TYPE 2 DIABETES – SCREENING

The North West London health and care partnership

WHOM TO TEST

It is very important to identify Diabetes as early as possible: 50% of newly presenting people with Type 2 Diabetes already have 1 or more complications at diagnosis [1]

Diabetes is often missed in the elderly

At least half of people with Type 2 Diabetes are asymptomatic[2]

Finger prick capillary results can not be used to diagnose Diabetes[3]

Glycosuria on its own does not confirm Diabetes

People PRESENTING WITH THE FOLLOWING SYMPTOMS:

- Excess thirst
- Polyuria (especially if nocturia)
- Weight loss
- Urinary incontinence
- Tiredness
- Pruritus Vulvae / recurrent candidiasis
- Recurrent infections / abscesses
- Balanitis
- Blurred Vision / changes in visual acuity
- Erectile Dysfunction
- Pain / Numbness / foot ulcers
- Non specific or unexplained symptoms

People AT INCREASED RISK OF DIABETES:

- People with BMI > 30
- People aged over 40 with BMI 25-30 (overweight)
- People aged 25–39 of South Asian, Chinese descent (especially those with BMI > 23)
- People with a family history of diabetes
- Women with polycystic ovary syndrome.
- Coronary disease, Cerebrovascular disease, peripheral vascular disease or hypertension/hyperlipidaemia.
- people on prolonged steroid therapy.
- people on atypical anti-psychotic drugs.

People AT HIGH RISK OF DIABETES:

- Women who have had Gestational Diabetes (screen at 6 weeks and one year post-partum, and then yearly)
- Those known to have impaired glucose tolerance, HbA1c 42-47mmol/mol or oral glucose tolerance test 2-hour value between 7.8 mmol/l and 11.1 mmol/l (Impaired Glucose Tolerance IGT) or fasting glucose 5.5 - 6.9mmol/l (Non Diabetic Hyperglycaemia NDH).

1. UKPDS Group. UK Prospective Diabetes Study 6. Complications in newly diagnosed Type 2 diabetic people and their association with different clinical and biochemical risk factors. **Diabetes Research. 1990;13:1-11**
2. World Health Organisation. **Report of a WHO Consultation 1999**
3. The Expert Committee on the diagnosis and Classification of Diabetes Mellitus. **Diabetes Care. 1997;20 (7); 1183-1203**

ROUTINE DIAGNOSIS OF DIABETES

DIAGNOSTIC CRITERIA FOR DIABETES

Diabetes may be diagnosed on any of the following criteria (WHO 2006, John 2012).

	Diabetes	High risk of Diabetes	Normal
HbA1c	**≥ 48 mmol/mol**	**42-47 mmol/mol**	**< 42 mmol/mol**
Fasting glucose	≥ 7 mmol/L	5.5 -6.9 mmol/L	≤ 5.4mmol/L
2 hr glucose in OGTT	≥ 11.1 mmol/L	7.8-11.0 mmol/L	≤ 7.7 mmol/L
Random glucose	≥ 11.1 mmol/L		

Consider an urgent direct access CT scan (to be performed within 2 weeks), or an urgent ultrasound scan if CT is not available, to assess for pancreatic cancer in people aged 60 and over with weight loss **and** the **new onset of diabetes. https://www.nice.org.uk/guidance/ng12**

When diabetes and pancreatic adenocarcinoma coexist a diagnosis of diabetes usually precedes the diagnosis of PDAC by 24 months in 74–88% of people

WHICH TEST IS BEST?

National and international expert groups do not know. Relevant groups (WHO, ADA, NICE) simply advise that HbA1c is now an option for diagnosing Diabetes.

NWL guidance recommend HbA1c – except in those groups where HbA1c may be unreliable and glucose should be used.

SHOULD A POSITIVE TEST BE REPEATED?

