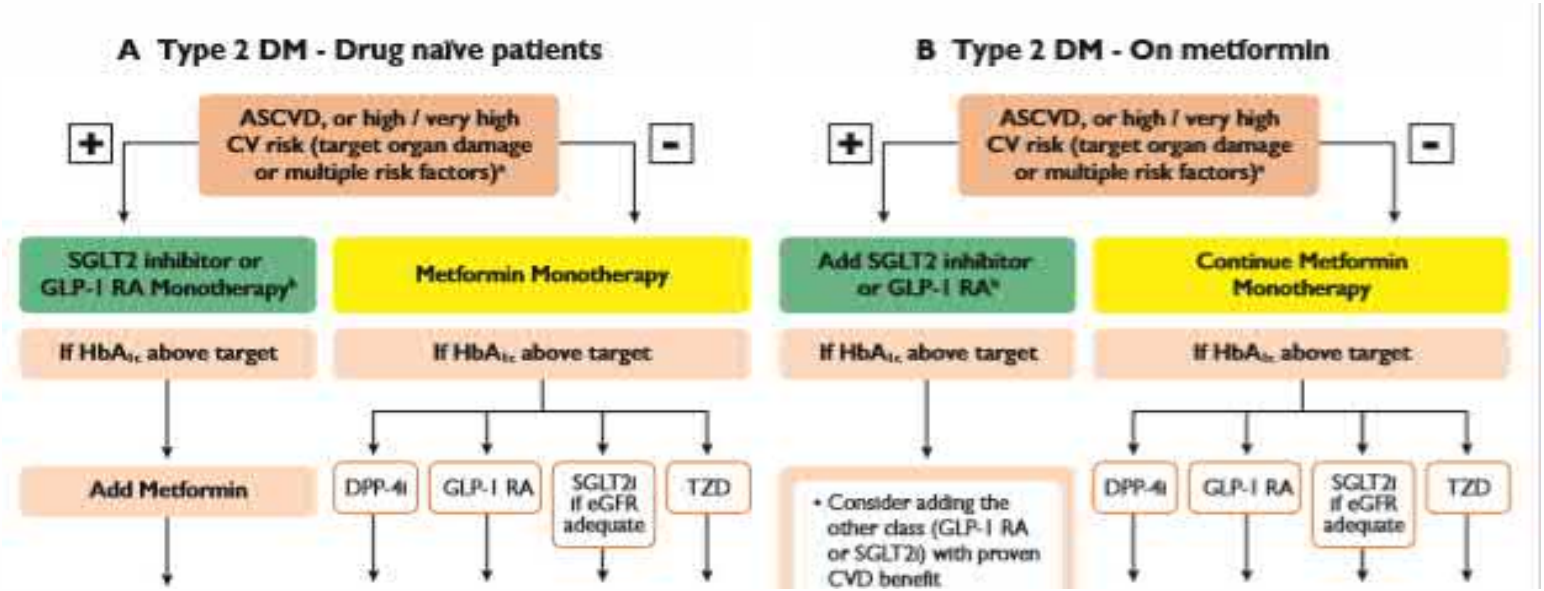
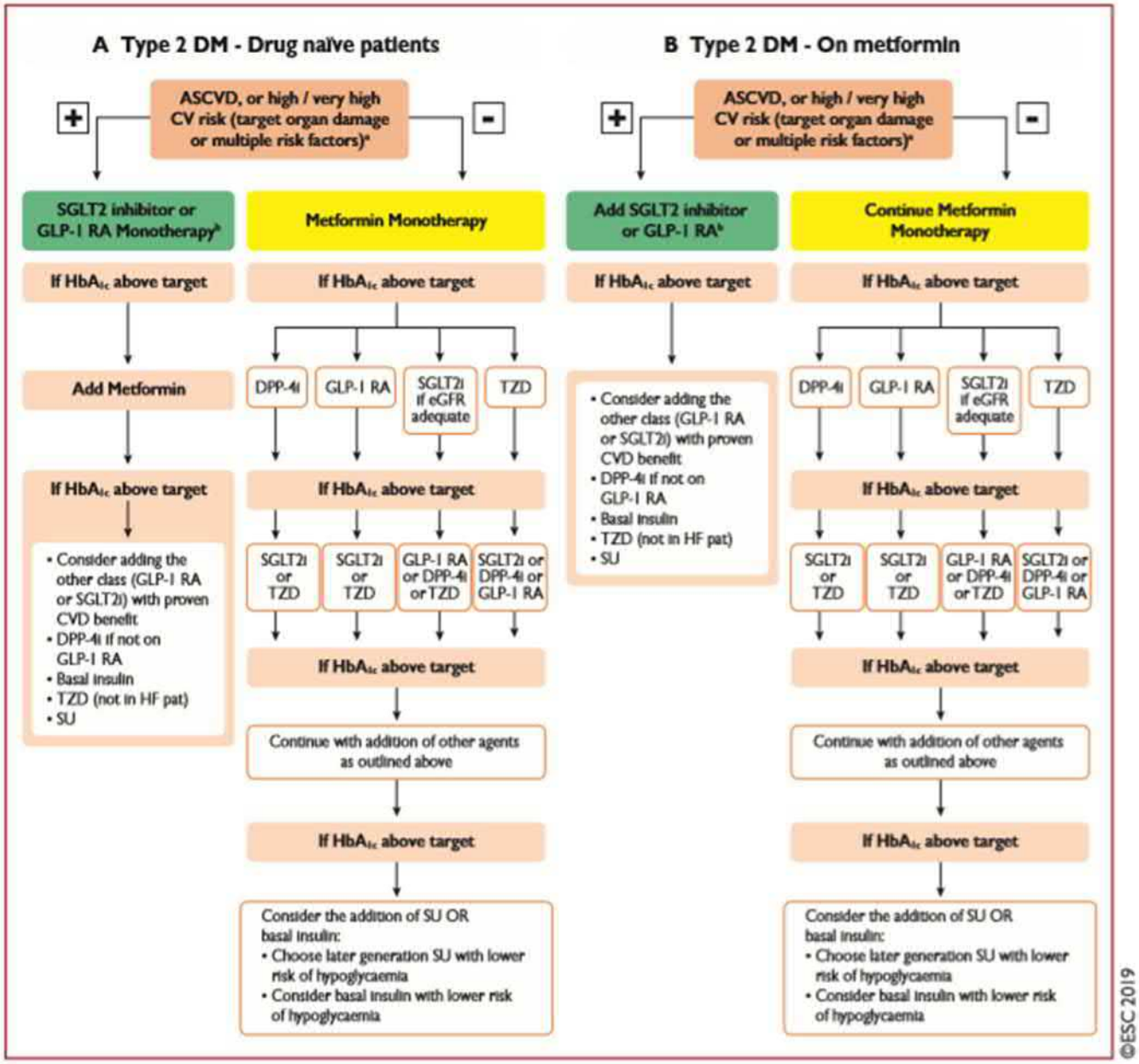
Treatment algorithm in patients with type 2 DM



Consensus recommendations ADA, EASD

- Among patients with type 2 diabetes who have established ASCVD, SGLT2 inhibitors or GLP-1 receptor agonists with proven cardiovascular benefit are recommended as part of glycaemic management.
- Among patients with ASCVD in whom HF coexists or is of special concern, SGLT2 inhibitors are recommended
- For patients with type 2 diabetes and CKD, with or without CVD, consider the use of an SGLT2 inhibitor shown to reduce CKD progression or, if contraindicated or not preferred, a GLP-1 receptor agonist shown to reduce CKD progression


