

DIABETES TYPE II IN CHILDREN

Screening

ANNUALLY:

All children over 10 years of age at high risk with one or more of:

- Weight > 120% ideal and / or BMI > 85th centile.
- Sibling (s) diagnosed with DM.
- Acanthosis nigricans - dark raised velvety change in skin, particularly on back of neck and armpits:



(photo reproduced with permission from Princes Margaret Hospital Rural and Remote Diabetes Team, client and family)

Use clinical judgment in testing children in high risk populations (e.g. Aboriginal and Torres Strait Islander) who do not meet these criteria.

How to Screen

- Venous glucose (random or fasting) if doing other tests

OR

- Random capillary glucose (finger-prick).

** See flow chart on page 4 of this protocol **

Case Definition

Diagnosis MUST be confirmed with a laboratory tested venous blood sample (all figures are in mmol/l).

A **high** reading is a fasting venous blood glucose (FBG) ≥ 7 or random venous blood glucose (RBG) ≥ 11.1 (or capillary ≥ 12.2).

DIABETES MELLITUS (DM) can be diagnosed in 3 ways:

without symptoms:

1. 2 high readings on separate occasions including at least one venous reading

OR

2. venous blood glucose > 20 mmol/L without cause (e.g. acute illness, steroids).

with symptoms (e.g. thirst, urinary frequency):

3. high venous reading.

See screening flow chart on page 4 of this protocol for indications for 75g oral glucose tolerance test (75g OGTT) and interpretation of results.

Interpretation of 75g GTT:

	Diabetes Unlikely	Impaired Fasting Glucose	Impaired Glucose Tolerance	Diabetes Likely
Fasting	< 5.5	5.5 - 6.9 and	<7	≥ 7 or
2 hr post	< 7.8	< 7.8	7.8 - 11	≥ 11.1

Type 1 diabetes vs Type 2 diabetes

The majority of Indigenous children and adolescents who are diagnosed with diabetes have the "adult type" or type 2 diabetes. Usually, classification can be made reliably on the basis of clinical presentation and course, though there may be considerable overlap.

Where doubt exists, refer to table on page 4 of this protocol and discuss with Regional Paediatrician and / or with PMH Rural and Remote Diabetes Team (0437 512 834).

Principles of Management

Most children diagnosed with type 2 diabetes do not present acutely unwell and are usually best managed in the community.

Establishing a trusting relationship between the child, their family and the health team is critical in the early stages - where possible, avoid hospitalisation and early interventions which may discourage this development.

Children are not small adults – education and management must be tailored to the child's age, education, development and maturity. Resources that have been designed for adults, or for children with type 1 diabetes may not be appropriate.

Offer diabetes screening for parents and siblings

Aims of management

- No symptoms of hyperglycaemia.
- Good glycaemic control : Hb A1C < 7 %.
- Minimise other cardiovascular risk factors:
 - TC < 4 mmol/L, HDL > 1 mmol/L, LDL < 2.0 mmol/L, TG < 2.0 mmol/L.
 - BP < 95th centile.
 - No smoking.
 - BMI in healthy range for age and sex.
- No alcohol or other substance misuse.
- Psychological and emotional well-being.

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Baseline Assessment

- Weight, height, Body Mass Index (BMI) (see age appropriate charts in [HEALTHY CHILDREN](#) protocol).
- Blood Pressure.
- Foot examination.
- Bloods : U+E+ Cr,TSH, HbA1C, Lipid profile.
- Mid-stream urine.
 - dipstick (including check for ketones).
 - M, C & S.
 - ACR.
- GFR – e GFR using MDRD is not reliable in children. Use Schwartz formula – calculator available at: <http://www-users.med.cornell.edu/~spon/picu/calculator/schw.htm>

Therapeutic Protocols

If the child presents with diabetic ketoacidosis (DKA) or hyperglycaemic hyperosmolar non ketotic state, admit to hospital, administer immediate care according to hospital protocols and discuss urgently with regional paediatric consultant.

For children NOT presenting acutely unwell, and for all children once stable:

1. Take time to establish a trusting relationship between the child, parents / carer and health service.
2. Consider the emotional and psychological response of the child and their family to the diagnosis of diabetes.
3. Work together with the child, parents / carer to develop a Care Plan and assign a trusted worker (e.g. Aboriginal Health Worker) as case manager / main support person.
4. Provide education re physical activity (refer also to [HEALTHY CHILDREN](#) protocol) – aim for at least 30 minutes exercise 5 days per week.

