Screening and diagnosis of type 2 diabetes in adults

Assess risk factors for type 2 diabetes ANNUALLY:
- Family history (first-degree relative with type 2 diabetes)
- High risk populations (non-white, low socioeconomic status)
- History of GDM/prediabetes
- Cardiovascular risk factors
- Presence of end organ damage associated with diabetes
- Other conditions and medications associated with diabetes
(see CPG Chapter 4, Screening for Diabetes in Adults, Table 1)

Who to screen

No risk factors
- Age <40 years or low-moderate risk*

Presence of risk factors
- Age ≥40 years or high risk* (33% chance of developing type 2 diabetes within 10 years)
- or very high risk (50% chance of developing type 2 diabetes within 10 years)

Test
- FPG (mmol/L) No caloric intake for at least 8 hours
  - 6.1 – 6.9 IFG
  - ≥7.0 Diabetes
- A1C (%)**
  - 6.0 – 6.4 Prediabetes
  - ≥6.5 Diabetes

End of life: A1C measurement not recommended. Avoid symptomatic hyperglycemia and any hypoglycemia.

Lower Risks Observed

SELECTED ADULTS WITH TYPE 2 DIABETES WITH POTENTIAL FOR REMISSION TO NORMOGLYCEMIA

If asymptomatic and A1C or FPG are in the diabetes range, repeat the same test (A1C or FPG) as a confirmatory test. If both FPG and A1C are available and only one is in the diabetes range, repeat the test in the diabetes range as the confirmatory test. If both A1C and FPG are available and are each in the diabetes range, diabetes is confirmed. If symptoms of overt hyperglycemia are present, diagnosis of diabetes can be determined with one test (A1C, FPG, 2hPG, random FPG) in the diabetes range, see Chapter 3, CPG.

*Using a validated risk calculator (e.g. CANRISK)
**Use a standardized, validated assay. Be aware of factors that affect A1C accuracy (see CPG Chapter 9, Table 1)
A1C Targets for glycemic management

<table>
<thead>
<tr>
<th>A1C%</th>
<th>Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;6.0</td>
<td>Selected adults with type 2 diabetes with potential for remission to normoglycemia</td>
</tr>
<tr>
<td>≤6.5*</td>
<td>Adults with type 2 diabetes to reduce the risk of chronic kidney disease and retinopathy if at low risk of hypoglycemia†</td>
</tr>
<tr>
<td>≤7.0</td>
<td>MOST ADULTS WITH TYPE 1 OR TYPE 2 DIABETES</td>
</tr>
<tr>
<td>7.1-8.0%; Functionally dependent‡</td>
<td></td>
</tr>
<tr>
<td>7.1-8.5%:</td>
<td></td>
</tr>
<tr>
<td>• Recurrent severe hyperglycemia and/or hypoglycemia unawareness</td>
<td></td>
</tr>
<tr>
<td>• Limited life expectancy</td>
<td></td>
</tr>
<tr>
<td>• Frail elderly and/or with dementia††</td>
<td></td>
</tr>
</tbody>
</table>

Avoid higher A1C to minimize risk of symptomatic hyperglycemia and acute and chronic complications

End of life: A1C measurement not recommended. Avoid symptomatic hyperglycemia and any hypoglycemia.
* Target 6.0 to ≤6.5 for adults with type 2 diabetes with potential for remission to prediabetes
† Based on class of antihyperglycemic medication(s) utilized and the person’s characteristics
‡ See Diabetes in Older People chapter

At diagnosis of type 2 diabetes (Fig. 1)

- Assess glycemic control, cardiovascular and renal status*, recent dietary patterns and weight change†
- Select individualized A1C target (see Chapter 8, 2018 CPG)
- Provide and/or refer for diabetes education (see Chapter 7 2018 CPG)
- Start healthy behaviour interventions (see Chapters 10, 11, 17 2018 CPG)

Goal: Attain A1C Target by 3 months

Lifestyle changes expected to reduce blood glucose levels
No pharmacotherapy

Start metformin (if A1C is > 1.5% above target, start metformin plus a second agent)

Symptomatic hyperglycemia and/or metabolic decompensation
Start insulin†† ± metformin

If A1C NOT at target at 3 months

start Metformin

Adjust or Advance Therapy

Reassess A1C in 3-6 months (see Chapter 9 2018 CPG)