A Type 2 DM - Drug naïve patients
ASCVD, or high / very high CV risk (target organ damage or multiple risk factors)[a]
+
-
SGLT2 inhibitor or GLP-1 RA Monotherapy[b]
Metformin Monotherapy
If HbA1c above target
Add Metformin
If HbA1c above target
• Consider adding the other class (GLP-1 RA or SGLT2i) with proven CVD benefit
• DPP-4i if not on GLP-1 RA
• Basal insulin
• TZD (not in HF pat)
• SU
If HbA1c above target
DPP-4i
GLP-1 RA
SGLT2i if eGFR adequate
TZD
If HbA1c above target
SGLT2i or TZD
SGLT2i or TZD
GLP-1 RA or DPP-4i or TZD
SGLT2i or DPP-4i or GLP-1 RA
If HbA1c above target
Continue with addition of other agents as outlined above
If HbA1c above target
Consider the addition of SU OR basal insulin:
• Choose later generation SU with lower risk of hypoglycaemia
• Consider basal insulin with lower risk of hypoglycaemia
B Type 2 DM - On metformin
ASCVD, or high / very high CV risk (target organ damage or multiple risk factors)[a]
+
-
Add SGLT2 inhibitor or GLP-1 RA[b]
Continue Metformin Monotherapy
If HbA1c above target
• Consider adding the other class (GLP-1 RA or SGLT2i) with proven CVD benefit
• DPP-4i if not on GLP-1 RA
• Basal insulin
• TZD (not in HF pat)
• SU
If HbA1c above target
DPP-4i
GLP-1 RA
SGLT2i if eGFR adequate
TZD
If HbA1c above target
SGLT2i or TZD
SGLT2i or TZD
GLP-1 RA or DPP-4i or TZD
SGLT2i or DPP-4i or GLP-1 RA
If HbA1c above target
Continue with addition of other agents as outlined above
If HbA1c above target
Consider the addition of SU OR basal insulin:
• Choose later generation SU with lower risk of hypoglycaemia
• Consider basal insulin with lower risk of hypoglycaemia
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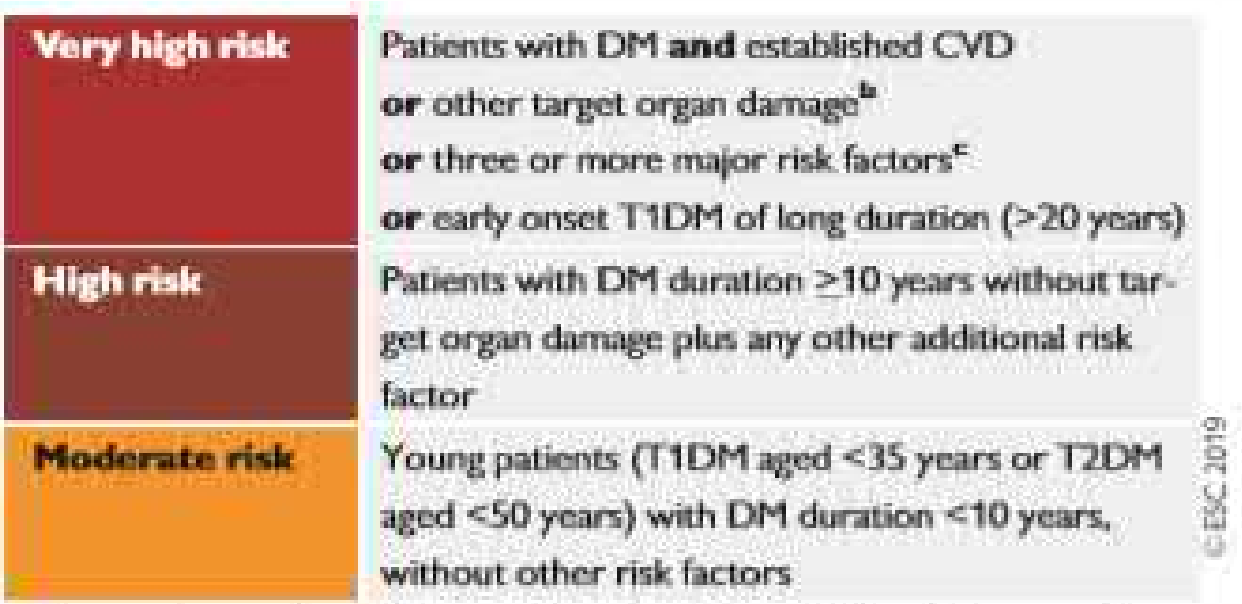
Atherosclerotic cardiovascular disease

Atherosclerotic cardiovascular disease (ASCVD) is the leading cause of death in people with type 2 diabetes.

Diabetes confers substantial independent ASCVD risk, and most people with type 2 diabetes have additional risk factors such as hypertension, dyslipidaemia, obesity, physical inactivity, chronic kidney disease (CKD) and smoking.

Cardiovascular risk categories



Very high risk	Patients with DM **and** established CVD **or** other target organ damage[b] **or** three or more major risk factors[c] **or** early onset T1DM of long duration (>20 years)
High risk	Patients with DM duration ≥10 years without target organ damage plus any other additional risk factor
Moderate risk	Young patients (T1DM aged <35 years or T2DM aged <50 years) with DM duration <10 years, without other risk factors

CV = cardiovascular; CVD = cardiovascular disease; DM = diabetes mellitus; T1DM = type 1 diabetes mellitus; T2DM = type 2 diabetes mellitus.

[a]Modified from the 2016 European Guidelines on cardiovascular disease prevention in clinical practice.[27]

[b]Proteinuria, renal impairment defined as eGFR <30 mL/min/1.73 m^2, left ventricular hypertrophy, or retinopathy.

[c]Age, hypertension, dyslipidemia, smoking, obesity.

PREVENTION OF **COMPLICATIONS**

- How to prevent or delay the onset of compliactions?

- Which complications can we screen?
- When to screen?
- How to screen?

- How to manage those complications which we were able to test?

Acute and chronic (late) **complications**

Acute complications:

- Hypoglycemia
- Diabetic Ketoacidosis (DKA)
- Hyperosmolar Hyperglycemic Syndrome (HHS)
- Metformin Associated Lactic Acidosis (MALT)

Late complications:

Microvascular

- ➥ Retinopathy
- ➥ Nephropathy
- ➥ Neuropathy

Macrovascular

- ➥ coronary heart disease
- ➥ cerebrovascular disease
- ➥ peripheral arterial disease

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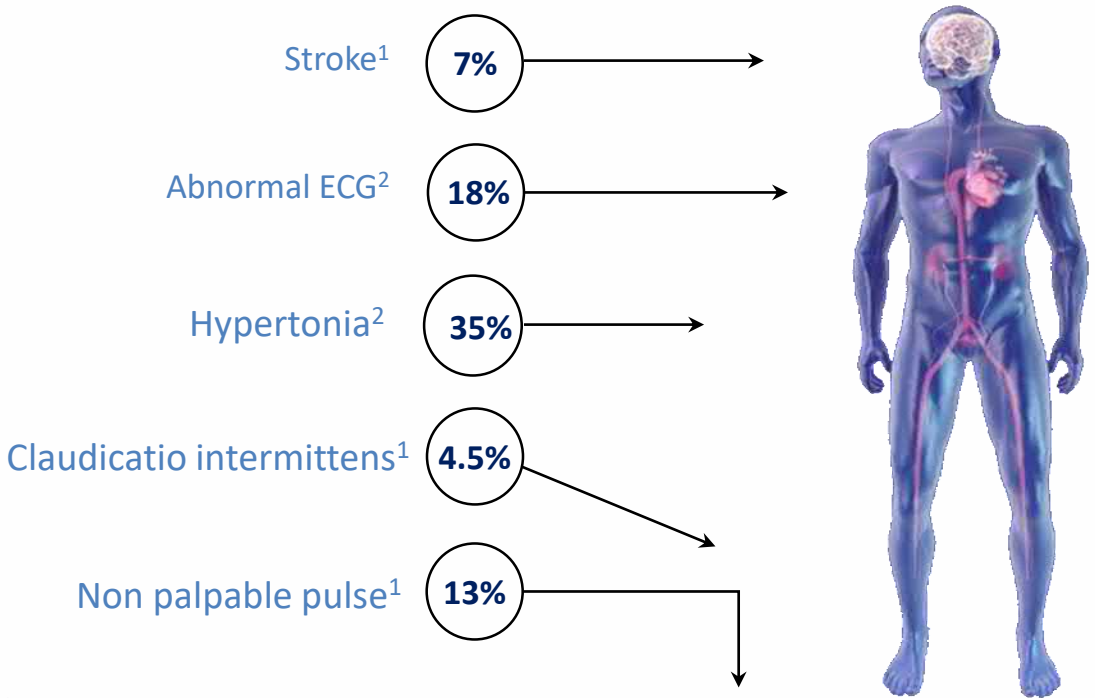
LATE complications at the time of diagnosis of DM