5. Reduce time spent on sedentary activities e.g. watching television, sitting at computer.
 6. Provide advice regarding healthy nutrition for the child and the family (refer to [HEALTHY CHILDREN](#) protocol).
 7. Establish plan for monitoring blood sugar level, taking into account age and understanding of child, involvement of parents / carer, options for monitoring at school. Monitoring using 3 monthly HbA1C alone may be appropriate for children and their families who are not able to sustain home monitoring.
 8. Consider oral medication:
 - a) Immediately if symptomatic (but not acutely unwell – see previous section).
 - b) After 6 weeks if BSLs not controlled (fasting BSLs < 7; random BSLs > 10).
 - c) At any time after 3 months if HbA1C monitoring shows less than ideal control (HbA1Cs > 7%).
- Start **Metformin XR** 500mg daily (if tablets are too large, tablets can be cut in half but not crushed, or consider using shorter acting **Metformin** 250mg twice a day).
 - Recommend taking with or after food – GI side effects are more common in children.
 - Check fasting BSL at least twice weekly while titrating therapy.
 - Increase Metformin by 500mg total daily dose every two weeks if fasting BSLs > 7, to a maximum of 2g daily.

Insulin therapy

Insulin is recommended if exercise, nutrition advice and maximum dose of metformin fail to achieve good glycaemic control (HbA1C < 7%; fasting BSLs < 7).

BEFORE STARTING INSULIN

- Child and their parents / carer need education about:
 - insulin storage.
 - insulin administration.
 - recognition and management of hypoglycaemia.
- Remember to target education to age and understanding of the child – some adolescents will have capacity to self-manage with home monitoring and self-injection, while for others this will be an inappropriate goal.
- Home monitoring using a glucometer is ideal, however monitoring in the clinic may be an appropriate alternative for some families.
- Encourage child and parents / carer to speak with another child / adolescent already using insulin.
- Discuss access to a secure fridge / or clinic fridge.
- Ideally discuss with PMH Rural and Remote Diabetes Team (**0437 512 834**) before starting insulin – in general, starting dose and titration is more important than the type of insulin selected.

HOW TO START

1. Continue **metformin**.
2. Use a once daily insulin regimen:
 - **isophane insulin** (e.g. **Protaphane Innolet**) - must be given in the evening.

OR

- **glargine insulin** - aim to give at around the same time each day, though the actual time does not matter - e.g. unlike isophane, it can be given in mornings if this suits the child / family better.

For this reason, glargine will be a good option for many children and adolescents. It is also preferred if there are problems with insulin storage (insulin can be stored and given at the clinic during the day).

DIABETES TYPE II IN CHILDREN

Complications / co-morbidities

Discuss **all** children with co-morbidities and / or complications with the Regional Paediatrician.

1. Hypertension and / or proteinuria

- ACEIs are indicated as first-line agents
- Consider risk of pregnancy in post-pubertal girls - ACEI are contraindicated in pregnancy and beta-blockers may be a safer alternative in this situation (though use caution in children on insulin – symptoms of hypoglycemia may be masked by b-blockers),

2. Hyperlipidaemia

- Statins may be indicated in children over 10 years of age when LDL remains very high (>4mmol/L) despite non-drug management; use with caution in adolescent females, given potential harm in pregnancy (category X).
- Cholestyramine may also be used for hyperlipidaemia not controlled by exercise and nutrition management alone, though GI side effects and frequency of dosing make compliance difficult.

Follow-up

When titrating therapy, review and check fasting BSL (finger-prick) at least twice weekly

3 monthly – Medicines, smoking, nutrition, alcohol, physical activity, weight, height, BMI, BP, HbA1C, urinalysis and feet.

Annually – Creatinine and electrolytes, GFR, lipids, LFTs, urine ACR, foot check, visual acuity; dental review.

At least every 2 years – Retinal screen (if diabetic retinopathy follow Ophthalmologist's advice).

Enrol with **National Diabetes Services Scheme:**
Phone: 1300 136 588, or download enrolment form at <http://www.diabetesaustralia.com.au/ndss>

Follow **TYPE II DIABETES PROTOCOL (ADULT)** once > 15 years of age.

Refer / Discuss

Most people with Type 2 diabetes are best managed as close to home as possible. Sending the child and carer(s) out of the region is disruptive and could be counter productive to good relationships with usual care providers.

Paediatrician - refer all of the following to the Paediatrician as soon as practical:

- Under 10 years of age.
- With complications or co-morbidities.
- Requiring insulin.
- Pattern of diabetes more consistent with type I (including acute presentation, DKA or ketonuria) or uncertain whether Type I or Type II diabetes - for these children, early discussion with PMH Paediatric Endocrinologist is also recommended: **Contact: 9340 8222.**

NOTE: some post-pubertal children / young adolescents may be more appropriately referred to the Regional Physician – this is best determined on an individual basis by GP in conjunction with the child / adolescent.

Dietician / diabetes educator – all children and parent/ family should be referred to a regional dietician as soon as practical.

