Type 2 Diabetes Mellitus in Family Medicine

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With contributions from Dr’s Hafizi, Malek, Muldoon, Rangwala, Charapova, Mavriplis, McLaren & Nguyen
Objectives

- Risk factors
- Screening
- Diagnostic criteria
- History and physical exam
- Complications
- Management - nonpharmacological
- Prevention
Facts and Prevalence

• Serious and complex chronic condition with potentially devastating complications
  1
• 2015: estimated 9.3% of the Canadian population had diabetes and 22.1% had prediabetes
  2
• Prevalence of diabetes projected to increase by 44% from 2015 to 2025
  2
• Leading cause of blindness, end stage renal disease and nontraumatic amputations in Canadian adults
  1
• CV disease is the leading cause of death in those with DM and occurs 2-4X more often than in those without DM
  1
• DM and its complications increase costs and service pressures on our publicly funded health care system
  1
• Fifty-seven percent of Canadians with diabetes reported they cannot adhere to prescribed treatment due to the high out-of-pocket cost of needed medications, devices and supplies. The average cost for these supports is >3% of income or >$1,500
  2

Case

• Mr. Sugar is a 45 yr old caucasian male who presents to your office for a periodic health exam. His past medical history is significant for hypertension, for which he takes Ramipril 5 mg OD, and for obstructive sleep apnea, for which he uses cpap. He works for the federal government and finds his job busy and stressful. He is married with 2 young children. You review his family history and he mentions his mother was diagnosed at age 55 with diabetes. He is a non-smoker and rarely drinks EtOH. You ask him about diet, and he says as a family they try to eat healthy but do order take-out about twice/week. He says he is too busy between work and family to have time to exercise.

• ROS is negative for any symptoms of concern

• BP is 146/96 and his BMI is 30
Question

• What risk factors does Mr. Sugar have for diabetes?
Risk Factors

- Age >= 40
- 1st degree relative with DM2
- High risk population (Eg.. African, Arab, Asian, Hispanic, Indigenous or South Asian descent, low SES)
- History of prediabetes
- Gestational diabetes or macrosomic infant
- Presence of end organ damage associated with DM (micro or macrovascular)
- Presence of vascular risk factors
  - HDL-C <1.0 mmol/L males, <1.3 mmol/L females, TG >= 1.7 mmol/L, Hypertension, Overweight, Abdominal obesity, smoking
- Presence of associated diseases
  - PCOS
  - History of pancreatitis
  - Acanthosis nigricans
  - Hyperuricemia/gout
  - Non alcoholic steatohepatitis
  - Psychiatric disorders (bipolar disorder, depression, schizophrenia)
  - HIV infection
  - OSA
  - CF
- Use of drugs associated with DM
  - Glucocorticoids, Statins, Atypical antipsychotics, HAART, anti-rejection drugs, other
- Other secondary causes

Case

• Mr. Sugar mentions he is worried about the possibility of having diabetes, given his mother’s history.

• Given the number of risk factors he has, you decide it is important to screen him for diabetes.

• Which lab test(s) should you order?
Screening and diagnosis algorithm for type 2 diabetes

Screen every 3 years in individuals ≥40 years of age or in individuals at high risk using a risk calculator.
Screen earlier and/or more frequently (every 6 to 12 months) in people with additional risk factors for diabetes (see Table 1) or for those at very high risk using a risk calculator.

- FPG <5.6 mmol/L and/or A1C <5.5%
  - Normal
    - Rescreen as recommended

- FPG 5.6 – 6.0 mmol/L and/or A1C 5.5% - 5.9%
  - At risk
    - Rescreen more often

- FPG 6.1 – 6.9 mmol/L and/or A1C 6.0% - 6.4%
  - Prediabetes†
    - Rescreen more often

- FPG ≥7.0 mmol/L and/or A1C ≥6.5%
  - Diabetes‡

If both FPG and A1C are available, but discordant, use the test that appears furthest to the right side of the algorithm.

*Consider 75 g OGTT if ≥1 risk factors; ** Consider 75 g OGTT (see Tables 3 and 5 in the Definition, Classification and Diagnosis of Diabetes, Prediabetes and Metabolic Syndrome chapter, p. S10 for interpretation of 75 g OGTT).