1. Wingard DL *et al*. *Diabetes Care* 1993; 16: 1022–5.
2. UKPDS Group. *Diabetes Res* 1990; 13: 1–11.

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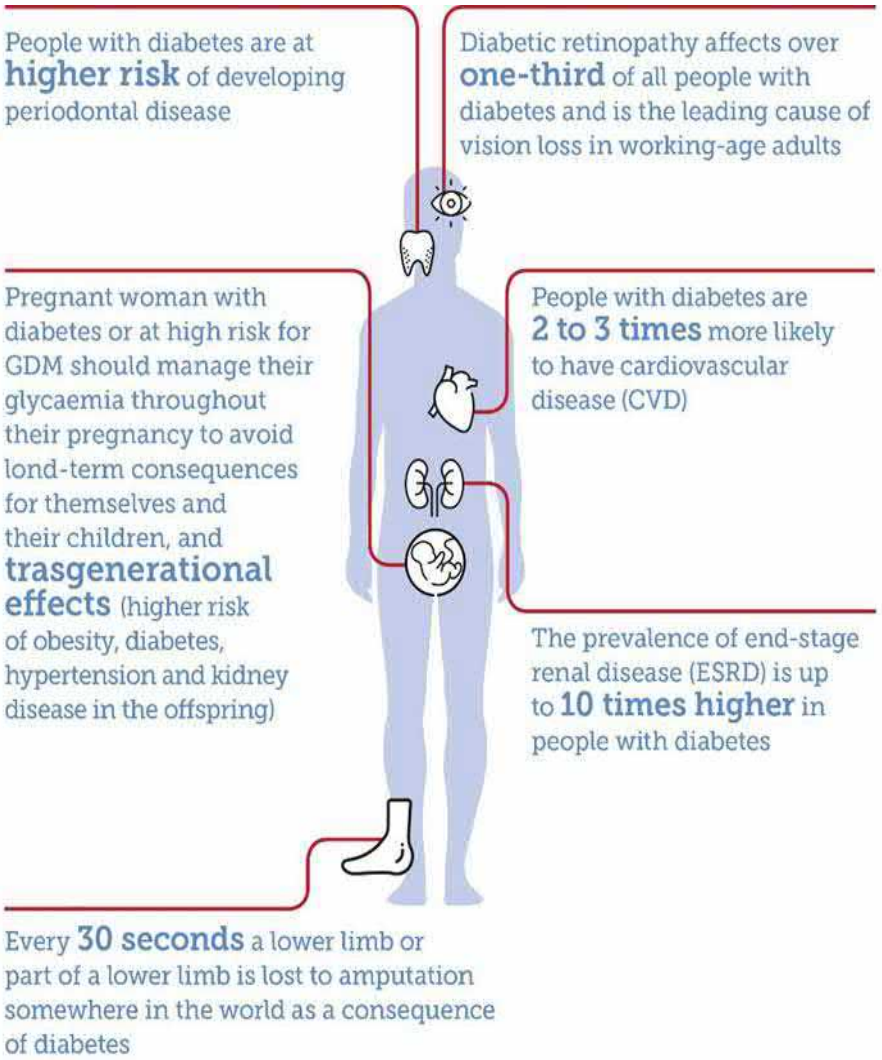
Complications



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PREVENTION OF COMPLICATIONS

- Which complications can we screen?
- When to screen?
- How to screen?

- How to manage those complications which we were able to test?

Screening of **Diabetic Retinopathy**

Role of primary care:
refer all diabetic patients for *annual* eye examination.

Optimize glycemic control to reduce the risk or slow the progression of diabetic retinopathy.

Optimize blood pressure and serum lipid control to reduce the risk or slow the progression of diabetic retinopathy.

Patients with type 2 diabetes should have **an initial dilated and comprehensive eye examination.**

Women with preexisting type 1 or type 2 diabetes who are **planning pregnancy or who are pregnant** should be counseled on the risk of development and/or progression of diabetic retinopathy.
Eye examinations should occur before pregnancy or in the first trimester. Patients should be monitored every trimester and for 1-year postpartum.

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Screening of Chronic Kidney Disease / **Diabetic nephropathy**

Screening

- At least once a year, assess urinary albumin (e.g., spot urinary albumin-to-creatinine ratio) and eGFR
- in patients with type 1 diabetes with duration of ≥5 years,
- in all patients with type 2 diabetes,
- and in all patients with comorbid hypertension.

Treatment

- Optimize glucose control
- Optimize blood pressure control (RAAS)
- Dietary protein intake should be approximately 0.8 g/kg body weight per day

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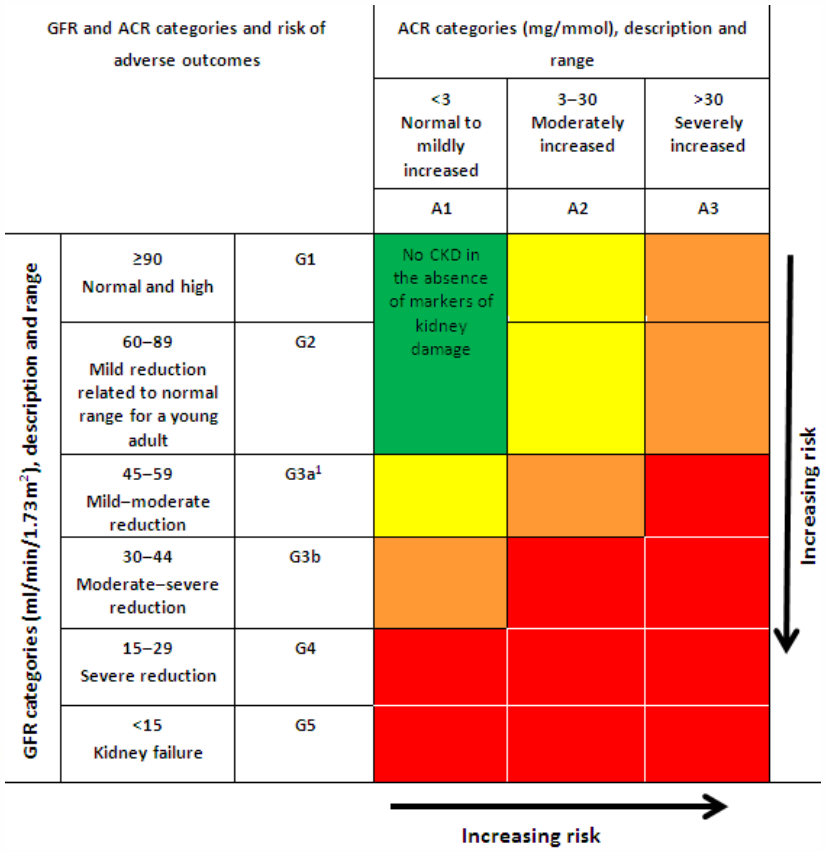
Screening of CKD /Stages



- Patients with CKD can be classified depending on their level of kidney function, or eGFR, and the amount of protein present in the urine.
- This information forms the basis of CKD staging which is useful for planning follow up and management.
- The higher the stage (G1->G5) and the greater the amount of protein present in the urine (A1->A3) the more “severe” the CKD.

