Type 2 Diabetes in Children

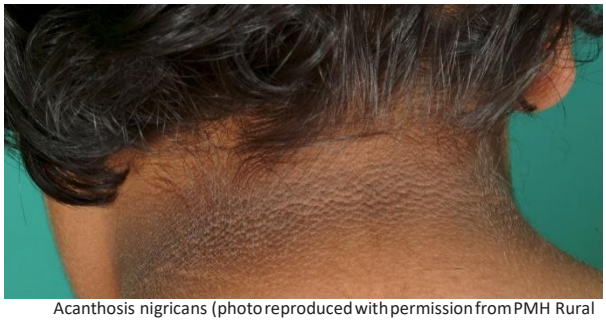
Case Definitions

HbA1c greater than or equal to 6.5% on venous blood sample

Screening

All Children 10 years and over with one or more of the following risk factors should be **screened annually**:

- BMI >85th percentile for age and sex
- Maternal history of diabetes or Gestational Diabetes (GDM) during the child's gestation
- Family history of type 2 diabetes (T2DM) in first-degree relative
- Signs of insulin resistance (acanthosis nigricans, skin tags)
- Conditions associated with obesity / metabolic syndrome (hypertension, dyslipidemia, PCOS, fatty liver, OSA, small-for-gestational age <10th percentile)
- Use of antipsychotics and antidepressants



Acanthosis nigricans (photo reproduced with permission from PMH Rural and Remote Diabetes Team, client and family)

Use clinical judgment in testing Aboriginal and Torres Strait Islander Children <10 years old who have risk factors as above

Screen with Point of Care (POC) HbA1c
or random glucose

POC HbA1c

- POC HbA1c <5.7% → **No diabetes** continue annual screening
- POC HbA1c 5.7 – 6.4% → **At risk of diabetes** Refer for **education and lifestyle management** Re-check HbA1c in 6 months
- POC HbA1c ≥6.5% → **Diabetes** → **Confirm with venous bloods & baseline assessment** See Management Flowchart below

If POC HbA1C not available, screen with POC random BGL

POC BGL <5.5 → No diabetes, continue yearly screen
POC BGL 5.5 – 11 → check venous HbA1c (manage as flow chart above)
POC BGL ≥ 11.1 → likely diabetes – will need baseline assessment*

Principles of Management

All Children with T2DM should be discussed with the Kimberley Paediatric Team at time of diagnosis.
(Paediatrician on-call 0427 988 570)

- Most children diagnosed T2DM do not present acutely unwell and are usually best managed in the community.
- Sending a child and carer out of the region is disruptive and could be counter-productive to good management .
- Develop a whole team approach and work with the family to develop a care plan to provide the best chance of facilitating lasting changes in lifestyle and adherence to medications and appointments.
- Assign a local clinic contact as the case manager and assign a support person to assist.
- Register with the NDSS (See Resources).

Aims of Management

Establish a trusting relationship between the child, their family and the health team to achieve:

- Good glycaemic control (HbA1C ≤ 6.5 %)
- Lifestyle modifications (healthy eating, regular physical activity, decreased screen use)
- Regular complication and comorbidity screening and management
- Psychological and emotional wellbeing

Education

Patients and families should be provided with the time to ask questions regarding the diagnosis and management, including a referral to a diabetes education program to build skills for living with diabetes (See Resources).

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Type 2 Diabetes in Children

Management Flowchart

Positive screen for diabetes

POC HbA1c ≥6.5%
POC BGL ≥ 11.1

Unwell child
Vomiting, dehydration, tachycardia, hypotension, ↓GCS, acidosis or ketosis

→ Manage as per **PCH Guideline** for DKA and **contact Kimberley Paediatrician on-call 0427 988 570**

Well child

Baseline assessment with initial screening investigations
Anti-GAD, IA2 Abs, C-peptide, LFT, lipids, UEC, urine ACR, venous HbA1c, venous blood gas, ketones (on blood).
Height, weight, BMI, BP, retinal screen.
(See Managing Complications and Comorbidities below)

Education & Lifestyle (see Lifestyle Factors below)
- Diet: decrease high caloric foods and soft drink
- Regular exercise, decrease screen use
- Maintain healthy weight (see healthy kids protocol)
- Improve sleep: aim 8 – 11 hours per night as per age

Refer to Multidisciplinary Team (See contacts in Refer/Discuss)
- Assign local case manager
- Refer to diabetes educator and dietician
- Regular GP review
- Refer to Kimberley Paediatrics via WA Health eReferrals or email: **kimberleypaediatrics@health.wa.gov.au**

Discuss any abnormal results from baseline assessment with Kimberley Paediatrician 0427 988 570
If GAD, IA2, Insulin antibodies negative → commence management for T2DM