† Prediabetes = IFG or A1C 6.0 to 6.4% (see Table 5 in the Definition, Classification and Diagnosis of Diabetes, Prediabetes and Metabolic Syndrome chapter, p. S10).

‡ In the presence of symptoms of hyperglycemia, a single test result in the diabetes range is sufficient to make the diagnosis of diabetes. In the absence of symptoms of hyperglycemia, if a single laboratory test result in the diabetes range, a repeat confirmatory laboratory test (FPG, A1C, 2hPG in a 75 g OGTT) must be done on another day. It is preferable that the same test be repeated (in a timely fashion) for confirmation, but a random PG in the diabetes range in an asymptomatic individual should be confirmed with an alternate test. If results of two different tests are available and both are above the diagnostic cut points the diagnosis of diabetes is confirmed.

A1C, glycated hemoglobin; FPG, fasting plasma glucose; IFG, impaired fasting glucose
SCREENING & DIAGNOSIS

Who to screen and what do you screen with?

Screen every 3 years in individuals ≥40 years of age or in individuals at high risk using a risk calculator.

Screen earlier and/or more frequently in people with additional risk factors for diabetes or for those at very high risk using a risk calculator.

DIAGNOSIS OF PREDIABETES & DIABETES

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Dysglycemia category</th>
</tr>
</thead>
<tbody>
<tr>
<td>FPG (mmol/L)</td>
<td>6.1 – 6.9</td>
<td>IFG</td>
</tr>
<tr>
<td></td>
<td>≥7.0</td>
<td>Diabetes</td>
</tr>
<tr>
<td>2hPG in a 75 g OGTT (mmol/L)</td>
<td>7.8 – 11.0</td>
<td>IGT</td>
</tr>
<tr>
<td></td>
<td>≥11.1</td>
<td>Diabetes</td>
</tr>
<tr>
<td>A1C (%)</td>
<td>6.0 – 6.4</td>
<td>Prediabetes</td>
</tr>
<tr>
<td>Standardized, validated assay, in the absence of factors that affect the accuracy of A1C and not for suspected type 1 diabetes</td>
<td>≥6.5</td>
<td>Diabetes</td>
</tr>
<tr>
<td>Random PG (mmol/L)</td>
<td>≥11.1</td>
<td>Diabetes</td>
</tr>
</tbody>
</table>

If asymptomatic, a repeat confirmatory test (FPG, A1C, or a 2hrPG in a 75 g OGTT) must be done. If symptomatic, diagnosis made, and begin treatment.

http://guidelines.diabetes.ca/screeninganddiagnosis/refguide
Diagnostic Testing With 3 Different Tests

Dealing with Discordance

• Many people identified as having diabetes using A1C will not be identified as having diabetes by traditional glucose criteria, and vice versa.

• When results of more than one test are available (amongst FPG, A1C, 2hPG in a 75-g OGTT) and the results are discordant, the test whose result is above diagnostic cut-point should be repeated, and the diagnosis made on basis of the repeat test.
### Advantages and Disadvantages of Diagnostic Tests for Diabetes