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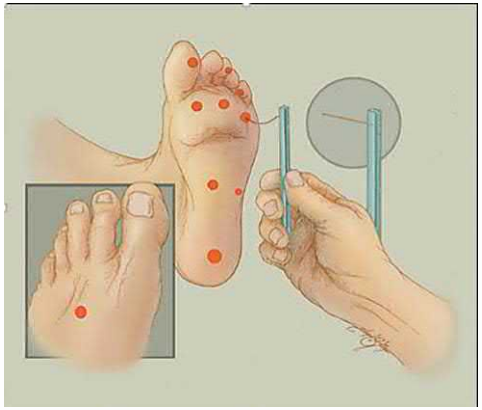
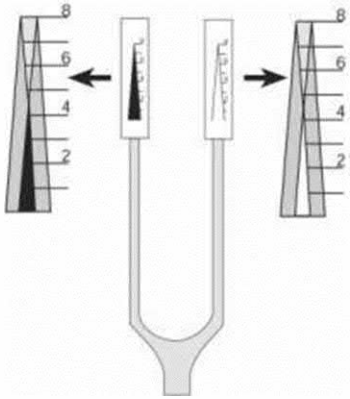
CKD MONITORING

- **When eGFR is <60 mL/min/1.73 m2, evaluate and manage potential complications of CKD.**
- Patients should be referred for evaluation for renal replacement treatment if they have an eGFR <30 mL/min/1.73 m2.
- Promptly refer to a physician experienced in the care of kidney disease for uncertainty about the etiology of kidney disease, difficult management issues, and rapidly progressing kidney disease (signs of chronic pyelonephritis, hematuria 2 times or more, nephrotic patient, anemia, secondary hyperparathyroidism, metabolic bone disease, resistant hypertension, or electrolyte disturbances).

DIABETIC NEUROPATHY





DIABETIC **NEUROPATHY**

- All patients should be assessed for diabetic peripheral neuropathy **starting at diagnosis of type 2 diabetes** and 5 years after the diagnosis of type 1 diabetes and at least annually thereafter.
- Assessment for **distal symmetric polyneuropathy** should include a careful history and assessment of either temperature or pinprick sensation (small-fiber function) and vibration sensation using a 128-Hz tuning fork (for large fiber function).
- All patients should have annual 10-g monofilament testing to identify feet at risk for ulceration and amputation.
- **Up to 50% of diabetic peripheral neuropathy (DPN) may be asymptomatic.**

If not recognized and if preventive foot care is not implemented, patients are at risk for injuries to their insensate feet.

DIABETIC **NEUROPATHY**

Distal symmetric polyneuropathy (DSPN):

75% of diabetic neuropathies.

Diabetic **autonomic** neuropathies: In type 2 diabetes, the prevalence of CAN also increases with diabetes duration and may be present in up to 60% of patients with type 2 diabetes after 15 years

Other, atypical forms

Symptoms and signs of DSPN

	Large myelinated nerve fibers	Small myelinated nerve fibers
Function	Pressure, balance	Nociception, protective sensation
Symptoms	Numbness, tingling, poor balance	Pain: burning, electric shocks, stabbing
Examination (clinically diagnostic)	Ankle reflexes: reduced/absent Vibration perception: reduced/absent 10-g monofilament: reduced/absent Proprioception: reduced/absent	Thermal (cold/hot) discrimination: reduced/absent Pinprick sensation: reduced/absent

Diabetic Neuropathy: A Position Statement by the American Diabetes Association. Diabetes Care 2017 Jan; 40(1): 136-154.

Symptoms and signs associated with diabetic autonomic neuropathy

Cardiovascular AN	Gastrointestinal	Urogenital	Sudomotor
Resting tachycardia	Gastroparesis (Gastropathy)	Bladder dysfunction	Dry skin
Abnormal blood pressure regulation	Nausea Bloating Loss of appetite Postprandial vomiting	Frequency, urgency Nocturia Hesitancy Weak stream Incontinence	Anhidrosis Gustatory sweating
Orthostatic hypotension	Esophageal dysfunction	Sexual dysfunction	
Orthostatic tachycardia or bradycardia and chronotropic incompetence	Diabetic diarrhea		

FOOT CARE

Perform a comprehensive **foot evaluation at least annually to identify risk factors for ulcers and amputations**.

Patients with evidence of sensory loss or prior ulceration or amputation should have their **feet inspected at every visit**.

The examination should include **inspection of the skin, assessment of foot deformities, neurological assessment** (10-g monofilament testing with at least one other assessment: pinprick, temperature, vibration), and **vascular assessment including pulses in the legs and feet.**

Patients with symptoms of claudication or decreased or absent pedal pulses should be referred for ankle-brachial index and for further vascular assessment as appropriate.

Hypertension/Blood Pressure Control

Blood pressure should be measured at **every routine clinical visit**.

- Patients found to have elevated blood pressure (**≥130/80 mmHg**) should have blood pressure confirmed using multiple readings.
- For individuals with diabetes and hypertension at **higher cardiovascular risk** (existing ASCVD or 10-year ASCVD risk >15%), a blood pressure target of **<130/80 mmHg** may be appropriate, if it can be safely attained.

Hypertension/Blood Pressure Control

Change in recommendations	
2013	**2019**
BP targets	
BP target <140/85 mmHg for all	Individualized BP targets are recommended SBP to 130 mmHg and, if well tolerated, <130 mmHg, but not <120 mmHg In older people (>65 years) target SBP to a range of 130 - 139 mmHg DBP to <80 mmHg but not <70 mmHg
	On-treatment SBP to <130 mmHg should be considered for patients at high risk of cerebrovascular events or diabetic kidney disease

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Key messages

- The BP goal is to target systolic BP (SBP) to 130 mmHg in patients with DM and <130 mmHg if tolerated, but not <120 mmHg. In older people (aged >65 years), the SBP goal is to a range of 130 - 139 mmHg.
- The diastolic BP (DBP) target is <80 mmHg, but not <70 mmHg.
- Optimal BP control reduces the risk of micro- and macrovascular complications.
- Guidance on lifestyle changes must be provided for patients with DM and hypertension.
- Evidence strongly supports the inclusion of an angiotensin-converting enzyme inhibitor (ACEI), or an angiotensin receptor blocker (ARB) in patients who are intolerant to ACEI.
- BP control often requires multiple drug therapy with a renin–angiotensin–aldosterone system (RAAS) blocker, and a calcium channel blocker or diuretic. Dual therapy is recommended as first-line treatment.
- The combination of an ACEI and an ARB is not recommended.
- In pre-DM, the risk of new-onset DM is lower with RAAS blockers than with beta-blockers or diuretics.
- Patients with DM on combined antihypertensive treatments should be encouraged to self-monitor BP.

Blood pressure

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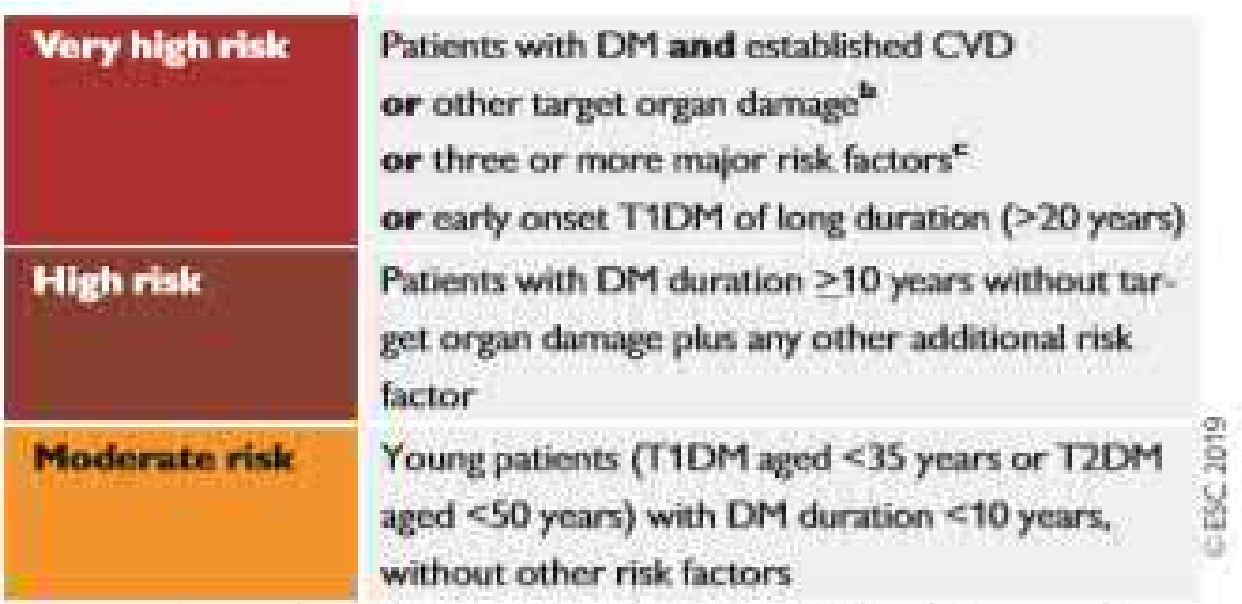
Cardiovascular risk categories



Very high risk	Patients with DM **and** established CVD **or** other target organ damage[b] **or** three or more major risk factors[c] **or** early onset T1DM of long duration (>20 years)
High risk	Patients with DM duration ≥10 years without target organ damage plus any other additional risk factor
Moderate risk	Young patients (T1DM aged <35 years or T2DM aged <50 years) with DM duration <10 years, without other risk factors

CV = cardiovascular; CVD = cardiovascular disease; DM = diabetes mellitus; T1DM = type 1 diabetes mellitus; T2DM = type 2 diabetes mellitus.