Go to Fig. 2

Go to Fig. 3

* In individuals with atherosclerotic cardiovascular disease, history of heart failure (with reduced ejection fraction) or chronic kidney disease, agents with cardiorenal benefits may be considered (see Pharmacologic Glycemic Management of Type 2 Diabetes in Adults 2020 Update – The Users Guide)
† Unintentional weight loss should prompt consideration of other diagnoses (e.g. type 1 diabetes or pancreatic disease)
†† Reassess need for ongoing insulin therapy once type of diabetes is established and response to healthy behaviour interventions is assessed
**Reviewing, adjusting or advancing therapy in type 2 diabetes (Fig. 2)**

- **Regular Review**
  - Assess glycemic control, cardiovascular and renal status
  - Continue to screen for complications (eyes, feet, kidney, heart)
  - Review efficacy, side effects, safety and ability to take current medications
  - Reinforce and support healthy behaviour interventions

  - if A1C NOT at Target and/or Change in Clinical Status

  - **ADD or SUBSTITUTE AHA** with demonstrated cardiorenal benefits

  - **Adjust or Advance Therapy**

  - ASCVD, CKD or HF, OR Age >60 with 2 CV risk factors

  - A1C above target and glucose lowering required

  - START insulin for symptomatic hyperglycemia and/or metabolic decompensation

  - **For people with ASCVD, CKD or HF, OR >60 yrs and 2 CV risk factors (Fig. 2.1)**

- **ADD or SUBSTITUTE AHA with demonstrated cardiorenal benefits**

<table>
<thead>
<tr>
<th>Established Cardiovascular or Renal Disease</th>
<th>Risk Factors</th>
</tr>
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<tbody>
<tr>
<td>ASCVD</td>
<td>CKD</td>
</tr>
<tr>
<td>GLP1-RA†† or SGLT2i*</td>
<td>SGLT2i*</td>
</tr>
<tr>
<td>SGLT2i* or GLP1-RA††</td>
<td>GLP1-RA††</td>
</tr>
</tbody>
</table>

- **Lower Risks Observed in Outcomes Trials**
  - MACE
  - HHF
  - Progression of Nephropathy

- **Highest level of evidence**
  - Grade A
  - Grade B
  - Grade C or D

---

1. Changes in clinical status may necessitate adjustment of glycemic targets and/or deprescribing
2. Tobacco use; dyslipidemia (use of lipid modifying therapy or a documented untreated LDL ≥3.4 mmol/L, or HDL-C <1.0 mmol/L for men and <1.3 mmol/L for women, or triglycerides ≥2.3 mmol/L; or hypertension (use of blood pressure drug or untreated SBP ≥140 mm Hg or DBP ≥90 mm Hg)
3. All AHA's have Grade A evidence for effectiveness to reduce blood glucose levels
4. Consider degree of hyperglycemia, costs and coverage, renal function, comorbidity, side effect profile, and potential for pregnancy

---

**For people with ASCVD, CKD or HF, OR >60 yrs and 2 CV risk factors (Fig. 2.1)**

- **ADD or SUBSTITUTE AHA with demonstrated cardiorenal benefits**

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1. Tobacco use; dyslipidemia (use of lipid modifying therapy or a documented untreated LDL ≥3.4 mmol/L, or HDL-C <1.0 mmol/L for men and <1.3 mmol/L for women, or triglycerides ≥2.3 mmol/L; or hypertension (use of blood pressure drug or untreated SBP ≥140 mm Hg or DBP ≥90 mm Hg); central obesity
2. Stop DPP4i when starting a GLP1-RA
3. Initiate only if eGFR >30 ml/min/1.73m²
Where additional glucose lowering is required (Fig. 2.2)

ADD or SUBSTITUTE AHA†† according to clinical priorities††† start insulin for symptomatic hyperglycemia and/or metabolic decompensation (Fig. 3)

<table>
<thead>
<tr>
<th>PROVEN cardiorenal benefit in high-risk populations**</th>
<th>CV safety, but NO proven cardiorenal benefit**</th>
<th>RISK of HF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight Loss</td>
<td>GLP1-RA dulaglutide, lixisenatide</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SGLT2i canagliflozin, dapagliflozin, empagliflozin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DPP4i sitagliptin, linagliptin, alogliptin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Thiazolidinediones</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Saxagliptin (DPP4i)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sulfonylureas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Meglitinides</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Insulin</td>
<td></td>
</tr>
<tr>
<td>Hypoglycemia</td>
<td>Weight gain</td>
<td></td>
</tr>
</tbody>
</table>

†† All AHA’s have Grade A evidence for effectiveness to reduce blood glucose levels

††† Consider degree of hyperglycemia, costs and coverage, renal function, comorbidity, side effect profile, and potential for pregnancy

** In CV outcome trials performed in people with ASCVD, CKD, HF or at high CV risk

*** VERTIS (CV outcome trial for ertugliflozin) presented at ADA June 2020 showed non-inferiority for MACE. Manuscript not published at time of writing.