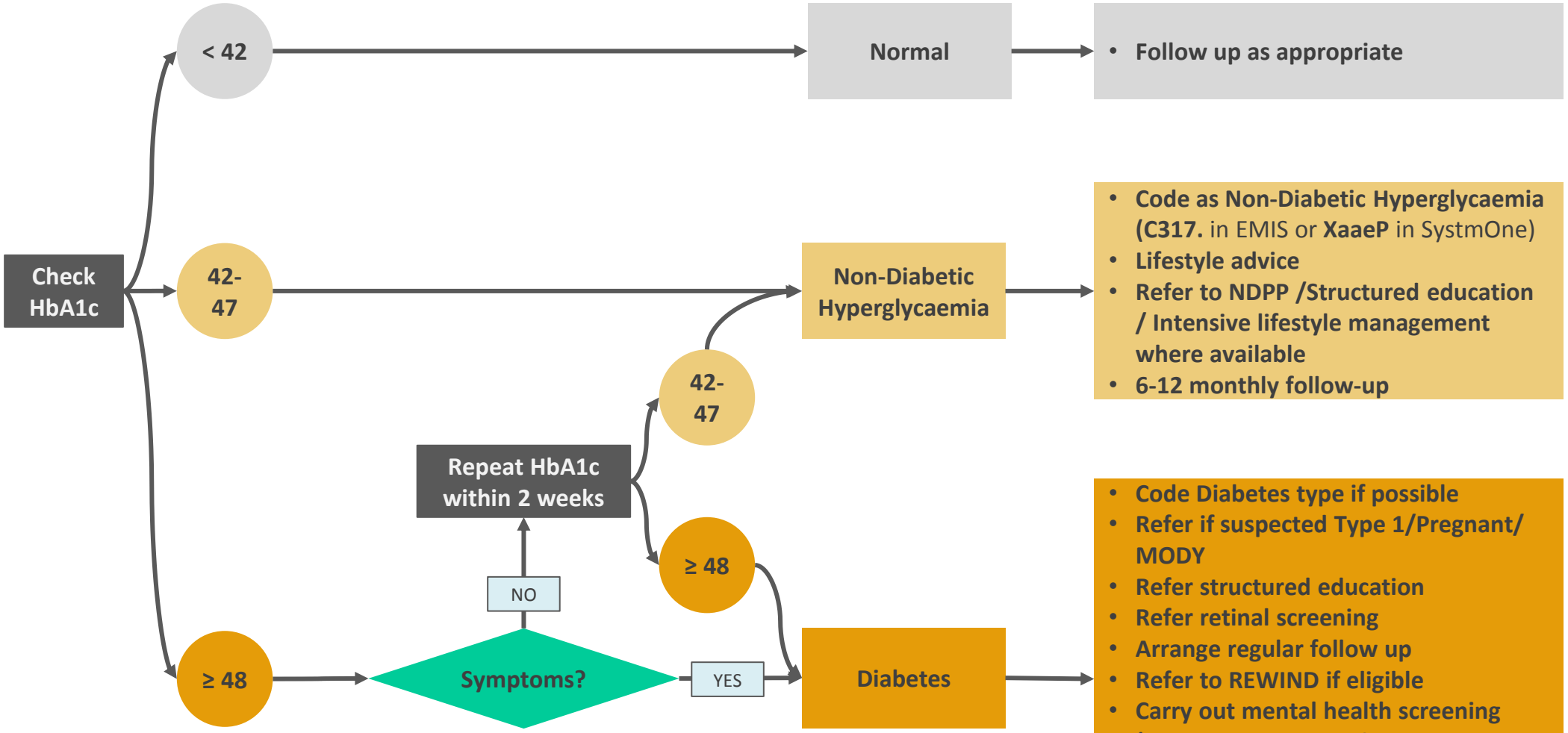
For glucose – yes, in most cases, a repeat glucose test is advised, unless there are classical osmotic symptoms of diabetes. Glucose measurements have greater biological variability compared to HBA1c.