Review Initial HbA1c

- HbA1c <7.5 → initiate 3 month trial of lifestyle modification without medications
- HbA1c 7.5 - 8.5 → initiate Metformin 500mg daily and titrate to 2g daily as needed
- HbA1c ≥ 8.5% and/or symptomatic (polyuria, polydipsia, nocturia, weight loss), but no acidosis or ketosis → initiate Metformin and discuss with Kimberley Paediatrician re need for insulin and plan for monitoring BGL

Titrate medications

Aim fasting BGL 4 - 6 mmol/L

Where possible check fasting BGL at least weekly while titrating therapy

3-monthly review

HbA1c, UEC

Height weight BMI, BP

Lifestyle management

- HbA1c ≤6.5% →continue current management
- HbA1c >6.5% →titrate Metformin to max 2g daily (XR) or 1g BD (IR) until HbA1c ≤6.5%
- HbA1c >6.5% *despite maximum Metformin*, →**contact Paediatrician on-call 0427 988 570** re consideration of additional oral medications/insulin
- HbA1c >10% and problems with adherence or socially complex → consider hospital admission and contact Paediatrician on-call.

6-monthly paediatric review

12-monthly Urine ACR, UEC, LFT, lipids, retinal screen foot exam

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Therapeutic Protocols

See Management Flowchart above

Lifestyle Management

The foundation of T2DM management is lifestyle modification and education, accompanied by medication adherence, glucose monitoring and management of complications and comorbidities.

Trial a 3-month period of lifestyle modification if venous HbA1c at baseline assessment <7.5% (see Additional Practice Points)

For all children with T2DM:

- Develop achievable targets with the child and their family
- Engage the family to increase the likelihood of lifestyle modification and reduce the risk of diabetes and its complications within at-risk families
- See additional information in Additional Practice Points

Goals of Lifestyle Modification:

- Diet: decrease soft drink and calorie dense / low nutrient foods, increasing fruit and vegetables, portion control
- Physical activity: at least 30 - 60mins of moderate activity daily, with strength-based activity 3 days a week
- Healthy BMI: aim for 7% decrease in excess weight, and focus on achieving healthy BMI
- Screen time: decrease screen time <2hr a day, no screen use for at least 30mins prior to bed
- Sleep: maintain good bedtime routine and sleep habits. Aim 9–11 h for 5–13 years, and 8–10 h for 14–17 years

Psychosocial Factors

- Consider the emotional and psychological response of the child and their family to the diagnosis
- Screen regularly for ongoing emotional, psychological, cultural and spiritual impacts of a T2DM diagnosis
- Involve Aboriginal Health Workers or Practitioners to assist with education and support of the child and their family
- Consider referral to mental health services where appropriate

Medications

Metformin and insulin are the only medications currently approved in Australia for use in children <18 years.

Metformin

- Indication: venous HbA1c ≥7.5% at baseline, or >6.5% at first 3 monthly review
- Starting dose: **Metformin XR 500mg daily**
- Avoid if:
    - Intolerable side effects
    - Known allergy to biguanides or
    - Renal insufficiency (eGFR < 30)
- Practice points:
    - Take after evening meal to minimise GI side effects (abdominal pain, nausea or diarrhea)
    - If tablets too large: cut in half (but do not crush), or consider using Metformin IR 250mg twice a day
    - See Additional Practice Points for further information
- Titrating therapy:
    - While titrating, check fasting BGL at least weekly
    - If fasting BGL > 6.5: increase Metformin by 500mg daily every two weeks to max. dose of 2g daily

Other Medications

If HbA1c is > 6.5% on 2g Metformin: contact on-call Paediatrician regarding need for insulin or additional hypoglycaemic medications. Kimberley Paediatric Team will contact PCH Endocrinology regarding initiating other medications.

Complications and Comorbidities

Screen for complications at diagnosis, and then annually. Discuss any concerns with on-call paediatrician.

- Blood pressure: measure 3-monthly; if >95th percentile (see NIH guide) emphasise lifestyle advice and discuss management with on-call paediatrician.
- Renal function: measure UEC 3-monthly and urine ACR annually; confirm elevated ACR (>3mg/mmol) on at least two occasions.
- Retinopathy: screen at diagnosis and annually with retinal photography or optometry/ophthalmology.
- Peripheral neuropathy: annual foot examination (see Type II Diabetes in Adults protocol)
- Obstructive Sleep Apnoea (OSA): screen for symptoms at each visit e.g. snoring, mouth-breathing, pauses in breathing, choking, gasping, waking unrefreshed
- Dyslipidaemia: note that lipids may be inaccurate in the setting of hyperglyacaemia, re-check when initial glycaemic control achieved, and then annually. TargetS: LDL <2.6 mmol/L, HDL >0.9 mmol/L, TG <1.7 mmol/L.
- Polycystic ovarian syndrome (PCOS): oral contraceptives are not contraindicated for females with T2DM.
- Non-alcoholic fatty liver disease (NAFLD): measure annual LFT (including AST).
- Pregnancy: discuss importance of good glycaemic control and consider contraception for females of child-bearing age (see Diabetes in Pregnancy protocol).