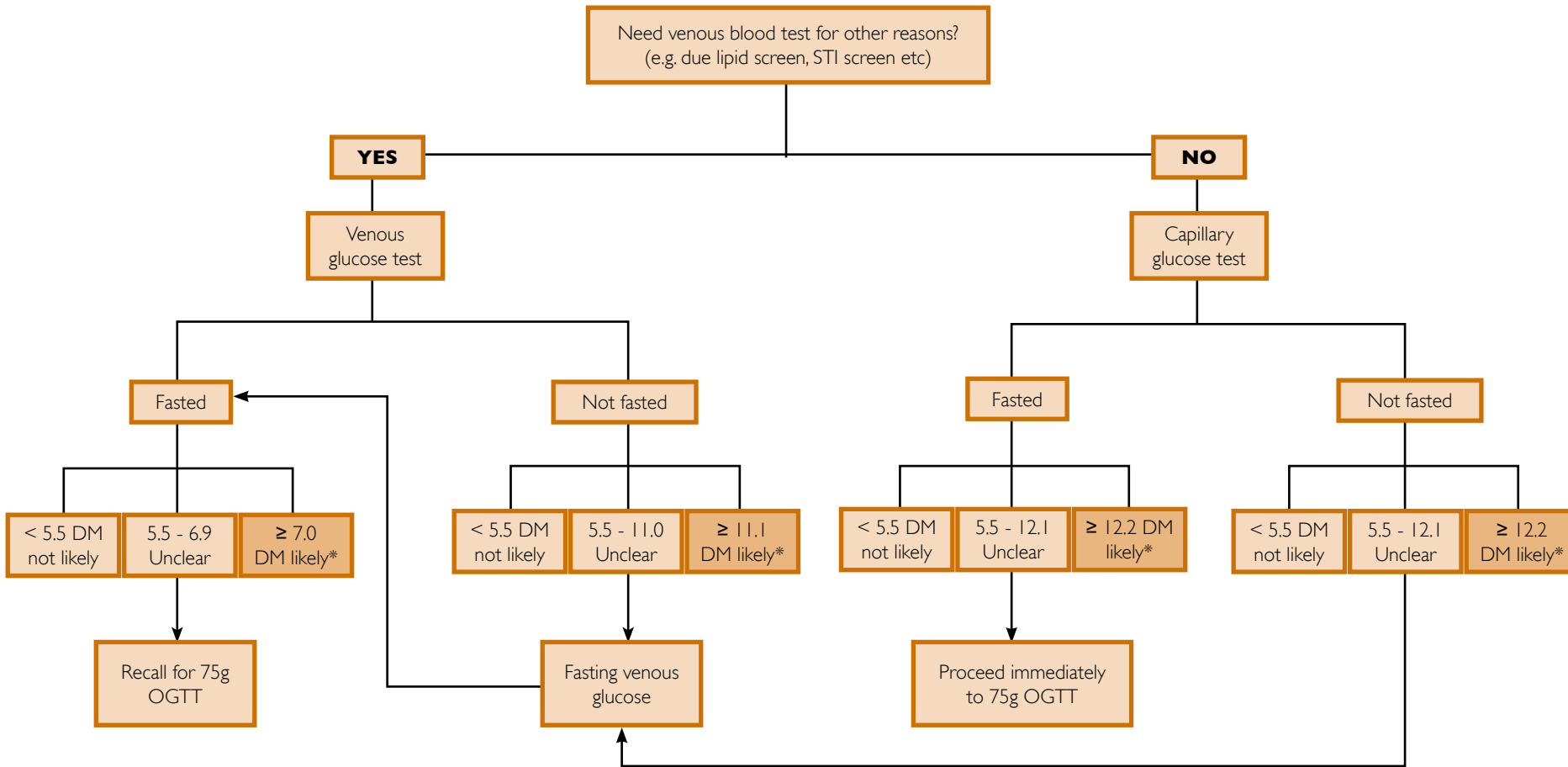
Podiatrist – refer all children with abnormalities on foot check to the podiatrist.

Ophthalmologist

- all children with retinopathy.
- if unable to be examined by primary health care team / not able to be screened with retinal camera.

Princess Margaret Hospital (PMH) Rural and Remote Diabetes Team (RRDT) is available to provide support to the local health care team, and may be called on for advice and liaison with the local health team via telephone, visits to local community, email correspondence and teleconference. **Contact: 0437 512 834.**

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TYPE 2 DIABETES IN CHILDREN – DIAGNOSTIC TABLE AND MANAGEMENT FLOW CHART

	Features more typical of Type 1 diabetes	Features more typical of Type 2 diabetes
Onset	Acute/ fast, symptoms present	Usually slow onset, may have no symptoms
Clinical features	<ul style="list-style-type: none"> • Weight loss • Passing lots of urine • Thirsty / drinking lots of fluids 	<ul style="list-style-type: none"> • Usually obese/overweight – though may also be normal / underweight • Strong family history of type 2 diabetes • Acanthosis nigricans • Polycystic ovary syndrome (PCOS)
Ketosis	Often present	Usually absent
C-peptide blood test	Low or un-detectable levels	Normal or raised levels
Antibody blood tests	ICA, ICA 12, and / or anti-GAD antibodies usually POSITIVE	ICA, ICA 12, and Anti-GAD antibodies usually NEGATIVE
Recommended approach if diabetes type is unclear	If the child has features more like type 1 diabetes, ICA, ICA 12 and Anti GAD tests are recommended	If the child has features more like type 2 diabetes, C-peptide testing is recommended