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>FPG</td>
<td>• Established standard</td>
<td>• Sample not stable</td>
</tr>
<tr>
<td></td>
<td>• Fast and easy</td>
<td>• High day-to-day variability</td>
</tr>
<tr>
<td></td>
<td>• Single sample</td>
<td>• Inconvenient (fasting)</td>
</tr>
<tr>
<td></td>
<td>• Predicts microvascular complications</td>
<td>• Reflects glucose homeostasis at a single point in time</td>
</tr>
<tr>
<td>2hPG in a</td>
<td>• Established standard</td>
<td>• Sample not stable</td>
</tr>
<tr>
<td>75 g OGTT</td>
<td>• Predicts microvascular complications</td>
<td>• High day-to-day variability</td>
</tr>
<tr>
<td>A1C</td>
<td>• Convenient (measure any time of day)</td>
<td>• Inconvenient</td>
</tr>
<tr>
<td></td>
<td>• Single sample</td>
<td>• Unpalatable</td>
</tr>
<tr>
<td></td>
<td>• Predicts microvascular complications</td>
<td>• Cost</td>
</tr>
<tr>
<td></td>
<td>• Better predictor of CVD than FPG or 2hPG in a 75 g OGTT</td>
<td>• Misleading in various medical conditions (e.g., hemoglobinopathies, iron deficiency, hemolytic anaemia, severe hepatic or renal disease)</td>
</tr>
<tr>
<td></td>
<td>• Low day-to-day variability</td>
<td>• Altered by ethnicity and aging</td>
</tr>
<tr>
<td></td>
<td>• Reflects long-term glucose concentration</td>
<td>• Standardized, validated assay required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Not for diagnostic use in children and adolescents** (as the sole diagnostic test), pregnant women as part of routine screening for gestational diabetes***, those with cystic fibrosis or those with suxected type 1 diabetes</td>
</tr>
</tbody>
</table>

*Diabetes Canada 2018 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada*
A1C Level and Future Risk of Diabetes

<table>
<thead>
<tr>
<th>A1C Category (%)</th>
<th>5-year incidence of diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.0-5.5</td>
<td>&lt;5 to 9%</td>
</tr>
<tr>
<td>5.5-6.0</td>
<td>9 to 25%</td>
</tr>
<tr>
<td>6.0-6.5</td>
<td>25 to 50%</td>
</tr>
</tbody>
</table>


*The combination of an FPG of 6.1 to 6.9 mmol/L and an A1C of 6.0% to 6.4% is predictive of 100% progression to type 2 diabetes over a 5-year period.

Case

• You get the results of Mr. Sugar’s bloodwork a few days later

• FPG: 6.3
• A1C 5.9

• What test would you order now?

• What is his diagnosis?
Prevention of diabetes

• Lifestyle modifications
  • Diabetes Prevention Study and Diabetes Prevention Program
  • In those with IGT, dietary modification targeted a low-calorie, low-fat, low-saturated fat, high-fibre diet and moderate-intensity physical activity of at least 150 minutes per week resulted in a moderate weight loss of approximately 5% of initial body weight. In both studies, the risk reduction for diabetes was 58% at 4 years

• Pharmacotherapy
  • Metformin- ~30% reduction
  • Others studied: acarbose, liraglutide, TZDs, orlistat
Recommendations for Prevention in those with Prediabetes

• structured program of healthy behaviour interventions that includes moderate weight loss and regular physical activity of a minimum of 150 minutes per week over 5 days a week should be implemented to reduce the risk of type 2 diabetes

• dietary patterns may be used to reduce the risk of diabetes, specifically: Mediterranean-style, DASH (Dietary Approaches to Stop Hypertension), AHEI (Alternate Healthy Eating Index)

• pharmacologic therapy with metformin may be used to reduce the risk of type 2 diabetes
Case

• 2 years later Mr. Sugar presents for his PHE

• Life has been busy and he hasn’t had time to make any of the lifestyle changes you discussed in past visits

• ROS: fatigue, new urinary frequency, difficulty with maintaining erections

• Knowing he already has prediabetes, you’re concerned this may have progressed now to diabetes.
Diabetes- History

• What do you want to ask him about?
Case

• You send Mr. Sugar for bloodwork

• His HbA1C: 7.2

• What is the diagnosis?

• You see him again to review the diagnosis, perform a relevant physical exam and counsel.
Diabetes Focused Physical Exam

• What physical examination should be included?
Diabetes: complications

MACROvascular
- Stroke
- Heart disease & hypertension
- Peripheral vascular disease
- Foot problems

MICROvascular
- Diabetic eye disease (retinopathy & cataracts)
- Nephropathy
- Neuropathy
- Foot problems
Waist Circumference

- Place a tape measure around your bare abdomen just above the iliac crest.
- Be sure that the tape is snug, but does not compress skin, and is parallel to the floor.
- Measure at the end of exhalation.
Central Obesity