For HbA1c – yes, in asymptomatic people. National guidance now advises a repeat HbA1c **within two weeks** in asymptomatic cases, as mislabelled samples or lab error are possible. Both results must be ≥48 mmol/mol to diagnose Diabetes; if the results are discordant, the lower is used.

The repeat sample must be sent with clinical detail (e.g. "repeat HbA1c to confirm diagnosis of Diabetes"), as repeats within 30 days may be rejected by the lab.

Do not delay urgent care while awaiting second test. For young, very symptomatic, or ill people, check ketones and seek specialist advice if necessary.

TYPE 2 DIABETES – DIAGNOSIS ALGORITHM



N.B. ***HbA1c is the recommended test for NDH due to practical benefits. However HbA1c is not suitable for use in everyone, and should not be used in people with anaemia, haemoglobinopathies or other causes of abnormal red cell turnover.***

ROUTINE DIAGNOSIS OF DIABETES

WHEN NOT TO USE HBA1C TO DIAGNOSE DIABETES

These are the most common situations where HbA1c is not suitable.
Except in pregnancy, diagnose by fasting glucose ≥7.0 mmol/L twice, or once with symptoms or a random blood glucose ≥11.0 mmol/L with symptoms .

In pregnancy, follow NICE guidelines.

1. Rapid onset of Diabetes – an increase in HbA1c may not be detected until a few weeks later.
    a. Suspected Type 1 Diabetes – rapid onset of symptoms, weight loss, ketosis.
    b. Children – because most will have Type 1 Diabetes.
    c. Steroids, antipsychotics & immunosuppressants can raise blood glucose, rarely precipitously.
    d. After pancreatitis or pancreatic surgery.

2. Pregnancy. Multiple factors make HbA1c lower in pregnancy. The diagnosis of gestational Diabetes should be made by using glucose measurements in line with NICE guidance.

3. Conditions with reduced red blood cell survival may lower HbA1c markedly.
    a. Haemoglobinopathy which will normally be detected by the lab, but should be suspected in racial groups where there is a high prevalence of sickle trait, sickle disease or thalassaemia.
    b. Haemolytic anaemia
    c. Severe blood loss
    d. Splenomegaly
    e. Antiretroviral drugs
    Fasting glucose or OGTT is recommended for diagnosis and fructosamine should be used in these people for monitoring.

4. Increased red cell survival may increase HbA1c e.g. splenectomy.
5. Renal dialysis people have a markedly reduced HbA1c especially if treated with erythropoietin.
6. Iron and B12 deficiency and their treatment. May raise or lower HbA1c, but the effect is small.

WHAT IF YOU HAVE GLUCOSE VALUES AND AN HBA1C ON A SINGLE PATIENT?

If one only is abnormal then a further abnormal test result, using the same method, is required to confirm the diagnosis.

References
WHO 2006 – http://whqlibdoc.who.int/publications/2006/9241594934_eng.pdf
John 2012 - http://onlinelibrary.wiley.com/doi/10.1111/j.1464-5491.2012.03762.x/pdf

For people with Type 2 diabetes and their healthcare team the possibility of achieving remission can provide motivation and hope – something to aim for. It can help to improve how people engage in their diabetes management, not only because of the need to reduce risk of complications, but also because there is a possibility of minimising the day-to-day impact of their condition.
For the local health economy there are benefits in reduction of the cost of medications and diabetes complications.

INTENSIVE LIFESTYLE INTERVENTIONS

Intensive lifestyle interventions that result in weight loss have been reported to lead to about 10-15% remission rates at one-year follow-up. Evidence for long-term remission following lifestyle interventions is limited though increasing.

Various dietary interventions such as **low fat diets**, **low carbohydrate diets**, **Mediterranean diets**, **very low-calorie diets**, and **meal replacements** have been used to achieve weight loss in people with Type 2 diabetes. An individualised approach is recommended.

The Counterbalance study tested the theory that normal blood glucose levels could be achieved through a very low-calorie diet and showed that those people with shorter duration Type 2 diabetes who achieved normal glucose control maintained this for at least six months.