Starting insulin in type 2 diabetes (Fig. 3)

Decision to initiate Insulin (from Fig. 1 or Fig. 2)

Fasting Glucose and/or A1C NOT at target on current AHA or symptomatic hyperglycemia and/or metabolic decompensation

Regular Review

Assess glycemic control, cardiovascular and renal status

Continue to screen for complications (eyes, feet, kidneys, heart)

Review efficacy, side effects, safety and ability to take current medications

Reinforce and support healthy behaviour interventions

Start Basal Insulin and titrate to achieve fasting glucose target

Continue Metformin unless contraindicated. Review / adjust other AHAs³

ADD GLP1-RA2,3 (stop DPP4i)

ADD SGLT2i (for glycaemia if eGFR >45⁸)

ADD DPP4i (unless taking GLP1-RA)

If GLP1-RA, SGLT2i, DPP4i are contraindicated or not options

Advance Therapy if A1C not at Target within 3-6 months despite adequate titration of insulin¹ and supports for lifestyle and pharma therapy

ADD SGLT2i (for glycaemia if eGFR >45⁸)

ADD GLP1-RA2,3 (stop DPP4i)

add bolus insulin step-wise, beginning with one meal injection per day (consider stopping SUs⁵)

Advance to multiple injections with bolus injection at each meal (stop SUs⁵, review or adjust other AHAs)

1 titration of basal insulin to achieve FPG target without hypoglycemia

2 and titrate dose of GLP1-RA as tolerated

3 or fixed ratio combination

4 for cardiorenal benefit, SGLT2i may be initiated at eGFR >30 ml/min/1.73m² (and continued at lower eGFR depending on the SGT2i)

5 sulfonylureas or meglitinides

Highest level of evidence

<table>
<thead>
<tr>
<th>Grade A</th>
<th>Grade B</th>
<th>Grade C or D</th>
</tr>
</thead>
</table>

2020
Which cardiovascular non-antihyperglycemic medications are indicated for my patient?

<table>
<thead>
<tr>
<th>Does the patient have cardiovascular disease?</th>
<th>Statin$^1$</th>
<th>Statin$^1$ + ACEi/ARB$^2$</th>
<th>Statin$^1$ + ACEi/ARB$^2$ + ASA$^3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Cardiac ischemia (silent or overt)</td>
<td>YES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Peripheral arterial disease</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Cerebrovascular/carotid disease</td>
<td>NO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the patient have microvascular disease?</td>
<td>YES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Retinopathy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Kidney disease (ACR ≥2.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Neuropathy</td>
<td>NO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the patient:</td>
<td>YES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- age ≥55 with additional CV risk factors?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Dose adjustments or additional lipid therapy warranted if lipid target (LDL-C <2.0 mmol/L) not being met.
2 ACE-inhibitor or ARB (angiotensin receptor blocker) should be given at doses that have demonstrated vascular protection (eg. perindopril 8 mg once daily [EUROPA trial], ramipril 10 mg once daily [HOPE trial], telmisartan 80 mg once daily [ONTARGET trial]).
3 ASA should not routinely be used for the primary prevention of cardiovascular disease in people with diabetes. ASA may be used for secondary prevention. Consider clopidogrel if ASA-intolerant.
4 TC > 5.2 mmol/L, HDL-C < 0.9 mmol/L, hypertension, albuminuria, smoking.

For antihyperglycemic medications with CVD and/or cardiorenal benefits see Fig. 2.1

Keeping patients safe when they are at risk of dehydration (vomiting/diarrhea)

**Re-hydrate** appropriately (water, broth, diet soft drinks, sugar-free Kool-Aid™, diet Jell-O™; avoid caffeinated beverages).

**Hold SADMANS meds. Restart** once able to eat/drink normally.

S sulfonyleureas, other secretagogues
A ACE-inhibitors
D diuretics, direct renin inhibitors
M metformin
A angiotensin receptor blockers
N non-steroidal anti-inflammatory drugs
S SGLT2 inhibitors

Special considerations regarding pregnancy for women with type 1 or type 2 diabetes

For women planning pregnancy, the following steps taken prior to conception:

- **A1C** 7% or less, but strive for ≤6.5% (ensure contraception until at personalized target)
- **Stop:**
  - Non-insulin antihyperglycemic agents (except metformin and/or glyburide)
  - Statins
  - ACEi/ARB prior to pregnancy, but if overt nephropathy exists, continue until detection of pregnancy
- **Start:**
  - Folic acid 1 mg per day x 3 months prior to conception
  - Insulin if target A1C is not achieved on metformin and/or glyburide (type 2)
  - Other antihypertensive agents safe for pregnancy (Labetalol, nifedipine XL) if hypertension control needed
- **Screen for complications:**
  - Eye appointment, serum creatinine, urine ACR, blood pressure
- **Aim for healthy BMI**
- **Ensure appropriate vaccinations** have occurred
- **Refer** to diabetes clinic
For people using glyburide, gliclazide, repaglinide or insulin

### Signs of hypoglycemia

**Adrenergic (autonomic)**
- Trembling
- Palpitations
- Sweating
- Anxiety
- Hunger
- Nausea
- Tingling

**Neuropathic**
- Difficulty concentrating
- Confusion
- Weakness
- Drowsiness
- Vision changes
- Slurred speech
- Headache
- Dizziness

### Classification of hypoglycemia

**Level 1**
- Glucose level below normal (often between 3.0 and 3.9 mmol/L)
- Associated with adrenergic symptoms
- Without autonomic symptoms or changes to mental status

**Level 2**
- Glucose level below normal (often <3.0 mmol/L)
- Associated with neuropathic symptoms
- Without significant impact on mental status
- With or without autonomic symptoms

**Level 3**
- Glucose level below normal (regardless of glucose reading)
- Associated with neuropathic symptoms resulting in significantly altered mental/physical status
- Requires assistance to treat

### Treatment*

**Level 1 or 2 hypoglycemia:**
- Ingest 15 g of carbohydrate, preferably as glucose or sucrose (i.e. tablets or solution). Glucose levels should be retested after 15 minutes and re-treated with another 15 g of carbohydrate if the glucose level remains <3.9 mmol/L

**Examples of 15 g of carbohydrate:**
- 4 x 4 g glucose tablets
- 15 mL (3 teaspoons) or 3 packets of table sugar dissolved in water
- 5 cubes of sugar
- 150 mL juice or regular soft drink
- 6 LifeSavers™
- 15 mL (1 tablespoon) honey

**Level 3 hypoglycemia:**
- Conscious: Treat with oral ingestion of 20 g of carbohydrate, preferably as glucose tablets or equivalent (if capable of swallowing) or 3 mg of glucagon intranasal or glucagon 1 mg SC/IM. Retreat with additional doses after 15 minutes if glucose level remains <3.9 mmol/L
- Unconscious: Treat with glucagon (as above) or 10-25 g (20-50 mL of D50W) of glucose IV. Retreat with additional doses after 15 minutes if glucose level remains <3.9 mmol/L

*After treatment of hypoglycemia, consume usual meal or snack that is due at that time of the day. If a meal is >1 hour away, consume a snack (including 15 g carbohydrate and a protein source)*

---

**Reduce Driving Risk**

- **EDUCATE** people at risk of hypoglycemia to drive safely with diabetes
- **PREPARE** Keep fast-acting sugar within reach and other snacks nearby
- **BE AWARE** of blood glucose (BG) before driving and every 4 hours during long drives. If BG is below 4 mmol/L, treat
- **STOP** driving and treat if any symptoms appear
- **AFTER** treating a low, **WAIT** until BG is above 5 mmol/L to start driving. Note: Brain function may not be fully restored for some time after blood glucose level returns to normal
- If a person has impaired awareness of hypoglycemia, he/she must check their BG before driving and every 2 hours while driving, or monitor glucose with a real-time continuous glucose sensor

**Psychoeducational training**
- Structured diabetes education programs focused on recognizing and reducing frequency of hypoglycemia

**Choice of pharmacotherapy**
- Avoid, reduce dose of, or discontinue pharmacotherapies associated with increased risk of hypoglycemia if appropriate
- Consider long-acting analogues (insulin glargine-100, glargine-300, detemir, or degludec) over NPH insulin
- Consider second-generation basal insulin analogues (insulin glargine-300 and degludec) over insulin glargine-100 and detemir to reduce the risk of hypoglycemia, including nocturnal hypoglycemia in type 1 and type 2 diabetes

**Glucose monitoring**
- Use of continuous glucose monitoring (CGM) and increased frequency of capillary blood glucose (CBG) monitoring to identify episodes of hypoglycemia