[a]Modified from the 2016 European Guidelines on cardiovascular disease prevention in clinical practice.[27]

[b]Proteinuria, renal impairment defined as eGFR <30 mL/min/1.73 m^2, left ventricular hypertrophy, or retinopathy.

[c]Age, hypertension, dyslipidemia, smoking, obesity.

Lipid management

In patient with T2DM **at moderate CV risk**,

an **LDL-C target of <2.5 mmol/l** (<100 mg/dl) is recommended

In patient with T2DM **at high CV risk**,

an **LDL-C target of <1.8 mmol/l** (<70 mg/dl) is recommended

In patient with T2DM **at very high CV risk**,

an **LDL-C target of <1.4 mmol/l** (<55 mg/dl) is recommended

“People with diabetes, can live healthy and fulfilling lives with the provision of an uninterrupted supply of insulin and blood glucose testing equipment, when combined with a healthy lifestyle”

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European Association for the Study of Diabetes (EASD)/ **e-learning courses**

https://www.easd.org/education/easd-e-learning.html

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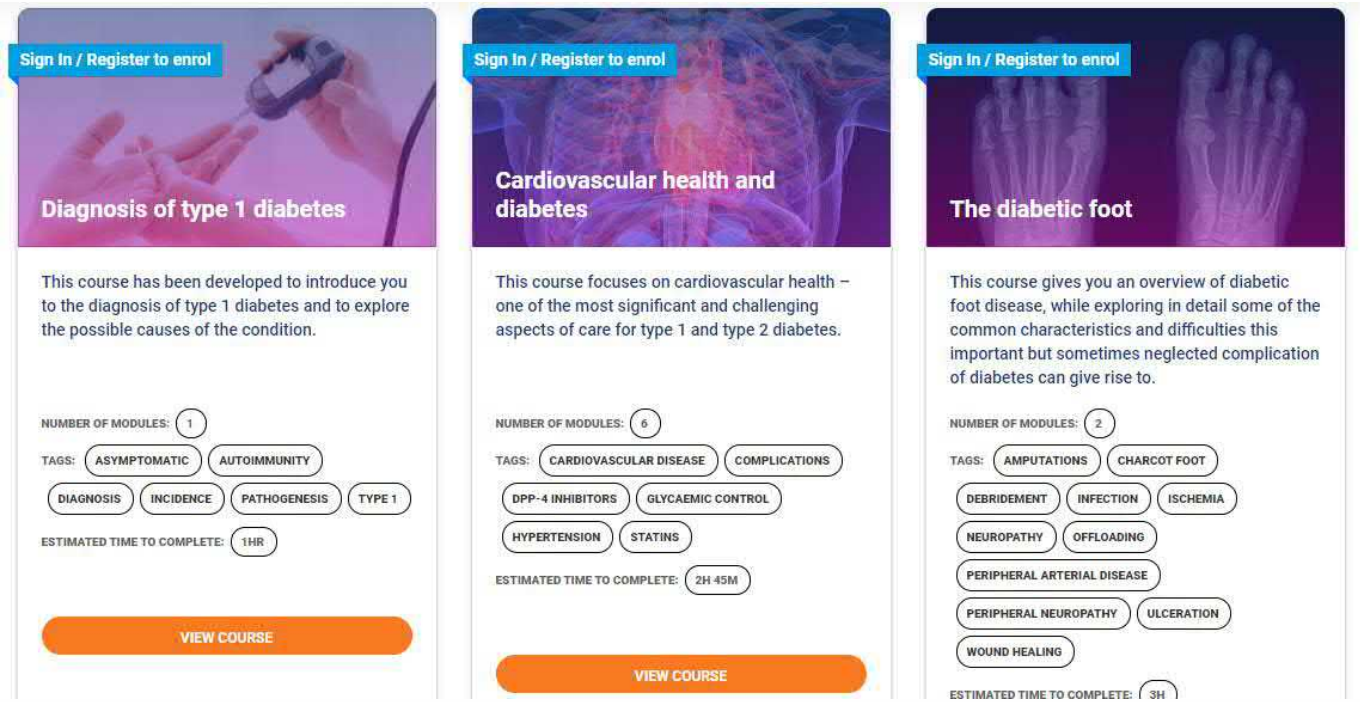

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Meet **Wasim**

Patient information

- **Occupation:** Tailor
- **Age:** 58 years old
- **Height:** 178 cm
- **Weight:** 109 kg
- Sedentary life-style
- Diagnosis of T2DM 8 years ago
- Overweight
- Weight gain from current antidiabetes treatment

Blood pressure:

- 155/100 mmHg

BMI:

- 24.4 kg/m²

- **HbA1c:** 8.4%
- **FPG:** 6.1–6.7 mmol/L (110–120 mg/dL)
- **PPG:** 9.4–10.0 mmol/L (170–180 mg/dL)
- **HDL cholesterol:** 0.9 mmol/L (35 mg/dL)
- **LDL cholesterol:** 2.6 mmol/L (99 mg/dL)
- **Triglycerides:** 2.0 mmol/L (180 mg/dL)
- **eGFR:** 80 mL/min/1.73 m²

Current medication

- Antihyperglycemic therapy:
  - Metformin 1000 mg BID
  - Glimepiride 10 mg QD
- Concomitant medications:
  - Atorvastatin 20 mg QD