The Look Ahead study, which aimed at weight loss through intensive lifestyle intervention, reported a remission rate of 7% at four-year follow-up. The Predimed study which involved an intervention with Mediterranean diets also reported remission rate of 5% at six-year follow-up.

Remission through lifestyle interventions appears more likely in **people newly diagnosed** with Type 2 diabetes and those with **lower baseline HbA1c**

Results from the larger long-term **DiRECT** study demonstrated a 46% remission rate in routine Primary Care using a low-calorie diet and supportive follow up at 1 year, with 36% remaining in remission at 2 years.

BARIATRIC (METABOLIC) SURGERY

Different remission rates have been reported depending on the procedure used, criteria for defining remission among other factors. An international consensus statement endorsed by 45 international diabetes associations including Diabetes UK and the ADA reported that Type 2 diabetes remission occurs in about 30–60% of people following surgery. To date, there is no reliable data to view surgery as a permanent cure, although remission of up to 15 years has been reported. Generally, the **median diabetes-free years** for people with Type 2 diabetes undergoing surgery is about **eight years**, depending on the procedure and available data suggest an erosion of remission over time.

Some studies have reported relapse rates of approximately 20% at three years and 25–35% at five years.
Whilst most of the long-term benefits of bariatric surgery can be attributed to weight loss, it has been suggested that some improvements in glucose control may occur independent of weight loss, via changes in gut hormones, microbiota, bile acid metabolism, intestinal glucose metabolism and nutrient sensing

TYPE 2 DIABETES – REMISSION DEFINITION

The North West London health and care partnership

86% of obese people who manage to lose 15kg of weight within 6 years of diagnosis achieved remission from Type 2 diabetes

COMPLETE REMISSION OF T2DM

Type 2 Diabetes Remission can be confirmed if a person has achieved all of the following criteria:

i) Weight loss
ii) Fasting plasma glucose or HbA1c below the WHO diagnostic threshold (<7mmol/l or <48mmol/mol) on two occasions separated by at least 6 months
iii) The attainment of these glycaemic parameters following complete cessation of glucose-lowering therapies

Ref: https://abcd.care/sites/abcd.care/files/resources/ABCD-and-PCDS-final-statement-3March2019.pdf)

However, remission is a fluid state and relapse can occur in various circumstances, especially if weight is regained. Patients need to continue to have regular monitoring at least annually and will need to remain on Diabetes QOF registers. The codes used below allow patients to remain on the register.

The following codes should be used for complete Type 2 remission: **C10P1** (EMIS) or **Xaagf** (SystmOne)

PARTIAL REMISSION OF T2DM

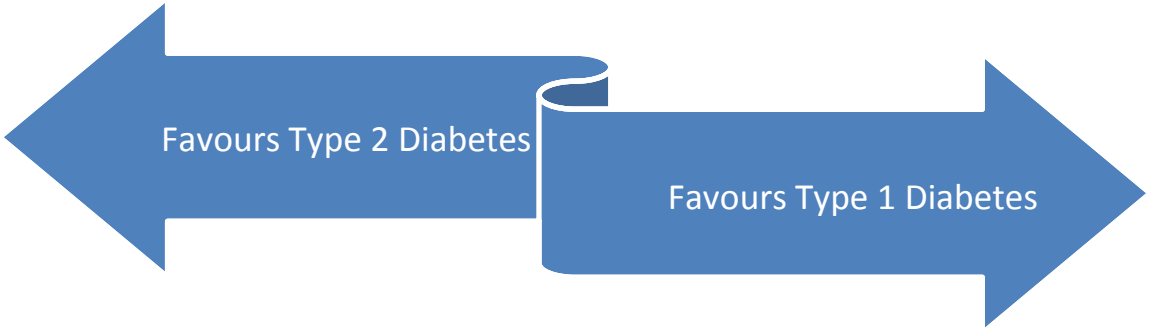
There are various definitions of partial remission including those included in this article: https://www.bmj.com/content/358/bmj.j4030/rr-0
The key point is that there is significant patient benefit even if complete remission isn't achieved.