**International Diabetes Federation classification**

- Waist circumference
- Europids Men ≥94 cm; women ≥80 cm
- South Asians Men ≥90 cm; women ≥80 cm
- Chinese Men ≥90 cm; women ≥80 cm
- Japanese Men ≥90 cm; women ≥80 cm
- Ethnic South and Central Americans, First Nations: Use South Asian recommendations until more specific data are available
- Sub-Saharan Africans, Eastern Med, Arabic: Use European data until more specific data are available
Diabetic Retinopathy
Acanthosis Nigrans
Diabetic Foot Ulcer
Screening for Protective Sensation Using The 10 gram Monofilament

**How to perform the sensory examination:**

- Conduct in a quiet and relaxed setting.
- Begin by applying the monofilament to the hands, elbow or forehead so that patient what to expect.
- Ensure that the patient can not see whether or where the monofilament is being applied.
- Test the three sites on both feet shown in the figure.

Screening for Protective Sensation Using The 10 gram Monofilament

How to Apply the monofilament:
• Repeat the application twice at the same site, but alternate the application with at least one ‘mock’ application in which no filament is applied (total three questions per site).
• Protective sensation is present at each site if the patient correctly answers two out of three applications. Incorrect answers – the patient is then considered to lack protective sensation and is at risk of foot ulceration.
Rapid Screening for Diabetic Neuropathy Using the 10 g Semmes-Weinstein Monofilament

1. Show the 10-g Semmes-Weinstein monofilament to the patient.
2. Touch it first to the patient’s forehead or sternum so that the sensation is understood.
3. Instruct the patient to say “yes” every time the monofilament stimulus is perceived.
4. With the patient’s eyes closed, apply the monofilament to the dorsum of the great toe proximal to the nail bed as shown in the illustration below. Use a smooth motion-touch the skin, bend the filament for a full second, then lift from the skin.
5. Perform this stimulus 4 times per foot in an arrhythmic manner so the patient does not anticipate when the stimulus is to be applied.
6. For each of the 8 stimuli, assign a score of 0 if it is not perceived, 0.5 if it is substantially less than that perceived on the forehead or sternum, and 1 if it is perceived normally. A score of 3 out of 8 correct responses means that the presence of neuropathy is likely. A score of 3.5 to 5 means that the risk of new onset neuropathy in the next four years is high. A score of 5.5 or greater indicates that there is a low risk of neuropathy onset in the next four years.
Case

• You have a discussion with Mr. Sugar about pharmacologic vs. nonpharmacologic management of his diabetes
<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>
Case

• He decides he wants to try and implement lifestyle changes in the next 3 months rather than start medication right away
• He is agreeable to you referring him to a Diabetes Education program
• He asks you how we’ll know if the changes he makes are working
Is it all working?

- **Targets:**
  - HBA1C: 7 %
  - AC BS: 4-7
  - PC BS: 5-10 (5-8)
  - Lipids: LDL < 2
  - BP: <130/80
WHAT A1C SHOULD I TARGET?

A target A1C ≤6.5% may be considered in some patients with type 2 diabetes to further lower the risk of nephropathy and retinopathy which must be balanced against the risk of hypoglycemia.

Most patients with type 1 and type 2 diabetes

Consider 7.1-8.5% if:
- Limited life expectancy
- High level of functional dependency
- Extensive coronary artery disease at high risk of ischemic events
- Multiple co-morbidities
- History of recurrent severe hypoglycemia
- Hypoglycemia unawareness
- Longstanding diabetes for whom it is difficult to achieve an A1C ≤7%, despite effective doses of multiple antihyperglycemic agents, including intensified basal-bolus insulin therapy.