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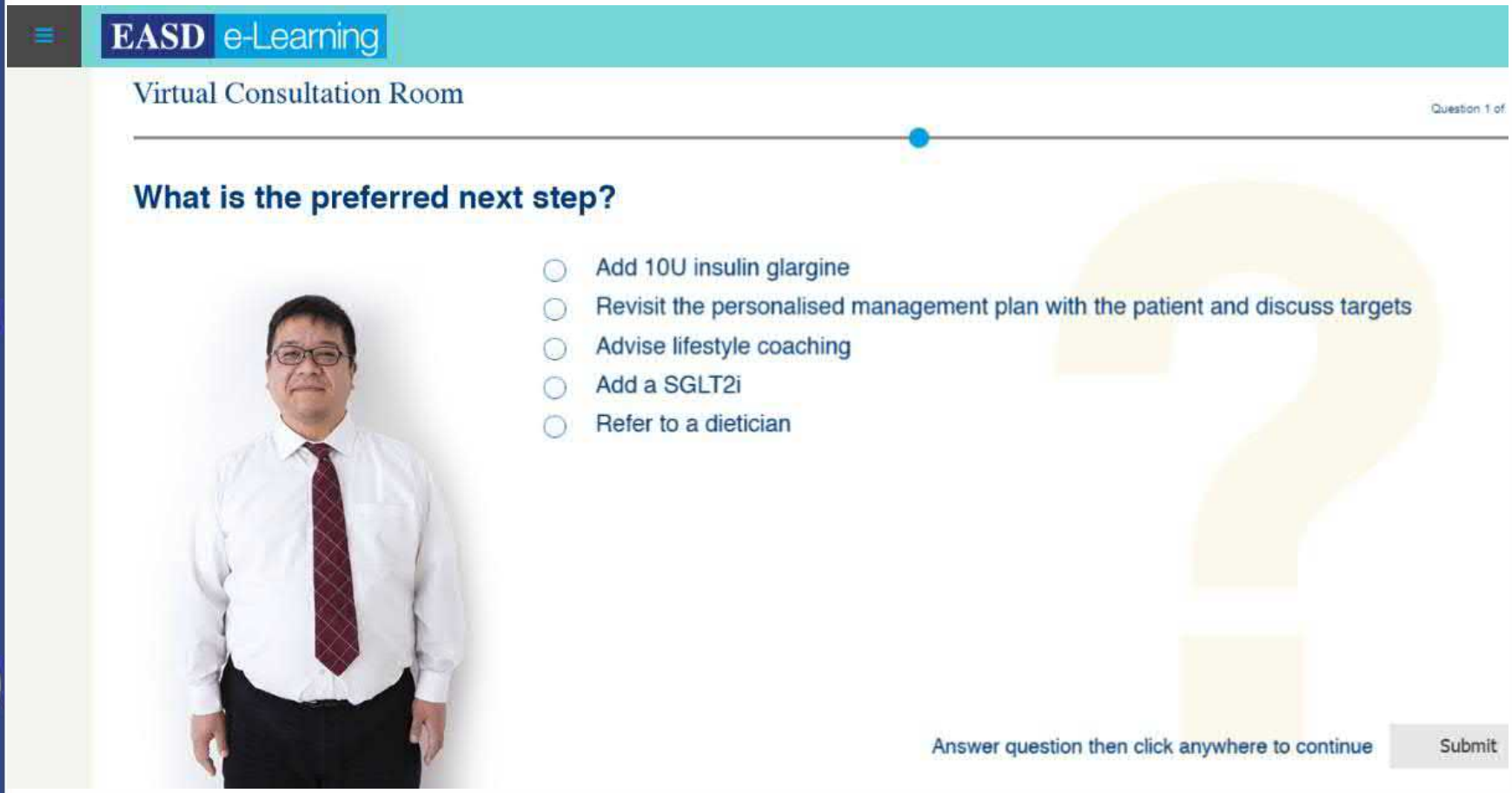

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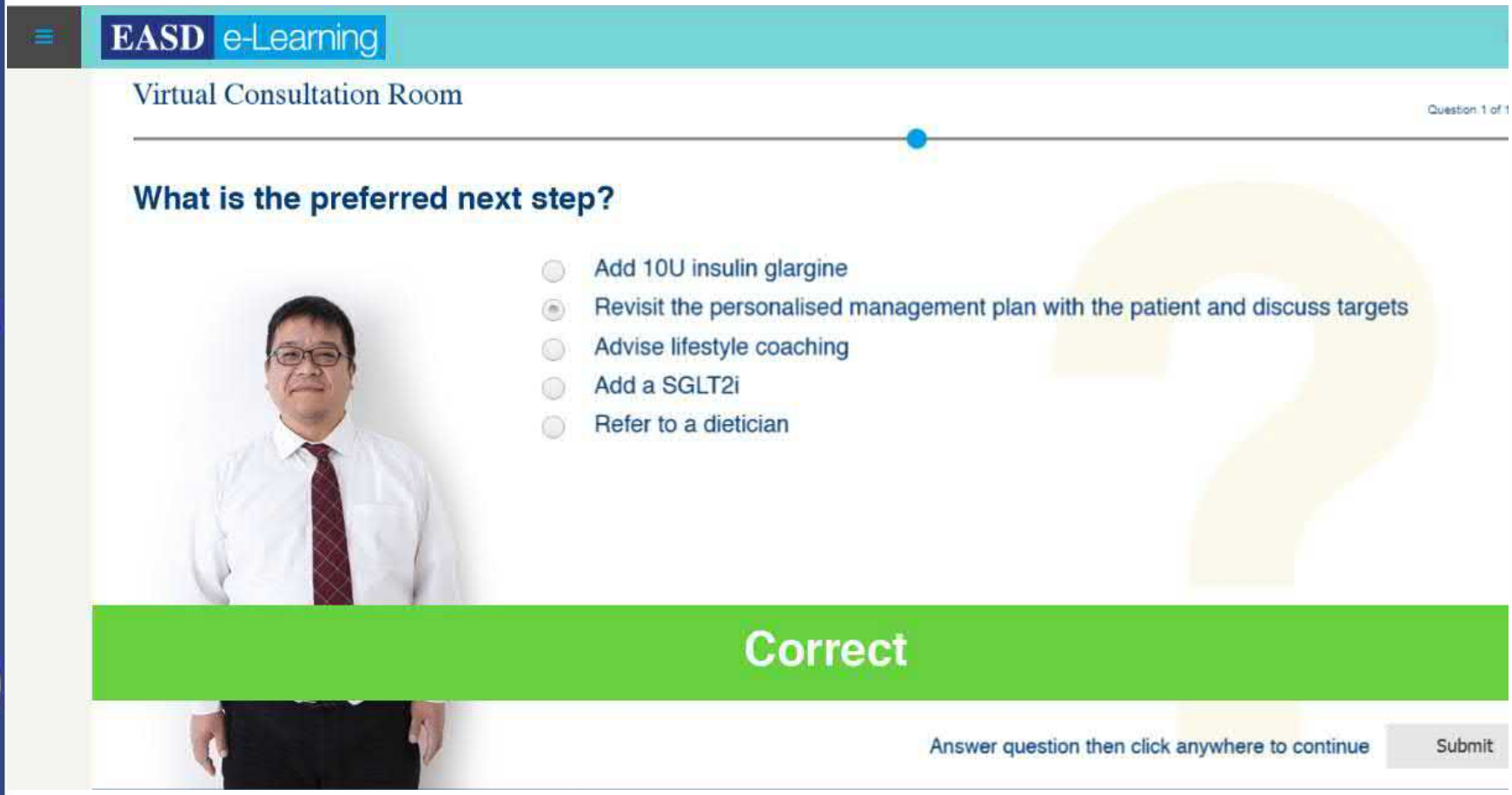

