Macleod Diabetes & Endocrine Centre
Royal Devon & Exeter Hospital

What type of diabetes is it?

Actually, the title of this document is a little misleading. We can't cover this well in a couple of sides of paper. The focus here is on the practical management in primary care.

Does this person need insulin now?

- **Ketosis**? The presence of moderate or high urinary ketones (or blood ketones above 1.5 mmol/L) is a strong indication for insulin, particularly if persistent. Low or moderate ketones may be seen in fasting or illness, but this will usually resolve.
- **Unplanned weight loss?** Marked weight loss in the context of newly-diagnosed or poorly-controlled diabetes suggests need for insulin.
- **Severe symptoms?** Severe polyuria and polydipsia are most rapidly treated with insulin.

Discuss urgently if insulin may be needed. If inpatient treatment is clearly needed (e.g. suspected DKA) then refer for admission. Otherwise, phone RD&E diabetes centre and ask to speak to a consultant or registrar, or the diabetes nurse on call via switchboard (Mon-Sun 9am-8pm).

Is it type 1 or type 2 diabetes?

The following is a rough guide; patients may fall between categories.

	Type 1	Type 2
Onset	Acute	Insidious
Age	Any age	Rare under 30, usually over 50
BMI	Any weight	Heavier
Ketones	Ketosis	No ketosis
Lipids	Normal	Low HDL, high triglycerides
Associated PMH		PCOS, hypertension
Family history	Relatively weak	Relatively strong

This person doesn't fit either category

For example, a patient in their 40s who is not particularly overweight and not ketotic, but has unusually high HbA1c or glucose levels at diagnosis.

1. Do they need insulin now? (see above – start in primary care or refer urgently)
2. Is there a strong family history of early-onset diabetes? (see MODY, below)
3. Is there another possible cause? (see below)
4. If not ketotic, and doesn't have a clear cause for diabetes that makes insulin treatment inevitable, start oral agents as for type 2 diabetes.
5. Refer to secondary care to be seen soon.
6. Send blood for diabetes antibodies (see below).

7. Initiate blood glucose monitoring, and ensure it is used as a safety net to start insulin if control deteriorates despite oral therapy.
8. Review effect of oral agents on a weekly basis initially. Adjust oral therapy rapidly based on blood glucose results – do not wait for HbA1c. Oral therapy can be increased if blood glucose levels are consistently over 12 mmol/L.
9. If blood glucose levels are not controlled on decent doses of metformin and sulphonylurea, insulin will be needed.

When should we measure diabetes auto-antibodies?

At time of writing, these are anti-GAD, anti-IA2 and anti-ZnT8. If any is above the reference range, consider it a positive test. Very high or multiple positives do not change the interpretation.

If type 1 diabetes is suspected, or atypical presentation.

- Positive antibodies mean it is more likely insulin will be needed in future. Patients should be referred to secondary care.
- Positive antibodies mean there is a risk of deterioration due to insulin deficiency. Patients should monitor blood glucose, not rely solely on infrequent HbA1c tests.
- Positive antibodies do not mean that insulin is required now, if you have reasonable blood glucose control without ketosis.
- Patients with ketosis or severe symptoms should start insulin even if negative antibodies.

If originally diagnosed with type 1 diabetes but now in doubt.

- Discuss such patients with secondary care. It will almost always be necessary to demonstrate residual C-peptide secretion before considering a trial off insulin.

When should we measure C-peptide?

For now, primary care should measure urine C-peptide:creatinine ratio (UCPCR). The RD&E lab generates serum C-peptide results for some research patients, which can be useful for secondary care clinicians but we suggest are ignored by primary care teams.

Measure C-peptide if a diagnosis of type 1 diabetes is in doubt (e.g. MODY)

- Patients should be seen in secondary care – do measure, but also refer if they are not.

Measure C-peptide if considering a switch from insulin to another therapy in type 2 diabetes

- Some people with a label of type 2 diabetes become insulin deficient over time, or may have always had undiagnosed type 1 diabetes. It would be unsafe to try another drug (e.g. GLP-1 agonist or SGLT2 inhibitor) in patients with little or no insulin secretion.
- Discuss result with secondary care.

Do not measure C-peptide in patients who are not on insulin, unless it will change management

- If your patient is not injecting insulin and is not currently in DKA, then their body makes insulin. You do not need a test to confirm this.
- C-peptide may have a future role in predicting the best therapy for individuals.

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Is it monogenic diabetes (MODY)?

Refer to secondary care if MODY is suspected. Consider monogenic diabetes in patients with a family history of early-onset diabetes (<25 years) including a parent, and particularly when there is a family history across several generations.

- **Apparent young-onset type 2 diabetes.** Monogenic diabetes is more likely in patients diagnosed <25 years old, who *do not have* obesity, acanthosis nigricans, polycystic ovarian syndrome and typical lipid profile (low HDL, high triglycerides).

- **Apparent type 1 diabetes**. Monogenic diabetes should be considered if there is a strong family history, in a patient who has negative antibodies and non-low C-peptide.

- **Deafness, short stature, neurological abnormalities, optic atrophy, megaloblastic anaemia**. Rare causes of diabetes are associated with some of these abnormalities. Diabetes is not always diagnosed at young age.

Could there be another cause?

- **Drugs?** Steroids, tacrolimus, mycophenolate.
    - Steroid-induced diabetes often requires insulin for glucose control but rarely causes ketosis. For short courses of steroids, it is reasonable to ignore temporary hyperglycaemia if the patient is well, and reassess after steroids stop.

- **Pancreatic disease**? Past history of pancreatitis, gallstones, pancreatic surgery. Recent history of abdominal or back pain, malabsorption. Marked unexplained weight loss.
    - Most patients with pancreatic disease will need insulin. It's not uncommon for patients to present with quite acute symptoms and high HbA1c several years after a bout of pancreatitis.

- **Haemochromatosis?** Abnormal LFTs. Elevated ferritin and iron indices.
- **Cushing's syndrome?** Marked weight gain, facial plethora, proximal myopathy, hypertension.
- **Acromegaly?** Facial change, enlarging hands and feet, headaches.
- **Cystic fibrosis?** CF-related diabetes is always treated with insulin, but is usually picked up and managed within the CF team.