### ABCDES of diabetes care

<table>
<thead>
<tr>
<th>A</th>
<th>A1C targets</th>
<th>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</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>BP targets</td>
<td>BP &lt;130/80 mmHg If on treatment, assess for risk of falls</td>
</tr>
<tr>
<td>C</td>
<td>Cholesterol targets</td>
<td>LDL-C &lt;2.0 mmol/L (or &gt;50% reduction from baseline)</td>
</tr>
<tr>
<td>D</td>
<td>Drugs for CVD risk reduction</td>
<td>ACE/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) SGLT2 inhibitor with demonstrated CV benefit (if have type 2 with CVD and A1C not at target)</td>
</tr>
<tr>
<td>E</td>
<td>Exercise goals and healthy eating</td>
<td>150 minutes of moderate to vigorous aerobic activity/week and resistance exercises 2-3 times/week Follow healthy dietary pattern (eg Mediterranean diet, low glycemic index)</td>
</tr>
<tr>
<td>S</td>
<td>Screening for complications</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>
</tr>
<tr>
<td>S</td>
<td>Smoking cessation</td>
<td>If smoker: Ask permission to give advice, arrange therapy and provide support</td>
</tr>
<tr>
<td>S</td>
<td>Self-management, stress, other barriers</td>
<td>Set personalized goals (see “individualized goal setting” panel) Assess for stress, mental health and financial or other concerns that might be barriers to achieving goals</td>
</tr>
</tbody>
</table>

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# Sample Diabetes Patient Care Flow Sheet For Adults

## Name: _______________________

## Type of diabetes: 
- [ ] Type 1
- [ ] Type 2
- [ ] Other

## Date of birth: _____________

## Date of diagnosis: ___________

### Self-management
- (Discuss with patient and add date and location to chart)

#### Patient Goals:
- Possible barriers to self-management:
- Diabetes self-management education:
- Weight management:
  - BMI:
  - Target BMI:
- Physical activity/exercise: (150 min/week; resistance 2-3 times/week)

### Vaccinations

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Date (annual)</th>
<th>Date (if annual)</th>
<th>Date (if annual)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Misaligned</td>
<td>Date: _________</td>
<td>Date: _________</td>
<td>Date: _________</td>
</tr>
<tr>
<td>Pneumococcal</td>
<td>Date: _________</td>
<td>Date: _________</td>
<td>Date: _________</td>
</tr>
<tr>
<td>(Assessed)</td>
<td>Date: _________</td>
<td>Date: _________</td>
<td>Date: _________</td>
</tr>
</tbody>
</table>

### Visits (Every 3 to 6 months)

<table>
<thead>
<tr>
<th>Date</th>
<th>BP</th>
<th>Weight</th>
<th>A1C Target</th>
<th>57K or HbA</th>
<th>Notes</th>
<th>Hypoglycemia</th>
<th>Antihyperglycemic Agents</th>
<th>CV protection agents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Review SMBG records
- Target: pre-prandial: 4-7 mmol/L; 1-hour post-prandial: 5-10 mmol/L; 15-8 mmol/L if A1C not at target

### Screen for diabetes complications annually or as indicated

#### Nephropathy

<table>
<thead>
<tr>
<th>Date</th>
<th>ACR</th>
<th>eGFR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Neuropathy

- Check feet for lesions and sensation: 10 g monofilament or 128 Hz tuning fork
- Check for pain, ED, GI symptoms

#### Retinopathy

- Baseline eye exam:
  - Date: _________
  - Findings: _________

#### Vascular protection

- Statins: if >40 yrs OR >50 yrs and >15 yrs duration OR end organ damage
- ACE/ARB if >55 yrs OR end organ damage (even in the absence of hypertension)

### Lipid Targets: If indicated treat LDL-C ≤ 2 mmol/L

<table>
<thead>
<tr>
<th>Date</th>
<th>Medication</th>
<th>LDL-C</th>
<th>HDL-C</th>
<th>TG</th>
<th>Non-HDL-C</th>
<th>Apo B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### CVD Assessment

- ECG: _________
- Stress ECG: _________
- Other: _________
Helping prevent complications

• DM confers a significantly increased risk of CVD (CAD, PVD, CVA) - 2-4 fold higher than those without DM

• For most >40 yo with DM, 10 year and lifetime risk of CVD is high (>20%)-→ health behaviour modification and pharmacologic interventions
# Which cardiovascular protection medications are indicated for my patient?