Follow Up

3-monthly: review of glycaemic control with HbA1c, UEC, BMI, BP, lifestyle management

6-monthly: paediatric clinic review

12-monthly: review of complications and comorbidities with urine ACR, UEC, LFT, lipids, retinal screen, foot exam

Refer / Discuss

Kimberley Diabetic Services
Add Link to Kimberley Diabetic Services doc

Boab Health Diabetes services:
Dietitian, Diabetes Educator, Podiatrist
Email: reception@boabhealth.com.au
Fax: 08 9192 7999

WACHS Dietitian Ph: 91942258
kimberley.dietetics@health.wa.gov.au

Kimberley Paediatric Team
Refer via WA Health eReferrals or email
kimberleypaediatrics@health.wa.gov.au

Mental Health
Boab Health age <12 years (contact above)
Headspace 12–18 years Ph: 9194 4500 or
headspace@kamsc.org.au

Discuss with on-call Paediatrician 0427 988 570

- Under 10 years of age
- With complications or co-morbidities
- Requiring insulin
- Unwell at presentation: DKA or ketonuria, symptomatic with vomiting / dehydration or other illness.
- Suspected diagnosis of Type 1, or any uncertainty regarding diagnosis

Resources

National Diabetes Services Scheme
Phone: 1300 136 588, or download enrolment form

DiabetesWA
DiabetesWA Telehealth

Perth Children's Hospital: Diabetes - For Patients and Families

Perth Children's Hospital: Metformin Fact Sheet

Perth Children's Hospital: DKA Guideline

National Heart, Lung and Blood Institute (NIH) Guide to Blood Pressure in Children

Additional Practice Points

T2DM Differential Diagnosis

Although type 1 diabetes (T1DM) can be diagnosed at any age, children with T1DM, usually present at a younger age, with a more acute onset of symptoms and with presence of autoantibodies (85–98% of patients). However, clinicians must be cautious as T2DM can present with diabetic ketoacidosis (DKA) or hyperglycaemic hyperosmolar state (HHS), and 10–20% of children with T2DM may have one positive autoantibody. Other less common differential diagnoses for T2DM can include monogenic diabetes, diseases of the pancreas (cystic fibrosis, haemochromatosis, pancreatitis), and endocrinopathies.

Trial of Lifestyle Modification

The rationale of a 3-month trial of lifestyle modification is to establish a relationship with the patient and reinforce the importance of lifestyle changes as a primary focus of management, prior to introduction of hypoglycaemic agents, which may have side effects that deter engagement. Patient should have at least monthly reviews during this time.

Use of Metformin

Patients who present unwell with symptoms, should be monitored closely. Once stabilized with insulin, they can be managed with metformin alone on discharge from hospital if T2DM confirmed. Slow dose escalation, good adherence, and administration with food reduce GI side effects. Metformin XR may be tolerated in those that do not tolerate IR formulation. Vitamin B12 deficiency and lactic acidosis are rare potential side effects. Withhold metformin 48 hours before elective surgery, exposure to contrast media, and during GI illness. Resume once tolerating diet and fluids.

Use of Long-Acting Insulin

Basal (long-acting) insulin commenced at 0.25–0.5 units /kg /day may be used if glycaemic targets are not met with metformin. Bolus (short acting) insulin with meals should be introduced as a next step. Discuss with on-call Paediatrician before commencing insulin therapy.

Engaging Families and Patients

Long-term behaviour change requires both family and community-centred approaches, and clinicians should explore any barriers to good glycaemic control together with patients and families at each visit in a supportive manner. Use a yarning approach involving a holistic family-centred discussion about diabetes with visual aids to overcome literacy issues, and collaborative goal setting to encourage family support. Keep messages positive, simple, easily understood and targeted to the child and their family, acknowledging their priorities, fears, misconceptions, preferences and beliefs. It is important to recognise that non-attendance does not necessarily represent lack of concern. When multiple family members have T2DM, children may be ambivalent or apathetic, feeling that having diabetes is inevitable and that little can be done.

Transition to Adult Services.

Due to many factors, adolescents are very vulnerable at the time of transition to adult care, with increased risk for worsening of engagement and associated poor glycaemic control. Given paediatric T2DM is an aggressive disease, all adolescents, should transition to the care of adult physicians / endocrinologists working within a multidisciplinary team, to allow transition to newer oral or injectable medications as indicated. Please discuss with the Kimberley Paediatric Team regarding this process.