WHAT IS THE IMPACT OF REMISSION ON DIABETES COMPLICATIONS?

Little is known about the actual effect of diabetes remission on new onset diabetes complications or progression of existing complications. A long-term follow-up observational study has concluded that bariatric surgery was associated with higher remission rates and fewer microvascular and macrovascular diabetes complications.
Systematic reviews have suggested that bariatric surgery may:
Protect against new cases of diabetic retinopathy, and its progression in people with Type 2 diabetes
Prevent the incidence and progression of albuminuria and stop the decline of renal function
It is recommended however that people diagnosed with diabetes continue with annual retinal and renal screening for life, even if they are in remission. The same targets for risk factors such as blood pressure and lipids should apply

WHEN AND HOW TO TEST FOR TYPE 1 DIABETES?

4% of people diagnosed with Type 2 over the age of 40 in fact have Type 1



Less likely to be Type 1 DM	Consider testing for Type 1 DM using GAD* antibodies and paired C-Peptide*Glucose, or refer to secondary care
Family history of Type 2	No family history of Type 2
No family history of Type 1 Diabetes	1st or 2nd degree relative with Type 1 Diabetes
BMI > 28 kg/m2	BMI < 28 kg/m2
Age > 45 yrs.	Age < 45 yrs.
Non-white ethnic group	White European
Dyslipidaemia, HDL < 1.0	Any autoimmune disease
	HDL > 1.5 mmol/l

GAD antibodies* are autoantibodies against the enzyme glutamic acid decarboxylase found in pancreatic islet cells. GAD antibodies are detectable in the serum ≈80% of people with Type 1 diabetic at the onset of Diabetes

C- peptide* can be considered in situations of diagnostic uncertainty, but must be paired with a glucose level to have any significance.
Discuss with a specialist colleague first to avoid inappropriate expensive testing.

DIAGNOSING MODY

Could the diagnosis be maturity-onset Diabetes of the young (MODY)?
See http://www.Diabetesgenes.org

Unusual Diabetes

- Very strong maternal or paternal family history of Diabetes often in three generations with early onset, before 30yrs. With some family members diagnosed with Type 1 others with Type 2 Diabetes

Unusual response to treatment

- Highly sensitive to sulfonylurea. Or having excellent control on small amounts of insulin without having hypoglycaemia or becoming ketotic if stopping insulin

No microvascular complications

- They and family members have few if any diabetic complications

Refer to Secondary care where screening tests can be undertaken to make the diagnosis

TREATMENT DECISION TREE FOR EARLY INSULIN INITIATION

PRINCIPLES OF TREATMENT

- Offer structured education advice to all newly diagnosed people according to local availability (i.e. X-PERT, DESMOND or conversation maps). Usually wait 6-12 weeks before glucose lowering agents are introduced unless patient is symptomatic.
- Carry out mental health screening (PHQ4 in primary and community care OR DDS2 in secondary care) and refer to IAPT or other relevant part of local pathway if +ve (See slide 29 for details of tools)
- Metformin is recommended for all people with Type 2 Diabetes at/soon after diagnosis in view of its cardioprotective effects (UKPDS legacy effect).
  However:
  Introduce oral hypoglycaemic agents early if fasting plasma glucose >15mmol/l and symptomatic.
- Ensure people are shown how to monitor their own diabetes if appropriate , and know what to do if results do not fall in the target range.
- Regular monitoring will identify the need to actively titrate treatment.
- Measure HbA1c every 2-6 months.
- Target HbA1c 48mmol/mol/6.5% in newly diagnosed Type 2 Diabetes and those on up to 2 oral hypoglycaemic agents unless individual target more appropriate. Involve the person in discussions about individual HbA1c target.
- In South Asian people BMI underestimates adiposity. Weight measurements need to be considered.
  Range for healthy weight is BMI 18.5-22.9 in South Asian people.
- Consider end of life care needs