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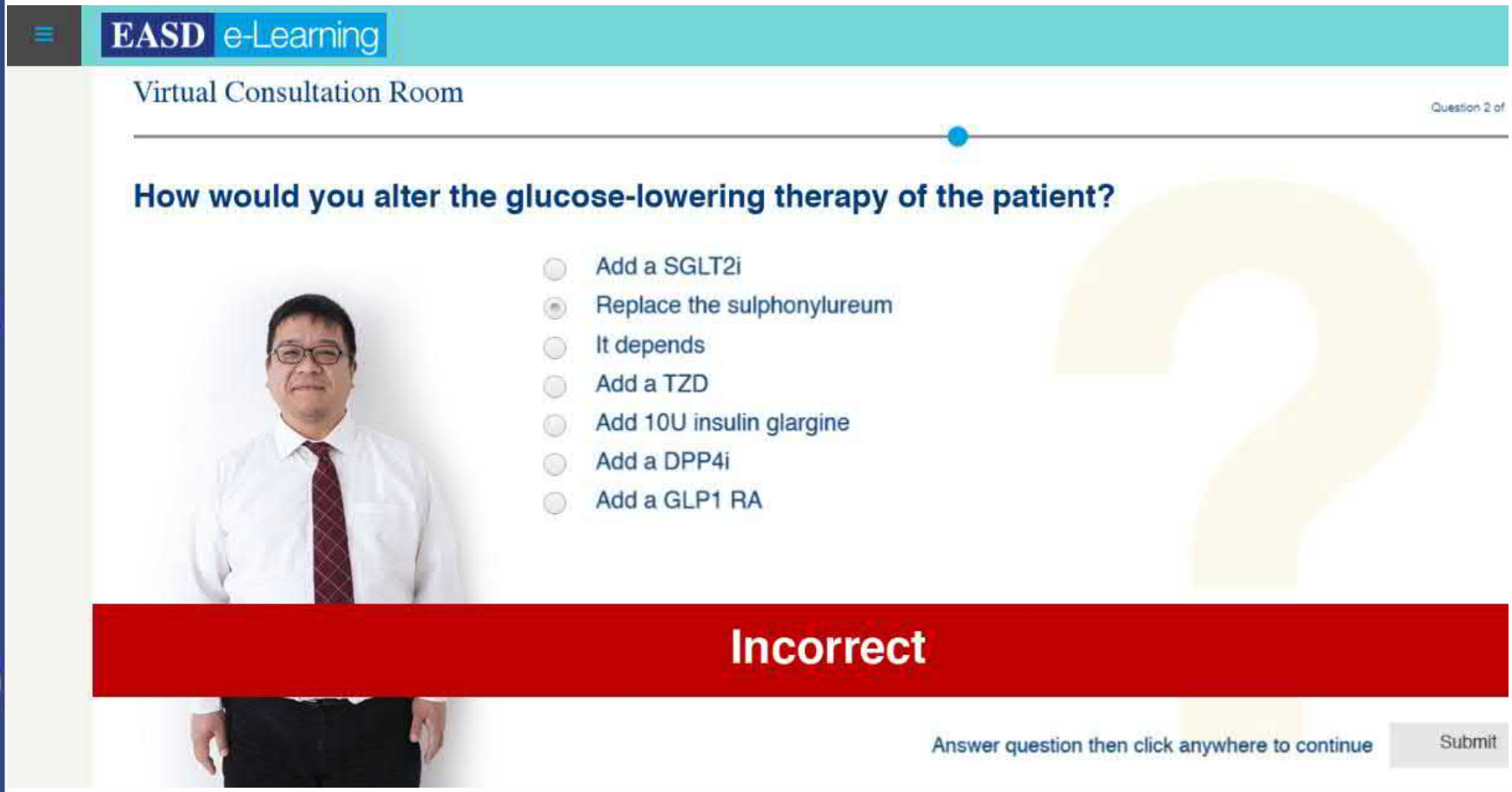

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Wasim

Discussion points

- Replace the sulphonylurea: yes, because of hypo risk, but what to use then? He has a good life expectancy, thus 8.4% is too high. Each individual glucose lowering agent will provide a drop of 1-1.5% maximum, so will have little chance to achieve goal (here 7%)-
- Add 10U insulin glargine: yes, but weight gain, more risk of hypoglycaemia- not first choice- if he would have symptoms of polyuria and polydipsia, then insulin is the preferred addition therapy
- Add a SGLT2i: yes, but be careful for bringing out hypo risk with SU- may need down tapering of SU
- Add a DPP4i: odds of reaching 7% are small, not preferred choice
- Add a TZD: low dose TZD is an option, but beware of fluid retention and weight gain
- Add a GLP1 RA: this is the preferred choice when an injectable is considered and it can be considered cfr 8.4%- advantage is weight loss, but may require down tapering of SU cfr hypoglycaemia risk- however, it depends whether the patient wants to inject

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Meet **Eva**

Patient information

- **Occupation:** Beautician
- **Age:** 52 years old
- **Height:** 165 cm
- **Weight:** 79kg
- Diagnosed with T2DM 6 months ago at occasion of myocardial infarction
- Recently ex-smoker

Blood pressure:

- 145/90 mmHg

BMI:

- 29.0 kg/m²

- **HbA1c:** 8.0%
- **FPG:** 8.0–9.1 mmol/L (144–163 mg/dL)
- **PPG:** 12.5–13.5 mmol/L (225–243 mg/dL)
- **HDL cholesterol:** 0.9 mmol/L (36 mg/dL)
- **LDL cholesterol:** 2.3 mmol/L (89 mg/dL)
- **Triglycerides:** 4.2 mmol/L (370 mg/dL)
- **eGFR:** 88 mL/min/1.73 m²

Current medication

- Antihyperglycemic therapy:
  - Metformin 1000 mg QD
- Concomitant medications:
  - Atorvastatin 40 mg QD
  - Enalapril 5mg QD

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Question 3 of 1

What is the preferred next step?

- Refer to a dietician
- Add a sulphonylureum
- Advise lifestyle coaching
- Revisit the personalised management plan with the patient and discuss targets
- Add 10U insulin glargine

Answer question then click anywhere to continue

Submit

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Question 4 of

What would you suggest as a first add-on therapy to metformin in this patient?

- [ ] Add a sulphonylureum
- [ ] Add a TZD
- [ ] Add 10U insulin glargine
- [ ] Add a DPP4i
- [x] Add a SGLT2i
- [x] Add a GLP1 RA

Please select two answers

Correct

Answer question then click anywhere to continue

Submit

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Question 6 of

Under what conditions would you consider prescribing insulin for this patient?

- (•) If she had symptoms of catabolism (polyuria, polydipsia, weight loss, fatigue…)
- ( ) Never

Answer question then click anywhere to continue

Submit

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Question 7 of

How would you initiate insulin?

- 20U of premixed insulin in the morning
- 0.1U/kg of basal insulin once daily and uptitrate to fasting glycaemia
- Full basal bolus regimen
- 4U of basal insulin twice daily

Answer question then click anywhere to continue

Submit

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Question 7 of

How would you initiate insulin?

- 20U of premixed insulin in the morning
- 0.1U/kg of basal insulin once daily and uptitrate to fasting glycaemia
- Full basal bolus regimen
- 4U of basal insulin twice daily

Correct

Answer question then click anywhere to continue

Submit

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Meet Timothy

Patient information

- **Occupation:** Bus driver
- **Age:** 55 years old
- **Height:** 178cm
- **Weight:** 109 kg
- Type 2 diabetes for 3 years
- Family history of obesity
- Sedentary lifestyle due to nature of the job
- Episodes of hypoglycaemia

Blood pressure:

- 135/75 mmHg

BMI:

- 34.4 kg/m²

- **HbA1c:** 8.4%
- **FPG:** 7.2–7.4 mmol/L (129–133 mg/dL)
- **PPG:** 11.9–12.1 mmol/L (214–218 mg/dL)
- **HDL cholesterol:** 1.3 mmol/L (52 mg/dL)
- **LDL cholesterol:** 2.6 mmol/L (99 mg/dL)
- **Triglycerides:** 1.7 mmol/L (150 mg/dL)
- **eGFR:** 115 mL/min/1.73 m²

Current medication

- Antihyperglycemic therapy:
  - Metformin 1000 mg BID
- Concomitant medications:
  - Atorvastatin 20 mg QD