**Surgical (for type 1 diabetes)**
- Islet cell transplant
- Pancreas transplant
**Individualized goal setting**

<table>
<thead>
<tr>
<th>Potential Self-management Goals</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eat healthier</td>
<td>See a dietitian to help develop a healthy eating plan.</td>
</tr>
<tr>
<td>Be more active</td>
<td>Increase physical activity with the goal of getting to 150 minutes aerobic activity/week and resistance exercise 2-3 times/week. Choose physical activity that meets preferences/needs.</td>
</tr>
<tr>
<td>Lose weight</td>
<td>Use strategies (e.g., reduce calories or portions) to lose 5-10% of initial weight.</td>
</tr>
<tr>
<td>Take medication regularly</td>
<td>Taking medication will help to improve symptoms and take control of your life. Consider using a pillbox or setting a timer.</td>
</tr>
<tr>
<td>Avoid hypoglycemia</td>
<td>Recognize the signs of hypoglycemia and take action to prevent it.</td>
</tr>
<tr>
<td>Check blood glucose</td>
<td>Establish a routine and act accordingly.</td>
</tr>
<tr>
<td>Check feet</td>
<td>Do a daily self-check and follow-up with a health-care provider if anything is abnormal.</td>
</tr>
<tr>
<td>Manage stress</td>
<td>Screen for distress (depressive and anxious symptoms) by interview or a standardized questionnaire (e.g. PHQ-9 [<a href="http://www.phqscreeners.com">www.phqscreeners.com</a>]),</td>
</tr>
<tr>
<td>Reduce or stop smoking</td>
<td>Identify barriers to quitting and develop a plan to address each of these.</td>
</tr>
</tbody>
</table>

**3 Quick questions to help your patients meet their goals**

For patients who are not making expected progress, try asking these questions to identify a path forward:

1. **How important is it for you to** <insert self-management goal> - low, medium, or high?
   - (Goal examples: increase levels of physical activity, reduce weight, improve A1C, lower BP)
   - If importance (motivation) is rated low, ask what would need to happen for importance to go up?
   - A high level of importance will indicate that the person is ready to change.

2. **How confident are you in your ability to** <insert target outcome here> - low, medium, or high?
   - If their confidence is rated low, explore what needs to happen to increase their confidence.
   - Usually this has to do with improving knowledge, skills or resources and support.
   - A high level of confidence indicates that the person is ready to change.

3. **Can we set a specific goal for you to try before the next time we meet?**
   - **What steps will you take to achieve it?**
     - Encourage S.M.A.R.T. Goals:
       - **S**pecific
       - **M**easurable
       - **A**chievable
       - **R**ealistic
       - **T**imely
**ABCDES of diabetes care**

<table>
<thead>
<tr>
<th>A1C targets</th>
<th>BP targets</th>
<th>Cholesterol targets</th>
<th>Drugs for CV and/or Cardiorenal protection</th>
<th>Exercise goals and healthy eating</th>
<th>Screening for complications</th>
<th>Smoking cessation</th>
<th>Self-management, stress, other barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1C ≤7.0% (or ≤6.5% to + risk of CKD and retinopathy) If on insulin or insulin secretagogue, assess for hypoglycemia and ensure driving safety A1C 6.0 - &lt;6.5% for selected adults with type 2 diabetes with potential remission to prediabetes A1C &lt;6.0 for selected adults with type 2 diabetes with potential remission to normoglycemia</td>
<td>BP &lt;130/80 mmHg If on treatment, assess for risk of falls</td>
<td>LDL-C &lt;2.0 mmol/L (or &gt;50 % reduction from baseline)</td>
<td>(non-AHA) • ACEi/ARB (if CVD, age ≥55 with risk factors, OR diabetes complications) • Statin (if CVD, age ≥40 for type 2, OR diabetes complications) • ASA (if CVD) (Antihyperglycemic Agents) • SGLT2i/GLP1-RA with demonstrated cardiorenal benefits in high risk type 2 with ASCVD, CKD or HF, OR Age &gt;60 with 2 CV risk factors</td>
<td>• 150 minutes of moderate to vigorous aerobic activity/ week and resistance exercises 2-3 times/week • Follow healthy dietary pattern (e.g. Mediterranean diet, low glycemic index)</td>
<td>• Cardiac: ECG every 3-5 years if age &gt;40 OR diabetes complications • Foot: Monofilament/Vibration yearly or more if abnormal • Kidney: Test eGFR and ACR yearly, or more if abnormal • Retinopathy: type 1 - annually; type 2 - q1-2 yrs</td>
<td>If smoker: Ask permission to give advice, arrange therapy and provide support</td>
<td>• Set personalized goals (see &quot;individualized goal setting&quot; panel) • Assess for stress, mental health and financial or other concerns that might be barriers to achieving goals</td>
</tr>
</tbody>
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