<table>
<thead>
<tr>
<th>Decision Path</th>
<th>Medications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Does the patient have cardiovascular disease?</strong></td>
<td><strong>YES</strong></td>
</tr>
<tr>
<td>- Cardiac ischemia (silent or overt)</td>
<td>Statin¹</td>
</tr>
<tr>
<td>- Peripheral arterial disease</td>
<td>+</td>
</tr>
<tr>
<td>- Cerebrovascular/carotid disease</td>
<td>ACEi/ARB²</td>
</tr>
<tr>
<td>AND if the patient is NOT at glycemic target</td>
<td>+</td>
</tr>
<tr>
<td><strong>ADD</strong></td>
<td>ASA³</td>
</tr>
<tr>
<td><strong>NO</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Liraglutide, Empagliflozin</strong></td>
<td></td>
</tr>
<tr>
<td>or Canagliflozin⁴ (only for patients with type 2 diabetes)</td>
<td></td>
</tr>
</tbody>
</table>

| **Does the patient have microvascular disease?**                             | **YES**     |
| - Retinopathy                                                                | Statin¹     |
| - Kidney disease (ACR ≥2.0)                                                  | +           |
| - Neuropathy                                                                  | ACEi/ARB²   |
| **NO**                                                                       |             |

| **Is the patient:**                                                          | **YES**     |
| - age ≥55 with additional CV risk factors?                                   | Statin¹     |
| - age ≥40?                                                                    | +           |
| - age ≥30 and diabetes >15 years?                                            | ACEi/ARB²   |
| - warranted for statin therapy based on the Canadian Cardiovascular Society  |             |
| Lipid Guidelines?                                                            |             |

---

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 (e.g. 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 Canagliflozin: avoid in people with prior lower extremity amputation.
Case: 32 yo pregnant woman

• Gestational diabetes- why is this important?
• Multiple associated adverse outcomes on pregnancy:
  • miscarriage, congenital anomalies
  • macrosomia, operative delivery, preeclampsia, hydramnios, fetal organomegaly, maternal and infant birth trauma, perinatal mortality, neonatal respiratory problems and metabolic complications
Case: 32 yo pregnant woman

All pregnant women between 24 and 28 weeks gestation
If there is a high risk of GDM based on multiple clinical factors, screening should be offered at any stage in the pregnancy

Preferred Approach

50 g glucose challenge test with PG 1 hour later

<7.8 mmol/L

Normal

Reassess at 24-28 weeks if tested earlier

7.8-11.0 mmol/L

75 g OGGT Measure FPG, 1hPG, 2hPG

≥11.1 mmol/L

If 1 value is met or exceeded

Gestational diabetes
Case: 13 yo boy with obesity

- Screening for type 2 diabetes should be considered every 2 years using a **combination of an A1C and a FPG or random plasma glucose** in children and adolescents with any of the following conditions:

  - ≥3 risk factors in nonpubertal children beginning at 8 years of age or ≥2 risk factors in pubertal children [Grade D, Consensus]. Risk factors include:
    - Obesity (BMI ≥95th percentile for age and gender)
    - Member of a high-risk ethnic group (e.g. African, Arab, Asian, Hispanic, Indigenous or South Asian descent)
    - First-degree relative with type 2 diabetes and/or exposure to hyperglycemia in utero
    - Signs or symptoms of insulin resistance (including acanthosis nigricans, hypertension, dyslipidemia, NAFLD [ALT >3X upper limit of normal or fatty liver on ultrasound])

- PCOS
- IFG and/or IGT
- Use of atypical antipsychotic medications
Case: 88 yo with dementia and diabetes

• Functionally independent older pt with life expectancy of > 10 years - treat to achieve the same targets as younger pt with DM
• In older pt with DM and multiple comorbidities and/or frailty- goal to prevent hypoglycemia- consider choice of antihyperglycemic therapy and less stringent A1C target
• Antihyperglycemic agents that increase the risk of hypoglycemia or have other side effects - discontinue
• A higher A1C target may be considered in older people with diabetes taking antihyperglycemic agent(s) with risk of hypoglycemia, with any of the following
  • Functionally dependent: 7.1–8.0%
  • Frail and/or with dementia: 7.1–8.5%
  • End of life: A1C measurement not recommended. Avoid symptomatic hyperglycemia and any hypoglycemia
References and resources