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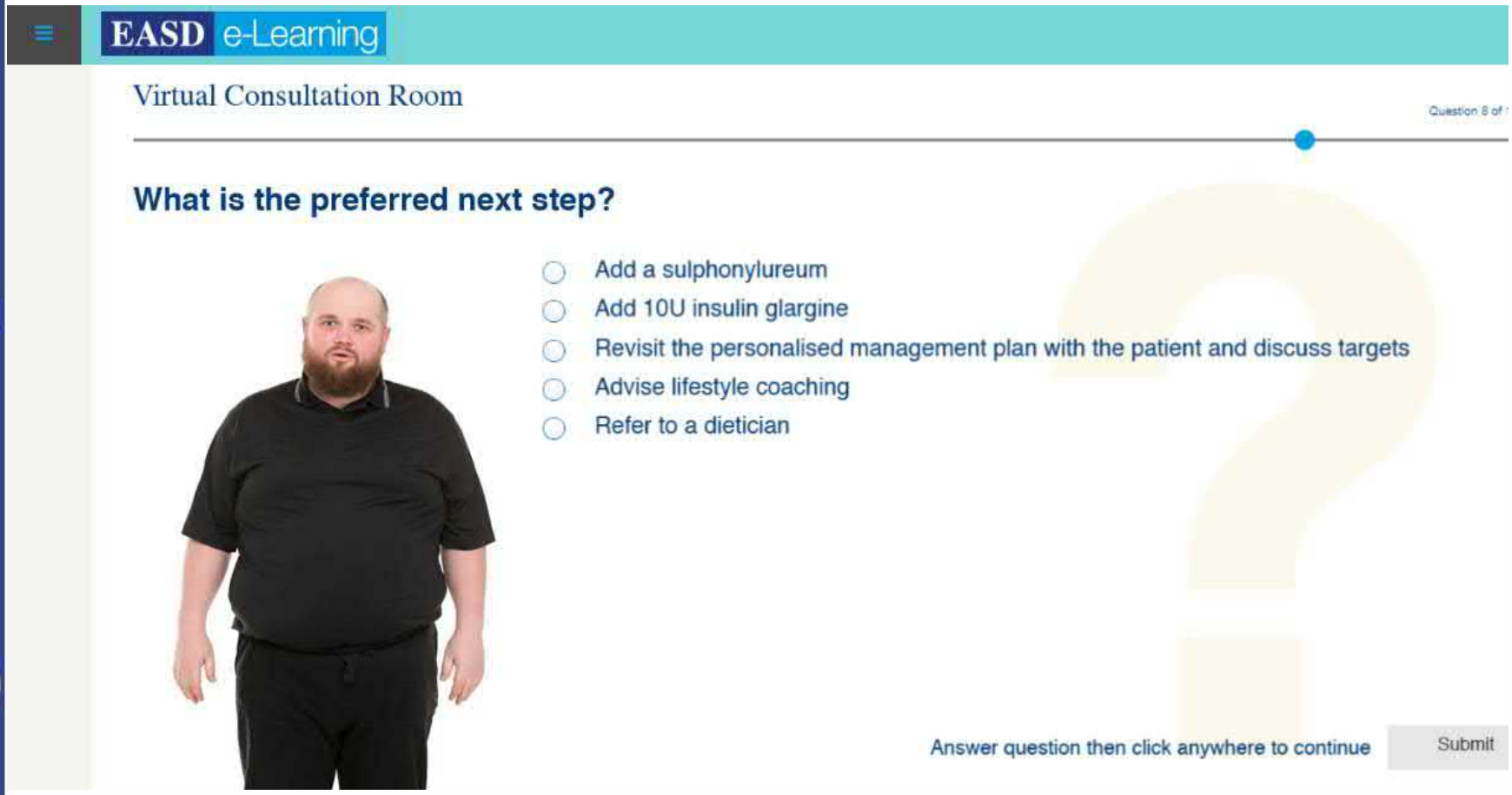

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Question 9 of

Would you change the first add-on therapy to metformin in this patient?

- Add a DPP4i
- Add a sulphonylureum
- Add a TZD
- There is no right answer
- Add 10U insulin glargine
- Add a SGLT2i

Answer question then click anywhere to continue

Submit

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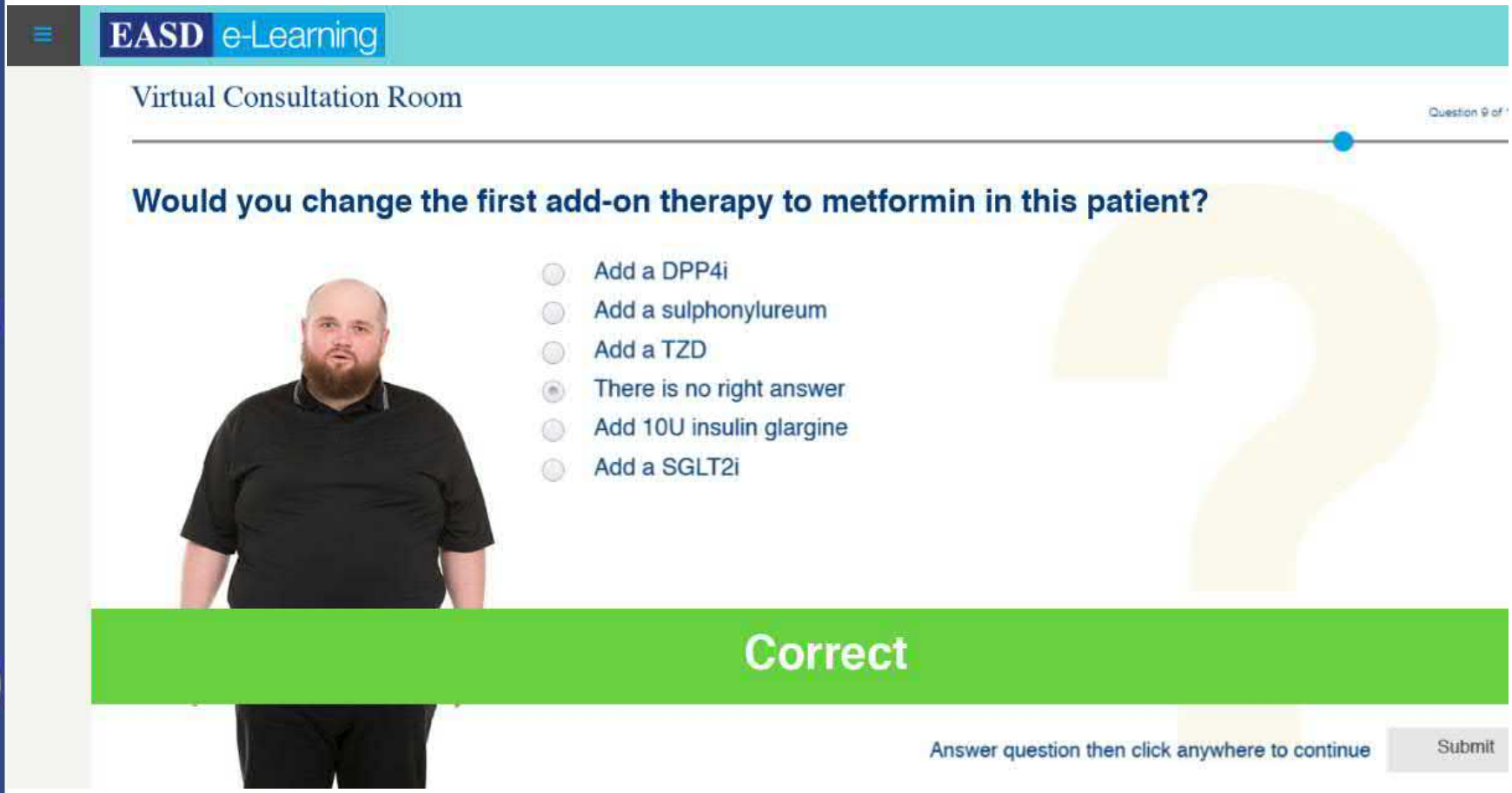

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Question 10 o

Would your choice of first add-on therapy to metformin differ if the patient's HbA1c was >9.5%?

- ○ No
- ○ Yes, if he had symptoms of catabolism (polyuria, polydipsia, weight loss, fatigue…)

Answer question then click anywhere to continue

Submit

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Timothy

Discussion points

- Would you change the first add-on therapy to metformin in this patient?
- What effects, if any, would you expect on HbA1c and other metabolic parameters in this patient?
- Would your choice of first add-on therapy to metformin differ if the patient's HbA1c was >9.5%?
- Would your choice of first add-on therapy to metformin differ if the patient had a history of CV disease?
- If the patient's HbA1c was not adequately controlled with dual antidiabetes therapy, what would be your preferred second add-on therapy?
- What would be your first choice of injectable therapy in this patient?
- Under what conditions would you consider prescribing insulin for this patient?
- Does the treatment strategy for this patient differ to what is recommended by clinical guidelines? If so, how?

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ADDITIONAL RESOURCES

- American Diabetes Association - **Standards of Medical Care in Diabetes**—2019. https://doi.org/10.2337/cd18-0105
- **Management of hyperglycaemia in type 2 diabetes**, 2018. A consensus report by the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). Diabetologia. https://doi.org/10.1007/s00125-018-4729-5
- Classification and Diagnosis of Diabetes: Standards of Medical Care in Diabetes—2019 American Diabetes Association Diabetes Care 2019 Jan; 42(Supplement 1): S13-S28. https://doi.org/10.2337/dc19-S002
- EASD E-Learning: https://elearning.easd.org/
- International Diabetes Federation https://idf.org/

Thank you for your attention!

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